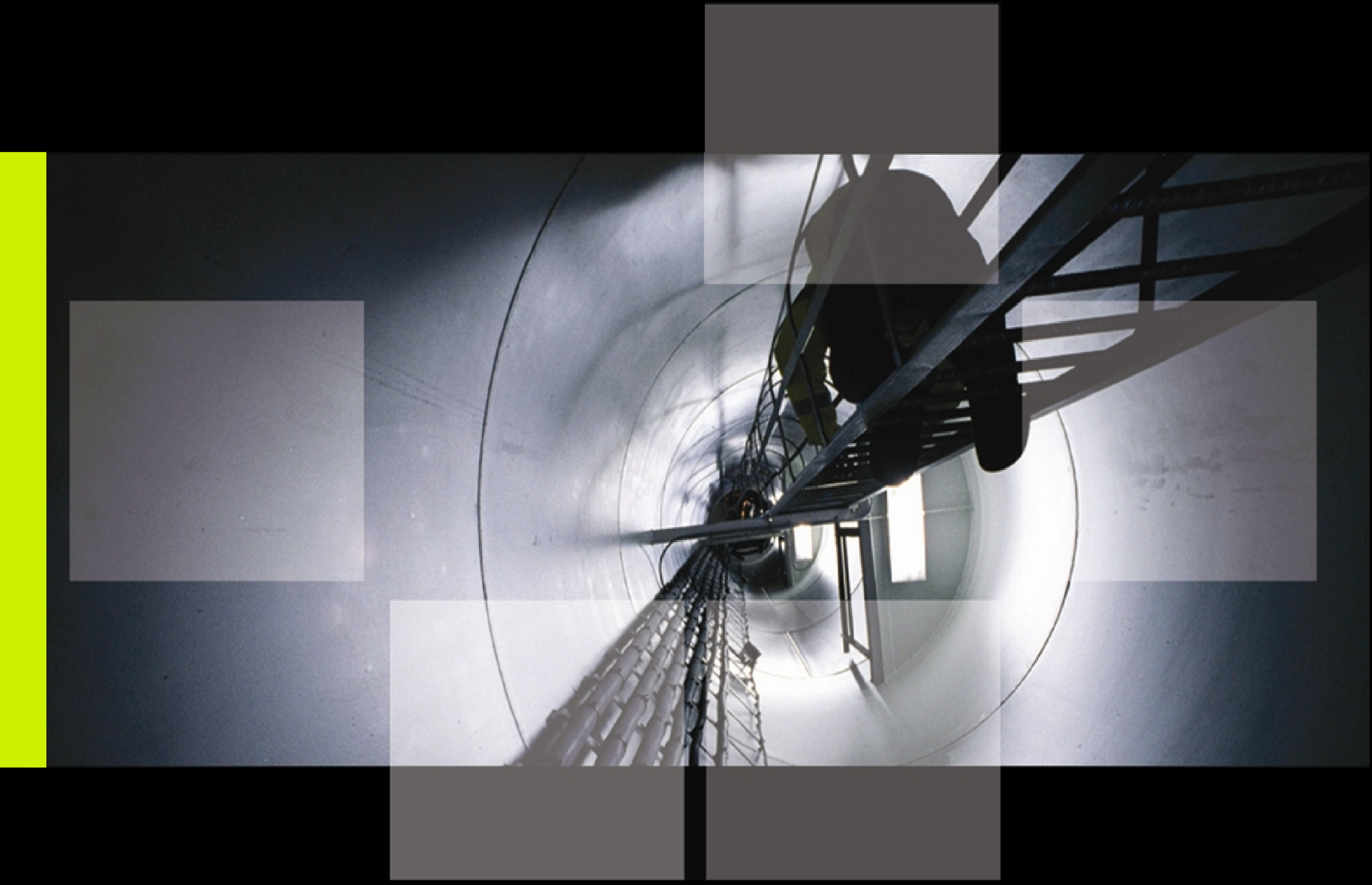
Orion BKP Mill Pre-Startup Audit

September 2007



Submitted to:

Botnia S.A.

Botnia S.A.
Fray Bentos, Uruguay

Orion BKP Mill Pre-Startup Audit

Project No. 155557

Projections of future events are uncertain and, any projections contained in this document, must be read in the full context of this document.

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REPORT SUMMARY

Botnia S.A. (Botnia) and the International Finance Corporation (IFC) wish to have independent confirmation that the Orion bleached kraft pulp mill currently under construction near Fray Bentos, Uruguay has been built and will be operated in accordance with the recommendations made in the Cumulative Impact Study (CIS) [1]. Botnia has retained AMEC Forest Industry Consulting to carry out a pre-start-up audit of the mill to confirm that those recommendation in the CIS report that relate to the mill's manufacturing processes and to the mill's pre-startup activities are being followed. The audit was carried out in two phases. Phase I occurred in April 2007 and Phase II in August 2007. At the time of Phase I of the audit the mill mechanical, electrical and instrumentation erection was 58.5% complete and civil construction more than 90% complete. At the time of Phase II of the audit the mill mechanical, electrical and instrumentation erection was 94.1% complete, civil construction more than 97% complete and commissioning 85% complete.

The activities for the Phase I site visit were the following:

a. Review process equipment installed or planned to be installed at the Orion mill, with particular emphasis on those facilities that influence or control the quantity and quality of liquid, gaseous and solid waste discharges, to confirm that the equipment is similar or equivalent to the best available techniques (BAT) described in the CIS. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions.

b. Review the Orion commissioning plan and assess the capacity of Botnia to implement that plan and to meet its environmental requirements and performance commitments at mill start-up and during the commissioning phase.

c. Review and assess Botnia's mill management team and its progress in preparation for start-up.

d. Identify necessary corrective actions and make recommendations to the Botnia management team for implementing those actions.

[1] "Cumulative Impact Study – Uruguay Pulp Mills" Prepared by EcoMetrix Incorporated, September

The activities in the Phase II audit were to:

a. Review the commissioning and operational status of mill production facilities and

b. Confirm that the recommendations for corrective action and improvements identified in the first audit visit had been carried out.

These activities from both the Phase 1 and Phase II audit visits are reported under the following headings: the Orion mill project organization; process equipment and technology, environmental management, personnel training, commissioning and operational status of mill production facilities and techniques to be used in mill operations.

Orion Mill Project Organization

The Botnia organizational concept is based on having the specialist skills required to lead construction completion, commissioning and initial operation in place to meet the scheduled start-up date. Most of these skills will come from foreign personnel. However Botnia has planned that within two years of start-up, the mill personnel will be nearly completely Uruguayan nationals.

Our impression, based on the review conducted, is that Botnia has built a strong organization for the Orion Fray Bentos mill. The caliber of personnel compare favourably with other projects of this type. The mill appears well-positioned from an organizational aspect to meet its operational objectives including its environmental management goals.

Process Equipment and Technology

All process equipment and technology installed or planned to be installed at Botnia-Orion is similar or equivalent to best available technology as described in the CIS. Minor improvements to the liquor tank area drain procedure (part of the spill recovery system) and evaporator area strong gas system were suggested after the Phase 1 visit, as was an independent operational review of the NCG systems.

Botnia reviewed our recommendations, and at our second visit the NCG system was practically complete, and operating instructions were developed and operators trained in its use. Botnia reviewed the NCG system operation

2006. (http://www.ifc.org/ifcext/lac.nsf/Content/Uruguay_Pulp_Mills_CIS_Final) with the suppliers and their engineers, and believe and assert that the system design, based on their experience in Finland, provides a safe system from a production and environmental standpoint, and that operators are trained in its safe operation. The auditors accept that the system design is similar to that in the CIS and in areas that it differs from the CIS description; it corresponds to IPPC-BAT (2001) or equivalent.

Operating procedures were developed for the spill systems and changes made in the control and operation of these systems. With these changes the systems corresponds to the CIS and IPPC-BAT (2001) or equivalent.

Environmental Management

Planning and responsibility for environmental management at Botnia-Orion has been assessed in four distinct areas:

a. As part of the core operating and maintenance staff training and work procedures (i.e. "the Botnia way") with every employee, up to the mill manager responsible.
b. As part of the Fire and Accident prevention planning and response, with the safety supervisor the responsible manager.
c. In the Environmental and Quality area (permits, monitoring, laboratory services and testing), with the Environment and Quality Manager responsible
d. As part of the operational management system – ISO 9001, 14001, 16001, with the mill manager ultimately responsible.

The first two of these areas (the Botnia Way and Accident Prevention and Response) were well developed at the time of the auditor's first visit. The third area (permitting and monitoring, laboratory testing and analysis) was being developed at the time of the Phase 1 visit. At the time of the second visit the laboratory was fully staffed and functional and monitoring plans were developed (note that assessment of monitoring plans was outside the scope of our audit). The fourth area, the operational management system, was in an early stage of development at the time of the Phase 1 visit, and is not scheduled to be complete until one-year after start-up. At the time of the second visit, the system was starting to be used, with a number of mill procedures entered into the system.

The mill management team has an appropriate level of environmental awareness for a project of this type. Botnia is working to complete environmental permitting, and has included key commitments made in the CIS. A comprehensive environmental management system, based on ISO 14001 is being developed as described in the CIS.

At the time of the second audit visit, the main information items and commitments required for issue of the mills operating permit (AAO) were either complete and submitted to DINAMA or close to complete, and submitted to DINAMA in draft form. The operating permit had not been issued, but would appear to be close to issue.

Personnel Training

There is a comprehensive personnel training program in place at the Botnia-Orion mill. This covers aspects that are normally found for a project of this type and includes classroom training, observation in other mills and participation in commissioning activities at the Botnia-Orion mill, to become familiar with the physical plant.

For the key local engineering staff, the training has been much more extensive that is often carried out, and a strong mentoring program has been developed.

At the time of the Phase 1 audit visit development of operating procedures and training for the spill control and recovery system, storm water system and parts of the NCG systems had not yet occurred, and general training for site environmental awareness was also recommended.

At the time of the second visit, many of required procedures had been written and operator training had occurred, including the areas highlighted as required in the first visit (spill control and recovery system, storm water system, the NCG systems and general training for site environmental awareness).

Experienced staff are being used for start-up and the Orion mill has been designed so that coordination between mill areas is easy and frequent, with the main process areas controlled from a common control room. The level of preparedness in terms of the areas highlighted in the Phase 1 visit report (spill control and recovery system, storm water system, the NCG systems) now appear to be appropriate for a project of this type.

Commissioning and Operational Status

Based on the information received, site interviews and observations it was concluded that Botnia's and Kemira's commissioning plans and procedures and also the people selected to carry out these plans have the features and characteristics that are normal for a project of this type.
At the end of the phase II visit it was clear that mid-August target date had not been met with construction at 94.1% and commissioning at 85.5%. Botnia's project director, project manager and Andritz project director all stated that all construction completion activities and commissioning checks could be completed within three weeks and all necessary area completion certificates issued. No detailed schedules that integrated the remaining erection and commissioning activities were available for review.

The Kemira supplied chemical plant would appear to have the necessary systems ready to allow start-up of the main pulp mill plant on this schedule.

The impact of compacted project completion schedule on commissioning and on the final phase of operator training where participation in commissioning checks and the use of the process simulators was planned, has been mitigated by the increased reliance on foreign expertise.

Operator training in some areas had occurred with simulators, and was scheduled to occur in all areas before the experienced operators from Finland are scheduled to leave. The use of simulators on this project, while different from originally planned (as they were not available earlier) has not been different from many projects of this type, as the availability of simulators has often been delayed.

Techniques to be used in Mill Operations

Botnia-Orion is planning to use the operating techniques outlined in the CIS report with respect to process control, process optimization, maintenance and maintenance planning. At the time of the first audit visit a number of operating procedures still required development, with some procedures for systems outside of the traditional vendor supply areas noticeably absent.

In general these procedures had been written at the time of the second audit visit and operators trained in their use.

The overall impression was gained of a well designed and generally well executed project. Modern process technologies are used that promise to perform with low emission and world-leading environmental performance. The staff we met were competent and motivated. The foreign nationals who are working on the project and supporting the initial mill operation have good mill operating experience.

1.0 INTRODUCTION

Botnia S.A. (Botnia) and the International Finance Corporation (IFC) wish to have independent confirmation that the Orion bleached kraft pulp mill currently under construction near Fray Bentos, Uruguay has been built and will be operated in accordance with the recommendations made in the Cumulative Impact Study (CIS) [1]. Botnia has retained Forest Industry Consulting (FIC), a management consulting division of AMEC AMERICAS LIMITED (AMEC) to carry out a pre-start-up audit of the mill to confirm that those recommendation in the CIS report that relate to the mill's manufacturing processes and to the mill's pre-startup activities are being followed.

1.1 Scope of the Audit

The CIS assessed the Orion Project with respect to its use of best available techniques [2] (BAT) as defined for modern bleached kraft pulp mills. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions A summary of the BAT evaluation methodology followed by the CIS is included in Appendix A1.1 of this report.

The audit was carried out in two phases. Phase I was carried out in April 2007. Based on the agreement for services, the Phase I audit was to be carried out just when the mill is nearing the end of construction. Phase II was to be conducted just prior to start-up and was carried out in August 2007.

The activities for the Phase I site visit were the following:

a. Review process equipment installed or planned to be installed at the Orion mill, with particular emphasis on those facilities that influence or control the quantity and quality of liquid, gaseous and solid waste discharges, to confirm that the equipment is similar or equivalent to BAT described in the CIS. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions.

[1] "Cumulative Impact Study – Uruguay Pulp Mills" Prepared by EcoMetrix Incorporated, September 2006. (http://www.ifc.org/ifcext/lac.nsf/Content/Uruguay_Pulp_Mills_CIS_Final)

[2] In this report and in the CIS report "techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

b. Review the Orion commissioning plan and assess the capacity of Botnia to implement that plan and to meet its environmental requirements and performance commitments at mill start-up and during the commissioning phase.

c. Review and assess Botnia's mill management team and its progress in preparation for start-up.

d. Identify necessary corrective actions and make recommendations to the Botnia management team for implementing those actions.

The main tasks in the Phase II audit were to:

a. Review the commissioning and operational status of mill production facilities and

b. Confirm that the recommendations for corrective action and improvements identified in the first audit visit had been carried out.

1.2 Audit Exclusions

Since this audit is limited to a review of process equipment and technology and pre-startup activities, a number of the recommendations contained in the CIS report were not investigated. It is understood that a review of post-startup activities will be undertaken at a later date. This review will be done by a different organization and will extend over a much longer time frame than the current audit.

The following are some of review activities recommended in the CIS report that were excluded at the request of Botnia and IFC from the current audit.

a. Review of the status of environmental and social action plans.
b. Review of the status of the mill's compliance monitoring plan.
c. Review of mill construction activities in terms of its environmental and social impacts and compliance with the Environmental Management Plan.
d. Review of solid waste management activities during construction and review of plans for the design and operation of landfills for post-construction operation.
e. Review of the status of road transportation management plans.
f. Review of the status of social and economic monitoring program in communities of Fray Bentos, Rio Negro and Paysandú.

g. Review of the status of social and environmental plans developed by Botnia and local communities to increase local and regional development opportunities and community programs and activities.
h. Review of the status of plans to treat municipal wastewater from Fray Bentos and to process weak black liquor from the Papelera Mercedes NSSC and kraft mill located in Mercedes.
i. Review of environmentally related permits, orders and requirements issued to Botnia by regulatory agencies and an assessment of Botnia's ability to meet these requirements.
j. Review of monitoring programs and facilities for measuring the quantity and quality of liquid, gaseous and solid waste discharges.
k. Review of the status of plans for the dissemination of environmental quality and safety data and related information on the mill's operation to the public.
l. Review of the status of plans for studying the effluent plume delineation in Rio Uruguay and monitoring of chemical and biological impacts of the mill effluent, sediment quality and benthic invertebrate community composition.

1.3 Audit Team

AMEC is a major consultant and design engineering company for Pulp and Paper projects worldwide[1] . AMEC Americas has more than 60 years experience in kraft pulp mill design, and this experience includes recent projects similar in scale and scope to the Botnia Orion project.

The audit was carried out by Mr. Peter Healy and Mr. Peter Gleadow.

Mr. Healy is a registered Professional Engineer in the province of British Columbia, Canada. He has more than 40 years experience in engineering and project management. He has held a number of project management positions in pulp mill development projects since 1974. These include responsibility for the design and execution of a number of major pulp and paper mill projects in Chile including a project which started up in December 2006 and has now successfully operated for 9 months, which was similar to the Orion project in equipment and scale.

Mr. Gleadow is a graduate in Chemical and Process Engineering. He has worked in the pulp and paper industry since 1981. He is a process specialist in chemical pulping, bleaching and millwide processes. He has a thorough knowledge of best available technologies in kraft pulping and their impact on the environment. Peter was a member of the EcoMetrix team that prepared the CIS report.

The report prepared by the auditors has been reviewed, critiqued and incorporated in this report by Dr. Leslie Galloway. Dr. Galloway is a registered Professional Engineer in the province of British Columbia, Canada. He has worked in the pulp and paper industry since 1964. He has participated in a number of environmental impact assessments for bleached kraft pulp mills both as a contributor and as a reviewer.

1.4 Audit Methodology and Reporting

The auditors first visited the Orion pulp mill site for 5 days during the week of April 23, 2007, a date recommended by Botnia. At the time of the first visit, Botnia's estimate was that erection was 58.5% complete. We completed the second visit of the Orion Mill pre-start up audit between the 13th and 16th of August. The mill construction progress was reported by Botnia to be 94.1% for mechanical, electrical and instrumentation erection and 85% for commissioning as of the 13th of August.

The audit was conducted through a combination of site inspections, document reviews and interviews with key personnel from Botnia, equipment suppliers Kemira and Andritz, and the engineering consultant Poyry. The schedule of interviews and the personnel interviewed is given in Appendix A1.2 and A 1.3 of this report.

One week before each visit to the mill by the auditors, Botnia was provided with a list of documents that the auditors wished to review on arrival. This list is included in Appendix A.1.4. During the first visit the auditors had good access to personnel and to the site, but access to documents was somewhat limited, with documents not universally available, or not delivered in a timely fashion. Some of the key documents that were not provided, or provided in incomplete form, included detailed schedules, process guarantees, and process and control documents. Reasons given for not providing these documents included confidentiality agreements with vendors and unavailability due to the documents having not yet been prepared.

In the second visit, many of the documents withheld or unavailable during the first visit were provided, including process guarantees and process and control documents

[1] July 23, 2007 issue of Engineering News Record.

In the second visit the auditors had good access to personnel, documents and the site.

Activities from both the Phase 1 and Phase II audit visits are reported under the following headings: the Orion mill project organization; process equipment and technology, environmental management, personnel training, commissioning plan and commissioning and operational status of mill production facilities and techniques to be used in mill operations,.

In this final report the main findings of the phase 1 visit have been retained and discussed relative to the phase 2 visit.

2.0 ORION MILL PROJECT ORGANIZATION

The Botnia organizational concept is based on having the specialist skills required to lead construction completion, commissioning and initial operation in place to meet the scheduled start-up. Most of these skills will come from foreign personnel. However Botnia has planned that within two years of start-up, the mill personnel will be nearly completely Uruguayan based personnel.

Our impression, based on the review conducted, is that Botnia has built a strong organization for the development and operation of the Orion Fray Bentos mill. The caliber of personnel appears to compare favourably with other projects of this type. The mill appears well-positioned from an organizational aspect to meet its operational objectives including its environmental management goals.

The commissioning and operation of the Botnia Mill will require a well-organized approach. The mill project organizational structure was reviewed in this regard. This review included the Botnia general organizational structure, the on-site mill project organization, the commissioning organization, the maintenance organization and fire and accident rescue organization. All of these organizational units work within the environmental management organization discussed in Section 4.0 of the report.

The audit included discussion with key on-site project personnel (approximately 50 persons) as listed in Appendix A1.3. In these discussions the organizational charts for each sector was reviewed and the caliber and experience of personnel was assessed at an overview level.

2.1 Mill Operational Organization

Botnia has stated that its intention is to have the Orion pulp mill's operational team composed of nearly all Uruguayan personnel within two years from mill startup. This is reflected in the chart entitled "Target Organization 2008/09" which can be found in Appendix A2.1. During pre-startup, startup and initial operations, the operational team will be led by, or heavily supported by, foreign specialists from the main equipment suppliers and by supervision and operational personnel from Botnia's Finnish mills. This approach has been used successfully in other similar projects. It will be necessary for mill management to continuously review the transition from foreign to Uruguayan personnel to ensure that the expertise level is maintained.

The chemical plant, which will be owned and operated by Kemira, also has foreign personnel to lead construction and startup activities but it is Kemira's intentions to have the plant managed and operated by Uruguayans as soon as possible following startup. This is reflected in the organization chart entitled "Kemira Uruguay SA" which can be found in Appendix A2.2.

2.2 Mill Construction Organization

The Orion Mill construction organization is shown in the chart entitled "Mill Project Site Organization" which can be found in Appendix A2.3. The team is led by the Botnia mill manager. The main contractor, Andritz, serves as the general site manager and manager of the main process areas. Andritz reports to the Botnia mill manager. Within the Andritz-led site team, Botnia manages erection of the utility area which includes: raw water treatment; effluent treatment; power distribution; compressed air services; distributed control systems (DCS); heating, ventilating and air conditioning (HVAC); demineralized water treatment; pipe bridges; and package boilers. Andritz's overall project director is located at the mill site and supports the site project organization.

The main personnel responsible for construction and commissioning were assessed to be knowledgeable within their respective areas of expertise. The Botnia/Andritz/Kemira team appears to function well possibly due to a cost sharing contractual arrangement between the parties.

2.3 Mill Commissioning Organization

The Orion Mill commissioning organization is shown in the chart entitled "Commissioning Organization of Botnia S.A. Pulp Mill" which can be found in Appendix A2.4. The commissioning organization is being led by a senior Botnia engineer. Within this organization are the key suppliers to the project, Andritz, Siemens, Degremont and Kemira are leading the commissioning of their respective operational areas. Botnia were coordinating commissioning activities in the utility areas.

The leaders in each of the process and utility areas have a dedicated team assigned to carry out the commissioning activities in their respective areas. This is illustrated in the charts entitled "Recovery and Auxiliary Boilers Commissioning Organization" and "Raw Water Pumping Commissioning Team" which can be found in Appendix A2.5 and A2.6. These charts are typical of commissioning organizations found in all other mill areas. They show that these organizations have dedicated area specialists covering each of the process, mechanical, electrical, instrumentation and DCS disciplines.

Organizational preparations at the mill-wide and area levels appear to be generally adequate and similar to other successful projects of this type.

2.4 Maintenance Organization

The safe and continuous operation of the Orion mill will require the services of a dedicated maintenance team. Botnia has contracted Andritz to provide long-term maintenance services to the mill. Andritz's maintenance team will report to Botnia's mill management. Overall organization of the maintenance team is shown in the chart entitled "Andritz Uruguay S.A. Maintenance Organization" which can be found in Appendix A2.7. This chart shows the overall maintenance organization for the Orion mill. Organization charts for maintenance teams within each mill area have also been developed but are not included in this report.

Andritz's maintenance team actively supports the commissioning of the mill.

From discussions with Andritz and Botnia managers responsible for maintenance and a review of planned services, including the arrival schedule of spare parts, it was concluded that Botnia has developed an adequate organizational plan for maintenance of the plant. Maintenance planning is further discussed in Section 7.0 Mill Operations.

2.5 Fire and Accident Rescue Organization

Pulp mills are designed to be operated safely. Nevertheless, fires and accidents can occur and mills must be prepared to deal with such events. Botnia has developed an organization to deal with such emergencies and this is shown in the chart entitled "Fire and Accident Rescue Organization Botnia SA" which can be found in Appendix A2.8. The organization is led by the mill Safety Manager who will direct the firefighting and first aid teams. The team is intended to be self-sufficient and will call for outside help from the firefighting services of Fray Bentos only in the case of a major event. Botnia has provided the Fray Bentos brigade specialized equipment similar to that available on site, and has regular combined training to provide effective emergency cooperation.

This emergency organization is comparable to those found in pulp mills of similar size and complexity and as such it is in the auditors view, generally adequate.

3.0 PROCESS EQUIPMENT AND TECHNOLOGY

All process equipment and technology installed or planned to be installed at Botnia-Orion is similar or equivalent to best available technology as described in the CIS. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions

In the audit we examined the process equipment and technology installed in the Orion pulp mill and assessed its compliance with Best Available Techniques (BAT) as defined in the CIS. This was accomplished during the site visit by site inspections, document reviews and interviews with key personnel from Botnia and equipment suppliers Kemira and Andritz.

3.1 Overview of the Pulp Mill Project

The Orion mill is a bleached kraft pulp mill which will produce 1,000,000 tonnes of pulp (measured as air-dried) per annum from eucalypt grown in plantations established in Uruguay in the early 1990’s. The finished product will be exported mainly to Europe and Asia.

The main processing units or areas of the pulp mill include the following: wood yard; digester; oxygen delignification; ECF bleach plant; pulp dryers; evaporators; recovery boiler, turbogenerators and recausticizing (i.e. chemical regeneration); water supply; and effluent treatment.

The Orion pulp mill is a “single line” mill which essentially means that there is one of each of the processing units and these are arranged, from a material flow stand-point, in a single line. The exceptions to this general rule, in the case of the Orion pulp mill, are the barking drums in the wood yard where two operate in parallel; the pulp dryers where, again, two operate in parallel; the water filtration plant which has three filtration lines operating in parallel; the effluent treatment system which has two biological reactors and two secondary clarifiers operating in parallel; and the electrical generation area which has two steam-turbines and two generators.

Other components of the pulp mill project include a port from which the product will be shipped, a landfill for solid waste disposal, a chemical plant owned and operated by Kemira which will supply a portion of its chemical production to the pulp mill and a portion for export, and the eucalypt plantations.

The pulp mill will produce electrical power in excess of its requirements. Most of this excess power will be sold to the chemical plant. The balance will be exported to the national grid.

For a more complete description of the project, please refer to the CIS report. A schematic diagram of the main process units and a site layout drawing are provided in Appendix A3.1 of this report. The main process description, from the CIS report is included in Appendix A3.2.

The mill is scheduled to start operating in the third quarter of 2007. The status of mill construction and commissioning at the time of the Phase I and Phase II audit visits are discussed in Section 6.0 of this report.

3.2 CIS BAT Assessment Methodology and Scope

The CIS report recommended the following methodology in determining whether or not the Orion pulp mill was employing best available techniques:

a. Assessment of the mill's compliance with the emission levels achievable with the use of BAT.
b. Assessment of whether the environmental regulating body in Uruguay, DINAMA, has a comprehensive plan to ensure the BAT standard will be met through their permitting process and requirements.
c. Assessment of whether BAT has been included in the mill equipment design.
d. Assessment of BAT operating requirements.

Because the current audit of the project is limited to reviewing the manufacturing process and pre-startup activities, only a portion of the overall BAT assessment undertaken in the CIS will be reviewed. Consequently, items (a) and (b) – emission limits and permitting and enforcement practices – were not addressed in the current audit but, it is understood, will be included in the scope of the post-startup audit.

Item (c) is addressed in Section 3.3 below.

The CIS report identified the following components of item (d): training and motivation of mill personnel; process control, equipment maintenance; environmental management systems (EMS); plans for solid waste management practices; monitoring plans including implementation in other operating mills; and plans for communication with the community.

The current audit addresses process control, EMS, training and motivation of mill personnel, and maintenance practices and are discussed in Sections 4.0 5.0 and 7.0 of this report. The remaining components of item (d), namely, solid waste management, monitoring, and communication with the community, are to be addressed in the post-startup audit.

3.3 Process Equipment Compliance with BAT

Table A13.1 in the CIS Report is a summary of the BAT analysis for the Botnia-Orion Pulp Mill. This is included in Appendix A1.1. This table has also been used in the current audit as a checklist for reviewing compliance of the main process technology with BAT.

In the CIS report the BAT analysis drew primarily on the European Union (IPPC, 2001) requirements for emission to air and water and also on the United States (USEPA) requirements for emissions to air and water.

Two additional columns have been added to the CIS table, these are a status column providing comment on the status of implementation at the time of our visits, and a summary of our assessment of compliance with the CIS.

The process guarantees from the equipment purchase contracts were inspected for a number of areas. This included areas critical to air and water emissions that is: the fiberline, bleaching, evaporator, recovery, recausticizing and effluent treatment areas. The process guarantee values are compared with the CIS report. The CIS report has typically used reasonable and expected performance values, and process guarantees are not to be exceeded numbers, and in some cases are slightly higher than the CIS values. It is expected and normal that process guarantee values may be at a higher level than expected performance levels, as there is usually some commercial allowance, as guarantee levels often involve penalty for non attainment, and are generally based on a short duration test run. Expected performance values are based on long-term average performance.

A supplemental analysis based on the mill process descriptions is included in Appendix A3.2, and is included to provide a commentary on a process areas basis, compared with the technology and attribute basis used in the table below.

Table 1: Summary of BAT Process Technology and Techniques Analysis for the Botnia-Orion Pulp Mill (from Table A13-1 of the CIS)

IPPC Requirements Related to Emissions to Water		***Status at time of the Site Visits (April and August 2007)***	***Compliant with the CIS***
Dry debarking of wood	Logs will be dry-debarked at the plantations, therefore debarking drums at the mill will remove only the remaining bark and impurities such as soil and sand. Water used in washing of the logs will be recycled, with only a minimum purge going to the effluent treatment plant, in order to avoid accumulation of impurities. The water consumption at the mill is expected to be below the definition for dry debarking, i.e. 0-5-2.5 m^3/ADt.	The Dry Debarking Drums had been installed in April and in August the Woodyard area was nearing completion. Water consumption and effluent flow guarantees (1 m3/ADt) were viewed and are consistent with the balance numbers in the CIS (0.7 m3/Adt) and are also consistent with IPPC-BAT.	Yes
Modified cooking either in batch or continuous system	Cooking will be done in a Downflow Lo-Solids® continuous digester.	The downflow Lo-Solids® continuous digester had been installed in April and in August the Fiberline Area was nearing completion	Yes
Highly efficient brown stock washing and closed cycle brown stock screening	Brown stock will be washed first in the digester, then in high-efficiency drum displacement washers (DD-Washers®, E10=23); three in parallel before oxygen delignification, and two in parallel before bleaching. Brown stock screening will be done in a three-stage closed cycle.	The DD- Washers had been installed as described in the CIS in April and in August the Brownstock and Bleach washing areas were close to complete. The performance guarantee was viewed for washing efficiency and is consistent with the CIS	Yes
Oxygen delignification	Before bleaching, pulp will be delignified in a two-stage oxygen delignification process. Final kappa number will be under 11.	The Oxygen reactors were installed.	Yes
ECF or TCF final bleaching and some, mainly alkaline, process water recycling in the bleach plant	ECF bleaching with the sequence A/D-E_{OP}-D-P; DD-washers® will be used in the intermediate washing stages. Botnia will install the necessary equipment to recycle the alkaline filtrate from the bleaching plant, however Botnia has stated that the implementation of this option requires that the mill is running for at least two years.	The ECF bleaching towers and chemical plant were installed and Mill process guarantees were inspected and comply with CIS	Yes

IPPC Requirements Related to Emissions to Water (continued)		***Status at time of the Site Visits (April and August 2007)***	***Compliant with CIS***
Purification and reuse of condensates	Segregation of condensates will be as follows: • primary (clean): returned to the feed water tank of the recovery boiler • secondary, type A: used in the fiberline • secondary, type B: used in the white liquor plant • foul: stripped to be returned to the process. TRS and methanol removal efficiency in stripping: >98%.	The installation of the condensate collection, purification and reuse systems was as per the CIS and Mill process guarantees were inspected and comply with CIS	Yes
Effective spill monitoring, containment, and recovery system	Spills will be collected and returned to the process. The floor channels and sumps will be monitored with sensors (pH or conductivity).	Spills are collected and can be returned to process. Sumps are monitored. Some changes were recommended after the April visit as discussed further below in Section 3.4.2. In August changes had been made, and operating procedures for operation of sumps have been developed and operating training scheduled.	Yes
Sufficient black liquor evaporation plant and recovery boiler to cope with the additional liquor and dry solids loads due to collection of spills, bleach plant effluents etc.	Evaporation plant and recovery boiler have been designed with adequate additional capacity. Evaporation capacity: 20% above normal operation. Recovery boiler: 27% above design capacity for peaks (9% for continuous operation).	The installation is as per the CIS and mill process guarantees were inspected and comply with the CIS	Yes
Collection and reuse of clean cooling waters	Contaminated cooling water will be directed to the effluent treatment plant.	The installation is as per the CIS	Yes
Provision of sufficiently large buffer tanks for storage of spilled cooking and recovery liquors and dirty condensates to prevent sudden peaks of loading and occasional upsets in the external effluent treatment plant	Spills will be collected and returned to the process. However, if an unexpected load goes into the effluent sewers, it will be contained in the equalization and safety basins (3 basins, 25,000 m^3 each). No effluent will be sent from these basins to the biological treatment without being checked by an operator.	The installation is as per the CIS. At the time of our visit in August repairs to the equalization basins were in progress	Yes

IPPC Requirements Related to Emissions to Water (continued)		***Status at time of the Site Visits (April and August 2007)***	***Compliant with the CIS***
Primary treatment of wastewater	Fiber-containing effluents from the process will go to a primary clarifier before being sent to the equalization basins.	The installation is as per the CIS.	Yes
External biological wastewater treatment	Activated sludge treatment, with two parallel lines (two aeration basins + two secondary clarifiers). Total volume of biological treatment: 150,000 m^3.	The installation is as per the CIS. At the time of our visit in August the effluent treatment area was nearing completion and repairs to the aeration basins were in progress.	Yes

USEPA Cluster Rule Requirements Related to Emissions to Water		*Status at time of the Site Visits (April and August 2007)*	*Compliant with in CIS*
Adequate chip thickness control	*The selected chippers (HHQ-Chipper) will produce chip size distribution sufficiently even to be classified by flat screens used only for cooking of eucalyptus pulp.*	Installation is as per the CIS and the Woodyard area was nearing completion at the time of the visit in August	Yes
Use of dioxin- and furan-free defoamers (i.e. water-based defoamers or defoamers made with precursor-free oils)	*Only dioxin- and furan-free defoamers will be used.*	The mill operating plans are as per the CIS. Material Safety Data Sheets were viewed for the defoamer to be used (BIM AF 4151 X). The manufacture declares that raw materials used are not dangerous to the environment and that the defoamers are not hazardous for transport.	Yes
Oxygen- and hydrogen peroxide-enhanced extraction (which allows elimination of hypochlorite and/or use of a lower kappa factor in the first bleaching stage)	*Oxygen and hydrogen peroxide enhanced extraction is in use.*	Installation is as per CIS and the area was nearing completion at the time of our visit in August.	Yes
Use of strategies to minimize kappa factor and dioxin & furan precursors in brown stock pulp	*The eucalyptus is delignified in Lo-Solids cooking system and two stage oxygen delignification system. Efficient washing with E10=23 will be used to minimize the organic solids content in front of bleaching. Hexenuronic acids are removed by acidic hydrolysis (A-stage) in front of the final bleaching.*	Installation as per CIS and the area was nearing completion at the time of our visit in August	Yes

IPPC Requirements Related to Emissions to Air		***Status at time of the Site Visits (April and August 2007)***	***Compliant with CIS***
Collection and incineration of concentrated malodorous gases from the fibre line, cooking plant, evaporation plant, condensate stripper, and control of the resulting SO2. The strong gases can be burnt in the recovery boiler, the lime kiln or a separate, low NOx furnace. The flue gases of the latter have a high concentration of SO2 that is recovered in a scrubber.	The concentrated odorous gases are collected from the cooking and evaporation plant and condensate stripper. The gases are primarily fired in the recovery boiler, and as a back-up only in an odorous gas boiler equipped with a scrubber for bisulphite production.	System installed as per CIS. During our April visit the possibility of local venting on evaporator start-up from the "hogging" vacuum system was identified as requiring further investigation. At the time of our second visit the odorous gas systems were mechanically complete and startup procedures written and operators trained to reduce the possibility of system venting from the evaporator on start-up from the "hogging" vacuum system. This is discussed below in Section 3.4.1	Yes – Some development of the design has occurred and the changes are consistent with IPPC BAT (2001) and modern system design as discussed in Section 3.4.1
Collection and incineration of diluted malodorous gases from e.g. the fibre line, various sources as tanks, chip bins, smelt dissolver etc. The weak malodorous gases can be burnt in e.g. the recovery boiler mixed with combustion air or in an auxiliary boiler depending on the volume.	The diluted odorous gases are collected in the brown stock fibreline, oxygen delignification, evaporation and recausticizing. The gases are burnt as the secondary air in the recovery boiler, and as a back-up only in an odorous gas boiler for weak gases.	The system is installed in compliance with CIS Mill process guarantees were inspected and incineration capacities are sufficient to burn the expected gas volumes.	Yes. An emergency local vent from the digester area has been added since initial design. The changes are consistent with IPPC BAT (2001) and modern system design as discussed in Section 3.4.1

IPPC Requirements Related to Emissions to Air (continued)		***Status at time of the Site Visits (April and August 2007)***	***Compliant with in CIS***
Mitigation of the TRS emissions of the recovery boiler by computerized combustion control and CO measurement and in the case of the lime kiln by controlling the excess oxygen, by using low S-fuel, and by controlling the residual soluble sodium from the lime mud fed to the kiln.	The TRS emissions of the recovery boiler are mitigated by computerized combustion control and CO measurement. No odorous gases are fired in the lime kiln, mitigating the TRS emissions. The residual soluble sodium to the lime kiln is minimized.	The operational plan for the system is as in the CIS and the system has been installed, as per the CIS. Low sulphur fuel has been ordered for mill operation.	Yes
Control of SO2 emissions from the recovery boilers by firing high dry solids concentration black liquor in the recovery boiler to mitigate SO2 formation and/or by using a flue gas scrubber.	The black liquor will be concentrated close to 80 % dry solids to mitigate SO2 formation.	The operational plan for the system is as in the CIS. The process guarantees for the evaporators and recovery boiler were inspected are consistent with 80% dry solids liquor firing.	Yes
Control of NOx emissions from the recovery boilers and lime kiln by controlling the firing conditions and by ensuring proper mixing and division of air in the boiler, and for new or altered installations also by appropriate design;	- Low NOx burner will be installed. - Firing conditions will be controlled. - Vertical four level air distribution.	The operational plan for the system is as planned in the CIS and the system has been installed, as per the CIS. ,	Yes
Control of NOx emissions from auxiliary boilers by controlling firing conditions and for new or altered installations also by appropriate design.	N/A		
Reducing SO2 emissions from auxiliary boilers by using bark, gas, low sulphur oil and coal or controlling S emissions with a scrubber (n/a in the case of Botnia).	N/A		
Cleaning of the recovery boilers, auxiliary boilers (in which other biofuels and/or fossil fuels are incinerated) and lime kiln flue gases with efficient electrostatic precipitators to mitigate dust emissions.	The recovery boiler and lime kiln flue gases are cleaned with high efficient (99,9%) electrostatic precipitators.	The system was being installed as in the CIS, .	Yes

USEPA Cluster Rule Requirements Related to Emissions to Air		***Status at time of the Site Visits (April and August 2007)***	***Compliant with in CIS***
Bleach plant vent control and collection. The control device shall reduce the total chlorinated HAP mass with 99 wt-% or more, achieve an outlet concentration of 10 ppmv or less; or achieve an outlet mass emission rate of 1 g/ODt.	All bleaching vents are collected to the bleaching scrubber.	System is installed as per the CIS,	Yes
Collection and treatment of CNCG should include digester, turpentine system, evaporation and stripper system. For DNCG the identified sources are at least; knotting/screening, oxygen delignification, pulp washing and weak black liquor storage. Reducing the total HAP emissions using a boiler, lime kiln or recovery furnace by introducing the HAP emission stream with the primary fuel or in the flame zone is an available option.	CNCG are collected from cooking, evaporation and stripper system and fired primarily in the recovery boiler and as a back-up in the strong odorous gas boiler equipped with a scrubber. DNCG are collected in the brown stock fibreline, oxygen delignification, evaporation and recausticizing. DNCG are fired primarily in the recovery boiler secondary air and as a back-up in a separate weak odorous gas boiler for mild gases.	System is installed as per the CIS	Yes
Foul condensates from digesters, evaporators and NCG collection systems. Different options are mentioned for treatment. For stripper systems the reduction of total HAP should be at least 92- wt%.	Foul condensates are collected from cooking, evaporation and NCG collection systems. The foul condensates are purified in a stripper. The system includes also methanol segregation. (The gases from the system are led to the CNCG collection system and fired.)	System is installed as per the CIS,	Yes
For new sources electrostatic precipitators are considered for recovery boilers and lime kilns, and for smelt dissolving tanks wet scrubbers. This to reduce particulate hazardous air pollutants (PMHAP).	Efficient electrostatic precipitators are used for both the recovery boiler and lime kiln. The gases from the smelt dissolving tank are fired in the recovery boiler.	System is installed as per the CIS	Yes

3.4 Further Comment on Process Equipment Compliance with BAT

Two areas were identified in the table above as requiring further discussion.

3.4.1 Concentrated Non-Condensable Gas System

A number of recently constructed kraft pulp mills have experienced operating difficulties in the non-condensable gas (NCG) systems during startup which have resulted in the release of odorous gases to the atmosphere. While the concentrations of these odorous compounds in the atmosphere are well below levels that cause health effects, they are, nevertheless, very unpleasant to smell. Such events, particularly in a community with no previous experience with kraft pulp mills, can lead to a significant loss of public confidence in the ability of the mill to meet its environmental obligations.

Botnia is well aware of this environmental sensitivity and has designed and installed a comprehensive NCG collection and incineration system which is expected to operate at a better than BAT level of reliability.

NCG systems collect gases from a number of process area which means that "ownership" is spread over a number of operating areas with no one operating area having overall responsibility for the system. Botnia has recognized this potential problem and has given responsibility for the system to a dedicated process engineer, who is responsible for coordination and system check out. According to the CIS report, Botnia has acknowledged, nevertheless, that releases of concentrated NCGs may occasionally occur, resulting in detectable odours in the community and, in anticipation of this, Botnia has stated that it will work to prepare the community for such events.

The CIS carried out air modeling exercises with the assumption that NCGs, when vented (i.e. released during an emergency event), would only be vented through the main exhaust stack and that there would be no localized venting of NCGs from the collection and incineration system. Our understanding is that some allowances for localized odorous releases from surface drains and the treatment plant were included in the model. During the current audit, the NCG system was reviewed with particular attention paid to the possibility of localized venting. This review included both an on-site inspection and an examination of process and control diagrams.

Four local vents in the concentrated NCG piping system were found. Three of these vents would only vent in the event of an explosion in the piping system or severe malfunction, which are unlikely events. The vents are protected by a bursting disk, or part of the boiler flame safety systems. . Minor piping errors on the drains lines on two of these vents were noted on the first visit and communicated to the construction engineer responsible, these minor errors were corrected at the time of our second visit. These three vents are of minimal concern to the audit team as they conform to standard design practice and have limited ability to vent, and are required for safe operation.

The fourth vent was from a manual valve on the hogging vacuum pump from the condenser in the evaporator area. This vent is designed to be used during startup to prevent the introduction of air into the concentrated NCG system, which could otherwise result in an explosion. When inspected on site during the first audit visit, the installation was only partially complete. A second shut off valve had not yet been installed, and is required for safe operation.

Use of a manual hand valve for operation of this vent is generally not a recommended practice. In many other mills this valve is automated to close when vacuum is obtained in the condenser, and interlocked so that it can only be open when there is no liquor being feed into the evaporators.

Our recommendations following the first visit were that consideration be given to the following with respect to the evaporator vent on the concentrated NCG system:

- Examine the operation of the hogging vacuum pump vent on the evaporators specifically with objectives of providing sufficient valving for process isolation, automation of vent valve as described above, and to consider relocation of the vent line so that vented gases are safely directed to the dilute NCG system or to the main stack
- Provide procedures and an interlock to ensure that the evaporator vent cannot or will not be operated when there is liquor in the evaporators.
- That consideration also be given to having the NCG system reviewed by an independent expert in NCG systems prior to startup.

It should be noted that at the time of the first visit inspection the concentrated NCG system was about 60% installed and the comments made above do not reflect a fully installed and commissioned system.

During our second visit we observed that the evaporator vent system had been completed with the necessary isolation valves and operating instructions prepared to keep emissions to a minimum. The manual valves are also equipped with limit switches, to enable valve status to be confirmed in the computer DCS system, and incorporated in control logic and interlock.

Further Botnia and their vendors have reviewed the design and operation of this part of the system and their Botnia's response to the question of automation of this valve is given below

"1.1. Concentrated Non-Condensable Gas System:-

We refer to Appendix 3.4.1 page 25 (57) wherein concerns have been raised and consequently recommendations made regarding the fourth vent (evaporator vent).The concern here is that the vent is a combination of two manually operated valves rather than automated valves which may be common within certain other Mill Sites.

We take note and appreciate the concerns and recommendations including suggestions made specific to this item however we are of a different opinion and detail below our reasoning for this:-

Previous case studies within Botnia Mills and other Mills of this type have led us to believe that it is far safer option both from a production and environmental standpoint to operate this vent manually than to rely on an automated system for operation.

Utilising manually operated valves will ensure the following:-

- *This system is regarded as 'hazardous' in respect of the possibility of explosion through the introduction of air into the NCG System and the emission of odorous gases and therefore we want to minimise the complete reliance on an automated system to operate these valves.*

- *Operating the valves manually ensures that the field operator has visually checked and verified that the valves are in their correct positions (i.e. open or closed).*

- *The field operator becomes more conscious of the importance of ensuring the valves are in their correct positions (i.e. open or closed) since he is the delegated responsible person.*

- *The field operator can confirm with the operator in the control room that the valve is in the correct position (i.e. open or closed) by way of verifying the readings within the DCS thus creating a second check.*
- *It prevents the field operator from becoming too reliant on the DCS for operating the valves thus reducing the possibility of complacency. If the pneumatic air line to the valve becomes damaged or is not working this will prevent the valves from opening or closing automatically which may pose a problem in the case of an emergency.*
- *Furthermore, the valve is equipped with a Limit Switch which will send an alarm signal to the DCS if the valve is not closed".*

The audit team is aware that Botnia have mills in Finland with systems that use automated valves and other mills that use manual valves, and that the use of manual valves on Orion was the result of a design decision to have this system under direct operator control. The audit team notes Botnia's reasons for using manual valves and for not using automated valves. As Botnia is convinced that there is greater operational reliability and less risk of odorous gas emission using manual valves, then the audit team respects this decision.

Botnia have not relocated this vent to the main stack or dilute odorous gas system. The Audit team recognize that it is also normal practice in a BAT designed system to have a local vent to remove air trapped in the evaporators, after shutdown and prior to start-up (as is designed at Botnia) and accept Botnia's decision not to consider relocation of this vent.

We understand that the mill has not had the NCG system reviewed by an independent expert in NCG systems prior to startup, and the audit team accepts that this is not a BAT-CIS requirement.

Botnia and their suppliers are continuing to investigate the best way to operate the concentrated NCG system, and may incorporate additional changes. Botnia-Orion and their suppliers have reviewed recent system failures at other mills, (for example for vents from the digester area at Veracel in Brasil) and incorporated an updated system design in this area. This includes a local emergency vent in the digester area.

The audit team concludes that the evaporator vent system and NCG systems are similar or equivalent to best available technology as described in the CIS. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions

3.4.2 Spill Control and Recovery System

The Orion mill will have a comprehensive spill control system for containing, collecting and recovering liquid spills within the mill processing areas. This system includes containment walls around storage tanks and a system of trenches in the floors of the operating areas which will collect liquids spilt on the floors and direct such spills to a reservoir (i.e. a "sump") located below floor level in the area.

There are five main areas for recovery of spills – the brown stock fiber line, the recausticizing process area, the recausticizing storage tank area, the evaporator process area, and the black liquor storage tank area. These five areas are provided with three sumps into which the recovered liquids are collected from the spill recovery areas and either returned to the process, if contaminated, or directed to the process sewers and from there to the effluent treatment system.

Spills and other liquids discharging to the floors in the brown stock fiber line are collected in a series of floor trenches and drain into a sump in the brown stock area. The liquid in the sump is pumped back to the process if its conductivity exceeds a pre-set value or otherwise, it flows by gravity into the process sewer.

Spills and other liquids discharging to the floors in the recausticizing process area are collected in a series of floor trenches and drain into recausticizing process area sump. Rainwater and other liquids collected in the recausticizing tank containment area drain by gravity through a remotely operated valve, located in the containment wall, into the recausticizing process area sump. This valve cannot be opened if the conductivity of the liquid within the containment area exceeds a certain pre-set value. Liquid collected in the recausticizing process area sump is pumped back to the process if its conductivity exceeds a pre-set value otherwise, it flows by gravity into the process sewer.

Spills and other liquids discharging to the floors in the evaporator process area are collected in a series of floor trenches and drain into the evaporator process area sump. Rainwater and other liquids collected in the containment area surrounding the recovery area black liquor storage tanks drain by gravity through a manually operated value, located in the containment wall, into the evaporator process area sump. Liquid collected in this sump is pumped back to the process if its conductivity exceeds a pre-set value otherwise, it flows by gravity into the process sewer.

The manual valve located in the wall of the black liquor storage tank storage area was a concern to the audit team. At the time of our first visit, there was no easy way to determine the position (i.e. open or closed) of this valve. In our experience with other mills, valves such as this have been known to be left open as a convenient way of avoiding an accumulation of rainwater in the containment area and, as such, would provide no protection from a major spill of black liquor from the any one of the storage tanks. It was recommended after our first visit that, as a minimum, Botnia develop operating instructions to prevent such an occurrence

During the second audit visit mill visit, we confirmed that operating procedures have been written for the spill system, and that operator training is scheduled for these systems. The black liquor area drain valve will also be modified by having a limit switch installed, which will display an alarm on the DCS system when the valve is open. This will enable the operators to be alerted if the valve is opened. With these changes this system now complies with BAT-CIS

The Audit team finding was that all process equipment and technology installed or planned to be installed at Botnia-Orion is similar or equivalent to best available technology as described in the CIS. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions.

4.0 ENVIRONMENTAL MANAGEMENT

Planning and responsibility for environmental management at Botnia-Orion has been assessed in four distinct areas :

a. As part of the core operating and maintenance staff training and work procedures (i.e. "the Botnia way"), with every employee up to the mill manager responsible.
b. As part of the Fire and Accident prevention planning and response, with the safety supervisor the responsible manager.
c. In the Environmental and Quality area, with permits, monitoring, laboratory services and testing, with the Environment and Quality Manager responsible.
d. As part of the operational management system – ISO 9001, 14001, 16001, with ultimate responsibility with the mill manager.

The first two of these areas (the Botnia Way and Accident Prevention and Response) were well developed at the time of the auditor's first visit. The third area (permitting and monitoring, laboratory testing and analysis) was being developed at the time of the Phase 1 visit. At the time of the second visit the laboratory was fully staffed and functional and monitoring plans were developed. The fourth area, the operational management system, was in an early stage of development at the time of the Phase 1 visit, and is not scheduled to be complete until one-year after start-up. At the time of the second visit, the operational management system was starting to be used, with a number of mill procedures entered into the system.

Our review concluded that the mill management team has an appropriate level of environmental awareness for a project of this type. Botnia have included key commitments made in the CIS in their environmental permits. A comprehensive environmental management system, based on ISO 14001, is being developed, as was described in the CIS.

The review of environmental management was carried to assess the management's team environmental awareness. For example:

- An understanding of the sensitivities associated with the mill siting
- An understanding of the need to meet environmental commitment in the CIS
- The need and management's commitment to meet all requirements in the environmental permits issued to the mill (i.e. AAO and AAP).

The review of environmental management was carried out also to evaluate the delineation of responsibilities for the mill's environmental performance, within the management team.

Botnia's staff communicated to us empathically that care of the environment is fundamental to the way work is done at Botnia-Orion. It forms part of their core policies. It flows from Botnia key values of trust, renewal and cooperation which are sought from and developed in staff.

Review of mill permitting and most parts of the environmental management system (for example monitoring and reporting) are not included in the scope of this audit. This audit is primarily focused on assessment of the management commitment to these systems.

At the time of the second audit visit, the main information items and commitments required for issue of the mills operating permit (AAO) were either complete and submitted to the permiting authority, DINAMA, or close to complete, and submitted to DINAMA in draft form. The operating permit had not been issued, but would appear to be close to issue.

Planning and responsibility for environmental management at Botnia-Orion can be assessed in four distinct areas with more details provided below

4.1 Operating and Maintenance Staff – "the Botnia Way"

Botnia has made the environment the responsibility of all employees and include it as an integral component of the "the Botnia way" which guides how Botnia's staff work. The Botnia way also includes industrial and commercial responsibility, social responsibility, human resources and equal opportunity policy. From interviews with the training manager, mill manager, key production superintendents and one operator, it was apparent to the auditors that "the Botnia way" is understood at all levels within the operating organization at the mill.

Botnia's stated corporate philosophy is to protect the environment through the efficient operation of well constructed and maintained plants using modern, inherently low polluting (best available technology) processes.

This philosophy is to be applied in all of Botnia's mills and the overall environmental performance of their mills (all of which, apart from the Orion mill, are located in Finland), as measured by the quantity and quality of their liquid effluents, air emissions and solid wastes, supports Botnia's claims that clean production technologies are applied. The benchmarking of Botnia's air and liquid discharges against all mills in Sweden and Finland is carried out as part of Botnia's Corporate Environmental Reporting[1]. The philosophy of using clean production technologies has also been applied in the design of the Orion mill. The Cumulative Impact Study projected that the environmental performance of the Orion plant would be consistent with the use of BAT and would likely be similar to or better than the performance of Botnia's Finnish mills.

The operator training and commissioning activities at the Orion mill are intended to produce well trained operators thereby ensuring that all systems are operated with a minimum of disruption. Botnia has experienced staff on-site, primarily sourced from their Finnish mills, and is bringing in additional experienced operators to assist during the start-up. Botnia has included best practices from their existing mills in the Orion mill's operating procedures and enhanced these practices with some new developments. One example of a new development at the Orion mill is ability to access the descriptions of control design and logic directly from the mill DCS system. This will enable the front-line operators to quickly determine the basis for the key control loops in the mill. This ability to quickly access such information will help to avoid confusion.

For the Uruguay project there has been close to 3 years of training for key engineering staff and 8-11 months of training for operational staff, including specific session on Botnia's ethics, values and way of working. The review of the operation and safety training programs is included in section 5.0.

The management reporting for all mill areas will include key environmental parameters (such as water use, effluent flow and load, air emissions). Management of mill process environmental parameters is part of the responsibility of the production units and supervisors in each area. This forms part of the production and environmental information that will be reviewed in a daily morning meeting.

[1] Botnia's Environmental Balance Sheets are at http://www.botnia.com/en/default.asp?path=204;215;270;272

4.2 Fire and Accident Prevention, Emergency Response and Occupational Safety and Health

The Orion mill has an industrial fire brigade and emergency response plans. The firefighting and emergency response equipment includes two industrial fire engines and specific equipment for containing and mitigating chemical hazards. One of the two industrial fire engines was on site at the time of the auditor's first visit and the second was scheduled to be delivered before mill start-up.

The fire fighting team is intended to be self-sufficient but it can call for outside help from the firefighting services of Fray Bentos in the case of a major emergency. The organization of the fire brigade is described in Section 2.0.

The mill is also equipped for marine emergencies at the port. There is a 550 meter oil containment boom which can be deployed in the event of an oil spill.

The alarm and notification system is shown diagrammatically in Appendix A4.1. This shows how alarms can be made. This includes direct alarms or telephone alarms. Alarms go to the emergency control center and main control room. This direct, primary alarm system includes alarm on use of the automatic sprinkler systems, from the fire detection systems, from fixed gas detectors and from emergency showers. Alarm calls can also be made by telephone for example for fires, other emergency calls and chemical accidents, or alarms can be generated by direct observation or observation via surveillance camera, in the control room or emergency control centre.

4.3 Environment and Quality Management

The auditors did not review the status of permits and commitments made by Botnia as part of the permitting process because this review was excluded from the scope of the current audit, beyond examination of management's commitments. It was noted that the key voluntary measures identified in the CIS have been included in the draft plan for environmental mitigation and compensation. These key voluntary measures included treatment and recycle of weak black liquor from Paperela Mercedes, treatment of municipal effluent from Fray Bentos, the export of power, and provision for supplying sodium chlorate to other mills in South America. This providing of sodium chlorate to other mills may enable these mills to convert from chlorine based bleaching to elemental chlorine free (ECF) bleaching resulting in a significant improvement in the quality of their liquid discharges.

The export of power will commence at mill startup while the available of supply of sodium chlorate to other mills in Uruguay and Argentina will begin shortly after startup.

Botnia's management is committed to the treatment of the weak black liquor from Papelera Mercedes (Pamer) and municipal effluent from Fray Bentos city, and initial concept studies are in place, which detail where and how the effluents will be introduced to the mill. Detailed planning, design and construction of the unloading points for Pamer black liquor and piping and tie-in connections for Fray Bentos municipal effluent on the mill site have not been installed.

4.4 Operational Management System

Botnia will implement an integrated system to assure production quality, environment, occupational safety and health systems and will seek registration of these systems under ISO 9001, 14000 and 18001 standards, respectively. This practice is consistent with Botnia's programs in their Finnish mills. These systems include documentation of standard operating procedures, methods to measure compliance, identification of non-compliance and implementation of corrective actions. The systems will provide transparency and help to assure continuous improvement in the areas of production quality, environmental performance and occupational safety and health. They are targeting for certification one-year after start-up. The major tasks and milestones have been identified to meet this target and initial tasks were underway in our first visit. At the time of the second visit, the system was starting to be used with meeting minutes and a number of mill procedures entered into the system.

5.0 PERSONNEL TRAINING

> There is a comprehensive personnel training program in place at the Botnia-Orion mill. This covers aspects that are normally found for a project of this type and includes classroom training, observation in other mills and participation in commissioning at the Botnia-Orion mill so as to become familiar with the physical plant.
>
> For the key local engineering staff, the training has been much more extensive that is often carried out, and a strong mentoring program has been developed.
>
> During the first audit visit it was noted that development of operating procedures and training for the spill control and recovery system, storm water system and parts of the NCG system was required and had not yet occurred, and general training for site environmental awareness was recommended. These procedures had been written at the time of the second visit and operator and maintenance staff environmental awareness training had been completed or was scheduled to start.

The operational and safety training programs for operators, maintenance personal and supervisors was reviewed. In particular the importance given to environmental awareness and compliance was assessed.

The quality and amount of training and motivation of staff and operators have been identified as important factors in reducing environmental discharges of pulp and paper mills. These factors were identified as key non-technology elements in the BAT analysis carried out for the CIS (See CIS section A12.0).

For the Botnia-Orion project, we have also discussed the recruitment process, as this closely relates to staff training and motivation.

5.1 Staffing at Orion

In terms of comparable new mills and upgraded mills in South America, the Botnia-Orion mill has some intrinsic disadvantages in terms of staffing. These are:

- The Orion mill is a greenfield project and in comparison to expansions and brownfield projects, cannot draw on experienced staff (operators, supervisors, maintenance) that may be already present on site. New brownfield projects, which used operators from existing pulping lines on site to start new lines in South America include the Aracruz C Line in Brazil and the Sante Fe expansion project in Chile.

- The Orion mill is the first large scale modern pulp mill in Uruguay, and has had limited ability to hire local staff with pulp and paper operating experience.

- The Orion mill, being the first pulp mill project for Botnia outside of Finland, has limited ability, due to distance and language, to acquire operators from Botnia's existing mills. This can be compared with the Greenfield Veracel project in Brazil, which drew on operational staff from Aracruz, one of the mill partners, and also the Nueva Aldea project in Chile which could draw on operational and start-up resources from within Arauco's other Chilean mills.

Nevertheless, the Orion mill does have advantages compared to some other Greenfield mills such as the mill currently proposed by Gunns in Australia. Gunns have no other bleached kraft mills and so cannot draw on there own operating experience to design, staff and start-up their new mill. Botnia, being a company that has produced bleached kraft pulp for many years, has developed good operating practices in their Finnish mills and can use these as the basis for establishing good operating practices at Orion. Botnia indicated that being able to start from a successful current mill model for operating practices may help avoid use of practices found in older mills, in which environmental protection does not use best practices.

The supervisory, operating and maintenance staff (which encompass all Botnia employees) in the Orion mill fall into two main groups – foreigners, almost all of whom are Finnish nationals, and local hire, who are almost universally Uruguayan. The 2008/2009 "target mill organization" has Uruguayans in almost all of the main supervisory and non-supervisory positions. For the first two years of operation, however, there will be a transitional period during which, in key positions, there will be an experienced Finnish national working alongside a Uruguayan national, in a mentoring role. Additional start-up support with Finnish operators from Botnia's other mills and also staff from vendors will be provided (mostly in the first 3-6 months), as described in the Commissioning Section of the Report (Section 6.0).

The disadvantages to staffing and training associated with location of the project have been recognized by Botnia, and they have undertaken an extensive recruitment and training program, designed to select and train staff new to the industry, to a standard suitable to operate a modern mill. The training and development program for the Uruguayan staff is summarized and evaluated below (in section 5.2). Botnia have also selected staff from within their organization to provide mentoring, training and start-up assistance. The selection, motivation and training of these staff is also discussed below (in Section 5.3).

5.2 Uruguayan Nationals

5.2.1 Engineers (in Maintenance, Technical and Production Positions)

Botnia had an extensive recruitment program for its Uruguayan employees. There are 25 engineering staff in key maintenance, technical and production positions. Selection of candidates for the staff engineering positions was based on a combination of professional qualifications (academic, prior experience) and personal skills (such as intelligence and ability to learn). In Botnia's selection and testing criteria they also indicated that impeccable ethics were required. The candidates went through an extensive interview process, including psychological testing.

Botnia has had the luxury of being the employer of choice for engineers in Uruguay. For the 25 engineering positions, 3172 applications were received and more than 2000 initial interviews were conducted by human resources companies retained by Botnia. From these, more than 500 were interviewed by Botnia. The result is that Botnia has selected a strong and capable team of engineers for the key mill operating and maintenance positions. Part of the selection and training process for the key engineering staff was to have demonstrable proficiency in the English language (i.e. the ability to speak, read and write). In our audit we met several of these Uruguayan engineers, and those we met have good English language ability.

Five of the Uruguayan engineering staff, who will occupy key technical positions, have had 2 years of training in Finland. This training included the taking of formal pulp and paper technology courses at the Helsinki University of Technology as well as time spent in Botnia's Finnish mills. Another three Uruguayan engineers in key technical positions had similar training in Finland with 9 months training in Helsinki University of Technology followed by 4 months job training at Botnia's mills. These eight Uruguayan engineering staff will work alongside a Finnish mentor for 2 years in the Orion mill, and will assume full responsibility in 2008/2009.

The balance of the engineering staff received technical training for 17 weeks in Finland, including time in Botnia's Finnish Mills. Training included English language, company knowledge, project knowledge, Finnish cultural awareness training, Botnia's way of working, management training, basic theory of pulp making, job training and recruitment training.

After this initial 17 weeks of training, these staff work have received further training, as determined by there job responsibilities and as identified as required by their "Finnish mentor" on site.

The mill manager and production manager are both from Finland.

The training program for other departments in the mill such as human resources, accounting and legal was not reviewed.

5.2.2 Operators and Technicians

86 operators and about 30 mill technicians were selected from an application pool of 5407 candidates. The selection and training of the operators is described below.

Selection of candidates was based on skills in 4 mains areas – process, mechanical, automation and electrical. 16 of the operators have 5 or 6 years of university training in engineering, 48 have a combination of experience and education, 6 have relevant experience in other pulp and paper mills or in high technology industries, and 16 local residents where selected based on ability to learn and perform.

The formal training at the mill included 12 weeks basic training and 14 weeks professional training, and continuing advanced professional training.

The basic training objective was for staff to have an overview of the Orion project, of pulp and paper technology and pulp production. This basic training included: overall equipment layout; safe working practices; collaboration and teamwork skills; knowledge of Botnia; basic business economics; knowledge of environmental protection and means so that the mill impact on the environment is a minimum; and knowledge of mill flows, process control and equipment.

In more detail basic training included sections on:

- General topics (Company overview including Finnish resources, general plant description, human relations topics, team building activities, business economics, security and safety, process chemistry and physics, English language, office automation).
- Process knowledge (wood handling, fiber line, recovery, water and effluent treatment and environmental protection, quality management, laboratory technology, process control system),
- Maintenance topics (pumps, valves, piping, bearings, lubrication, basic of hydraulics and pneumatics, maintenance of process equipment, maintenance of electrical equipment, corrective and preventative maintenance).

Training material for the basic training was provided by Botnia, the equipment vendors and third party training companies (such as Senai from Brazil).

The professional training objectives are for operators are to know their duties, equipment and relationships with other departments. They are also to have experience in process control so as to be able to run the mill. A focus of the training program is to build competence in the core areas in which the operator will be working. There are 4 department groups, Wood handling, Fiberline, Drying and Baling and Recovery Line. The professional training is developed and taught by Botnia and the equipment suppliers. The intended duration is about 14 weeks, depending on departmental grouping. Initial training was in classrooms and was supplemented through work in an operating mill either in Finland (for the 18 operators with English language ability) or Brazil. Those in Finland had 4 weeks in a Botnia mill, and those in Brazil had 2 weeks at Aracruz. In the Finnish and Brazilian mills the operators worked on shift beside the mill operators.

Advanced Professional training aims to give operators the skills to start-up the mill, with a good knowledge of process flows, operation of the process control system and location of the equipment.

This includes start-up training, labelling, equipment testing, water runs and simulator training. The training includes: start-up and shut down procedures, operational disturbances, process training with the simulator, tracing and confirming piping and equipment installation.

The wood yard operators have similar training but after the basic training they followed the fiberline training and then specializing later to their own process area.

Laboratory technicians have customized training programs, following a similar training model combining classroom and practical training.

The maintenance staff technicians are trained in a similar manner by Andritz.

Due to an approximately 6 month delay in commissioning the DCS system, the dynamic training simulator was not available at the time of the first visit and was available for about half of the process areas, at the time of the second visit. This is discussed in the commissioning and mill operations section of the report (7.0).

5.3 Finnish Nationals

Almost all of the staff selected to initially supervise mill operation and act as mentors for the Uruguayan engineers have been selected from within the 5 pulp mills owned by Botnia and the 3 pulp mills owned by UPM-Kymmene, Botnia's major shareholder.

The operating staff generally has long-term operating experience in Botnia's mills. Botnia's Finnish staff are well versed in "the Botnia way" which includes respect for the environment and Botnia's standard work practices. They are knowledgeable in their process areas, and demonstrate competence. They appear to have good working relations with the Uruguayan counterparts.

The audit teams understanding of the training program for most of the Finnish staff on the Orion project is to have Spanish language training available (most do not speak Spanish) and opportunity for participation in Uruguayan cultural events. The overseas assignment for Finnish nationals varies, with 3 years for key technical and engineering staff 1 to 2 years for some project staff and 3-6 months for operators and trainers.

The mill manager has a slightly different background from other Botnia staff, having left Finland some years ago and worked in both technical and production management in a large new mill in Asia. He joined Botnia in 2001 and worked as Mill Manager for the Botnia Kemi mill before assignment at Orion.

The construction and project personnel (who have responsibilities to support start-up), are from within Andritz, Botnia and other vendors.

5.4 Chemical Plant

Kemira has a training program which includes the following components:

- Basic English, math, physics and chemistry
- Theoretical studies (classroom based) on process diagrams, control, equipment and reading engineering drawings
- Studies and visits to chlorate plants, peroxide plants and chlorine dioxide plants. The peroxide plants are in Sweden, chlorate plants in Finland and chlorine dioxide plants in Chile and Canada.
- The peroxide and chlorate plant visits included 3 weeks in each plant on shift, alongside the operators.
- The chlorine dioxide plant visit in Chile was for 3 days, as an observer, and a visit to Canada included one week on shift, and training in laboratory analysis and general plant operations.
- The training program includes work at commissioning with line tracing, equipment identification and water testing under vendor and Kemira supervision.
- Instruction in automation and control systems
- Instruction in the distributed control system
- Chemical safety instruction
- First aid and site safety (in coordination with the site fire brigade)
- Instruction in the harbour operation and a visit to an operating harbour (Kemira is involved in loading and unloading bulk chemicals).

Kemira have a total of 24 operators operating in shifts – Each shift has 2 operators in the main control room, 1 in the Praxair oxygen plant or Praxair control room and 3 in the field.

The operator training program for the oxygen plant, which will be undertaken by the supplier Praxair, was not reviewed. The operation of the oxygen plant is not expected to contribute significant emissions to air or water, even under upset or non-optimal conditions.

5.5 Observations and Comments on Botnia's Training Programs

We reviewed Botnia's training plans in our first mill visit and our analysis of training and development primarily focused on those items which may affect emissions or the ability of the mill to start-up well. In general the training program was comprehensive. We identified a number of areas in which the training could be improved. Some of these areas may not have been covered, due to the timing of our visit (4 months before start-up) however we felt that some areas may not have been covered as they were outside of specific vendor responsibility, and relied in procedures which had not been developed.

Botnia agreed with these recommendations, and had written procedures, developed training material and trained operators (or had training scheduled for these operators) at the time of our second visit. The audit team was satisfied that the recommendations with respect to training were acted on.

A summary of the observations from the first visit follow.

At the time of our first visit the training given the Uruguayan staff had been extensive and compared well with training in other state-of-the art new mills. The instructions with respect to care for the environment are generally implicit in the materials being presented.

At the time of our first visit there had been little direct instruction in, or illustration of, environmental awareness. The lack of direct instruction partly reflected the Botnia philosophy of using inherently “clean production” processes and the operators were being trained to operate these processes with the minimum of emissions. Examples include the use of correct furnace conditions and control in the Recovery boiler to minimize nitrous oxides (NOx) and sulphur dioxide (SO_2) emission. Another example is instruction to operate the bleach plant with minimum chemical addition, which ensures that effluent has a minimum of dissolved organics- (COD) content.

In terms of specific areas of instruction the operators had comprehensive instruction in the main process operation (fiberline, bleaching, evaporators, recovery and causticizing). The operation and purpose of the effluent treatment plant has also had comprehensive instruction.

At the time of our first visit the operation of the NCG systems has had some instruction, but start-up and shut down of these systems required further development. Successful operation of the areas listed above (fiberline, bleaching, evaporators, recovery, recausticizing, effluent treatment and NCG systems) is fundamental to operating with low environmental discharges.

At the time of the first audit visit there had been little or no instruction in the operation of the storm water and spill control and recovery systems. There also appeared to be to be little instruction in Orion site-specific environmental concerns or attributes (such as sensitivities on odorous gas discharges, concern with effluent color and possibly noise impacts).
The operation of the spill recovery system and understanding of site specific factors are not as important in ensuring low discharges as the competent operation of the primary process areas. However they still were required in operator training and it was recommended that training be provided and reinforced in these two areas.

It was recommended that all key operating procedures be developed prior to mill start-up; including those for balance of plant areas, and that operators are instructed in these procedures, prior to start-up.

At the time of the second audit visit we confirmed that many operating procedures in the areas of spill recovery system, storm water system and many other “mill wide” area, that had been written at the time of the first visit were written and operators trained in these areas.

5.6 Language, Culture

Some discussion of the linguistic and cultural context of the mill is useful in discussing training requirements.

There are three main languages used by the operating team on the Orion site. These are Spanish, English and Finnish.

Botnia is a Finnish company and its primary language of operation and control is Finnish. The key areas of competence and support (for example in the environmental and process areas) are also primarily in Finnish. English is a strong second language within Botnia, and is widely used for technical and commercial communication.

The operational language of the Orion mill will be Spanish. About 25% of the 125 operators and technicians have competence in English. All of the key 25 Uruguayan Engineers in supervisory positions have competence in English (and Spanish of course). The Finnish mentors generally have limited ability in Spanish. Generally both the Uruguayan operators and Finnish nationals understand the key process and equipment terminology in both English and Spanish. The mill manager and training manager are actively studying

Spanish, and many other Finnish Nationals are acquiring some Spanish language ability.

The mill is organized to be run under a Nordic model. This includes a flat organization structure, open communication and direct accountability. This contrasts with many South American mills which can be more layered and hierarchal in their structure and less direct in communication. Botnia has selected and trained select Uruguayan staff (the 25 engineers) to work with the Finnish model, and also had some training for operators in this area, but will rely primarily rely on the 25 Engineers to staff to bridge the language and to some degree the culture gap.

Botnia has generally not trained the Finnish staff to recognize and work within the South American language and business model, as they are primarily seeking to reproduce their Nordic model in Uruguay.

The cultural and language differences in the audit team's assessment are not likely to pose an increased risk of environmental emissions, but should be considered in communication activities, if emissions should occur, to ensure that communications are appropriate.

Mill communications with the community are to be included in the social and environmental audit team work, and it is suggested that this include consideration of cultural differences in communications.

5.7 Motivation

The audit team found all members of the operational team at the mill well motivated. This strong motivation partly draws from the importance of this project to Botnia; to Uruguay and to Finland. This is further explained below.

The importance of the project to Uruguay is presented on the IFC website. The Orion project will represent 8% of Uruguay's export earnings and 2% of the countries GDP. As such, it is a project of National importance for the Government and Country, and is widely supported by the citizens in Uruguay (as indicated, for example, by polling). It is also a source of national pride and is now increasingly seen as an important expression of sovereignty, due to the disagreements with Argentina, and International Bridge blockades. In Uruguay it has been Government policy for the past 20 years to encourage investment in forestry on land poorly suited for agriculture, and more recently to add value to the forest resource by converting the trees to pulp. In addition to log exports, Uruguay is expected to be able to support an efficient pulp industry particularly in comparison to countries with a traditional forest industry, such as in Canada, the USA and Europe, where trees are much slower growing requiring more land and greater transport distances. The Orion project is the first project to fulfill these long standing national ambitions.

The Orion project will be Botnia's largest mill. It is the first overseas mill for Botnia. The auditors understand it to be the largest foreign investment ever by a Finnish company. For these reasons it is also important to Botnia, and, indirectly to Finland.

6.0 COMMISSIONING AND OPERATIONAL STATUS

Based on the information received, site interviews and observations it was concluded that Botnia's and Kemira's commissioning plans and procedures and also the people selected to carry out these plans have the features and characteristics that are normal for a project of this type.

At the end of the phase II visit it was clear that mid-August target date had not been met with construction at 94.1% and commissioning at 85.5%. Botnia's project director, project manager and Andritz project director all stated that all construction completion activities and commissioning checks could be completed within three weeks and all necessary area completion certificates issued. No detailed schedules that integrated the remaining erection and commissioning activities were available for review.

The Kemira supplied chemical plant should have the necessary systems ready to allow start-up of the main plant on this schedule.

The impact of compacted project completion schedule on commissioning and on the final phase of operator training where participation in commissioning checks and the use of the process simulators was planned, has been mitigated by the increased reliance on foreign expertise.

Progress of the Botnia Orion projects towards start-up is measured by three main indices. These are:

- completion of civil construction (foundations, supports, roads and site work.
- completion of mechanical, electrical and instrumentation (MEI) installation
- completion of commissioning (the process of system check out and acceptance by the operating staff).

The progress in each area is evaluated regularly by the project staff. Work completed in each area is expressed as a percentage of the total amount of work that must be done in than area for the completed project.

In any given area, these three tasks are generally completed sequentially, that is, the main civil construction is completed before MEI installation and MEI installation is completed before commissioning.

In both phase I and phase II audit visits we made an independent assessment of progress through a visual inspection of the site and we examined the methods and documentation procedures used by Botnia to assess progress. We also examined the management level reporting to ensure progress documentation was consistent with management reporting. This provided confidence to the audit team that the levels of completion reported by Botnia were reasonably accurate.

In the phase I visit we examined plans for commissioning in terms of the organization and manning, training, procedures and systems development, and the time allowed for commissioning.

The schedule for carrying out the activities required for the construction and commissioning of the project is shown in Time Schedules (see Appendix 6 for examples). These schedules show the planned or target schedule for the main tasks to be undertaken and the actual time being taken to complete these tasks and progress achieved.

In the phase I visit we looked at the target schedule and actual progress with the objectives of assessing whether all required areas of the mill would be completed according to plan and whether there would be sufficient time to complete commissioning programs planned by Botnia and Kemira prior to the planned start-up date.

The first visit resulted in the audit team making a number of recommendations to Botnia with respect to the planning and scheduling of remaining work.

Since the planned startup date had passed when the audit team made its second visit to the mill, many of the observations and recommendations made following the phase I visit with respect to the schedule were no longer relevant. The primary focus of the audit team during the phase II visit was on the commissioning and operational status of the project.

This review of the commission and operational status was based primarily on information received from Botnia and Kemira and supplemented by observations at the site. Excluded from this review was review of engineering detail that may be relevant to commissioning sequencing.

6.1 Project Schedule

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Information on the construction schedule was requested prior to the auditor's phase 1 visit to the mill site but the main information was not received until the last day of the phase 1 visit. Prior to the phase 2 visit the key information was again requested to be ready on arrival. The response this time was much improved and where information existed it was generally made available.

In the phase 1 visit the 78-page "MASTER TIME SCHEDULE" showing progress to the 2nd April 2007 was reviewed on site. This document is not included in this report. In this activities were scheduled so that the mill would be ready to operate in mid-August 2007. This start-up date was an internal mill target, used for project planning. The official startup date had been reported in public information from Botnia as "third quarter 2007". It was apparent in the April visit that construction activities in all areas were behind schedule. Civil construction, overall, was shown to be delayed in the order of six months but less so in the more critical process areas. The reported delay of eight weeks[1] for the overall project (i.e. civil construction and MEI installation) appeared to be reasonably correct and consistent with other information received, such as the "Project Total" progress curve which is included in Appendix A6.1. The delay of eight weeks was also consistent with our observations on site.

The status of the project schedule at the time of the phase 1 visit is illustrated graphically on the one-page summary schedule entitled "Target Time Schedule, Progress 1.4.2007" which is included in Appendix A6.2. The status of mechanical, electrical and instrumentation erection progress as reported on the 20th April 2007 is also given in tabular form below.

Table 6.1: Progress Report from Andritz / Botnia Meeting on April 20, 2007

Item	Actual	Target
Project Overall	58.5%	81.1%
Wood Handling	46.4%	85.5%
Fiberline	60.1%	80.8%
Pulp Drying	64.4%	82.0%
Evaporation	59.2%	74.0%
Recovery Boiler	67.1%	87.1%
White Liquor Plant	58.8%	84.9%
Turbine Plant	54.3%	71.5%
Demin. Plant	95.8%	100.0%
Water Pumping	95.6%	97.9%
Water Treatment	35.9%	97.2%
Effluent Treatment	21.0%	89.5%
Power Distribution	69.8%	100.0%

[1] Andritz site report dated 18.04.2007 Rev. A

During the phase 1 visit, Botnia stated they had chosen not to revise the "MASTER TIME SCHEDULE" to reschedule those activities that were behind schedule. This schedule therefore was not very useful for understanding how and when the uncompleted activities would be completed.

A specific example was the effluent treatment plant, in which MEI erection progress was only 21% in April, and yet this area was required to be completed well before to start-up, to allow for the establishment of active biomass.

For this reason, the audit team recommended preparation of detailed recovery schedules to show how the lost time would be recovered and updating of the Master schedule to reflect the delays that had already occurred.

Botnia reported that they produced recovery schedules by area, but did not revise the master schedules to reflect the new work plans.[1]

The progress reported by Botnia for completion of Mechanical, Electrical and Instrumentation (MEI) installation and commissioning up to August 10th is given in the table below for the overall project and for each mill area.

Table 6.2: Progress Report from Botnia August 10th 2007

Area	Actual progress MEI	Actual progress Commissioning
Project overall	94.1 %	85.5 %
Wood handling	94.6 %	76.1 %
Fiberline	95.1 %	75.1 %
Pulp drying	97.8 %	95.7 %
Evaporation	91.1 %	98.0 %
Recovery boiler	97.1 %	89.1 %
Turbine plant	94.1 %	78.1 %
Steam distribution	n/a	100.0 %
Demin plant	100.0 %	99.7 %
White liquor plant	94.6 %	79.2 %
Water pumping	98.8 %	96.9 %
Water treatment	97.0 %	76.6 %
Effluent treatment	87.5 %	48.0 %
Power distribution	99.7 %	n/a

According to the above information, mechanical, electrical and instrumentation (MEI) installation was 94.1% complete for the overall project and a commissioning was 85.5% complete. This information is also shown by the progress curve attached in annex 6.1.1.

In the phase 2 visit it appeared to the audit team that Botnia had achieved some success with their work approach. When the information in the two tables are compared, it is evident that substantial progress had been made in all areas, while the target start-up date of August 15th was not achieved, Botnia believed that they would be ready for start-up within 3 weeks of that date (i.e. September 5th).

Progress for the Kemira chemical plant as reported in April and again in August are as follows:

Table 6.3: Progress from Kemira

Kemira MEI Progress Area	30 April 2007	14 August 2007
Project overall	32 %	83 %
Chlorate plant	24 %	85 %
Chlorine Dioxide Plant	48 %	97 %
Chemical Storages	42 %	98 %
Peroxide Plant	15 %	72 %

The above chemical plant percentages indicate that the key chemical systems required for start up (chlorine dioxide plant and chemical storages) should be available in time.

6.2 Commissioning Plan

In the phase 1 visit, the two-page "Commissioning Master Time Schedule", which is included in Appendix A6.3, was received from Botnia in conjunction with the "Master Time Schedule". The two documents received in the phase 1 visit were useful in assessing delays in commissioning relative to the planned startup date. The Master Time Schedule received in April indicated that delays in the order of two to five months had occurred in the utility areas. Delays in commissioning main process areas were at that point minimal but commissioning in these areas were predicted to be impacted by the delays in commissioning the utilities as described above. Of particular concern was the delay in the DCS (distributed control systems) that was several months late, since this delay would impact the ability to commission the both utility and the main process areas. Botnia's site management was making a strong effort to mitigate those delays.

[1] Correspondence from T Piilonen and S Saarela, 27 July 2007.

As described in the project organization section (Section 2.0) of this report Botnia had either assembled on site, or planned to bring in at the appropriate time, personnel adequate to carry out the commissioning plan. These personnel include project contractors experienced in the specialized technologies employed by the mill. These personnel would stay on site only as long as required to fulfill their specialized function. Also a key part of the commissioning team was the operators and supervisors that would eventually supervise and operate the mill. In Section 5.0 above, the training of the supervision and operating team has been described. Participation in the mill commissioning process was planned to be an important part of the training program. It was therefore important that adequate time durations were assigned to this important activity.

When the audit team returned in the phase two visit in August, Botnia had proceeded with the commissioning plan and had been able to achieve many of the commissioning objectives. The status of commissioning is further discussed in Section 6.4 below.

6.3 Commissioning Procedures

The commissioning procedures developed by Botnia are based on a structured approach that begins when erection has been certified as complete. This is expressed in the two Botnia project diagrams entitled “Commissioning and Test Principals Diagram” and “Stages of the Project” which are included in Appendix A6.4 and A6.5.

Documentation was reviewed at the site which supported these principles. This documentation includes the “Master Binder” for each area. These binders contains a commissioning status record for each of the main disciplines (Structural, Mechanical, Piping, Electrical, Instrumentation/DCS and HVAC) within the area. This record gives the commissioning status for each component in the system certifying that it has satisfied its acceptance criteria. The rigorous completion of the commissioning tests and thorough recording of status in the “Master Binders” is the main mechanism that provides confidence that any given area is certifiably complete for both erection and commissioning and is ready to allow start-up of the plant and transition to commercial production.

The commissioning procedures outlined in the “Commissioning and Test Principals Diagram” shows erection being completed before commissioning begins. In the phase1 visit in April it was clear that with the erection running late, commissioning would run more in parallel with construction, and less sequentially, than indicated in the "Master Time Schedule" and the associated "Commissioning Master Time Schedule". It was apparent that care would have to be taken to ensure that area procedures and testing of sub-systems are redefined as required to adjust to this the late situation.

In the phase 2 visit in August it was apparent that Botnia had made adjustments in the commissioning plan to deal with the reality of erection delays in various areas. In making these adjustments Botnia appears to be accomplishing the main objectives of the commissioning plan.

6.4 Commissioning Status

The status of commissioning as in April 2007, indicated that the commissioning was running between and one and five months late depending on the area. Most of the late commissioning was in the utility areas. The delay in the utility areas was predicted to have a domino effect on the process areas, which were dependent on the availability of basic utilities.

Commissioning in the process areas was scheduled to begin in April and was already underway using temporary utility supply during the Phase I site visit. A temporary utility was used as the mill utilities had not yet been commissioned. This domino effect from utility to process areas could already be seen to some extent in the fiberline where commissioning was in the order of 1½ months late.

In the phase one visit we commented that given the general lateness of erection completion, it would be important to track commissioning completeness in detail. It was understood the existing tracking would include a weighting system of the different commissioning activities to allow percent complete to be tracked on a weekly basis. This would provide the data for re-scheduling of resources in an organized manner to allow the orderly start-up of the mill on the targeted date.

When the audit team returned for the phase 2 visit in mid August the plant was still in the final stages of construction and well advanced in commissioning. Botnia's project director, Botnia's project manager and Andritz's project director (Andritz is the main contractor for the process areas and also the site manager) were of the opinion that the remaining necessary erection and commissioning activities could be accomplished within 3 weeks to allow plant start up. All stated that the plant would not start-up until the balance of necessary erection and commissioning activities are completed and the areas certified as ready as per the Botnia commissioning procedures. In addition the mill start up was pending the issue of the formal operating permit from DINAMA.

The plant areas reviewed by the audit team were well advanced but had not reached completion to the point that area completion certificates had been issued. We understood that Botnia would issue these certificates as the areas are completed and thus ensure the necessary level of completion for start-up has been achieved. For purpose of illustration of the level of completion at the time of the phase 2 visit we list below by area key activities that we understand needed to be completed prior to area certification and plant start-up. This list is not exhaustive and many minor activities are not listed. Insulation completion is a common theme to all process areas and the level of completion prior to area certification should ensure that workers will be able to complete remaining insulation safely.

Wood preparation area

- commissioning of chip screening and the conveyor to the digester

Fibreline (Digesting and Bleach plant)

- Balance of process piping, both FRP and stainless steel
- Insulation of pipe and tanks
- Completion of the hot commissioning of the process systems

Dryer area

- Stabilizing of the DCS system –see Control systems below

Recovery Boiler area

- At least two of the three cells of the exhaust gas electrostatic precipitator complete with insulation and commissioned
- Insulation of ductwork and piping

Evaporator area

- insulation of evaporator bodies and piping

White Liquor plant

- insulation of piping and vessels

Water Treatment area

- Commissioning of the remote control of raw water pump station

Effluent treatment area

- Repair of leaks on the three effluent receiving ponds and the two aeration chambers
- Commissioning of the aeration systems
- Preparing the aeration chambers to be biologically ready to receive effluent as per the supplier specifications

Power Generation and distribution

- Permanent power supply to harbor to be commissioned
- Emergency power supply to be tested in black out condition
- SCADA power control system communication to the DCS control system to be completed to allow operators to see the system status

Control systems/DCS system

- Complete the commissioning of the mill wide DCS system to allow secure operation. This includes elimination of the instability of digital and analog output signals and achieving secure communication with the Profibus and SCADA systems.

Mill site and underground piping

- Complete and commission the storm water drainage system including piping connections and the four catchment ponds with oil separators
- Complete and commission all underground process piping

Chemical plant

- Completion of erection and commissioning of Chlorine dioxide plant and chemical storage systems

The commissioning of Commissioning of Turbine Generator number two and the second pulp drying machine are not listed above. The requirement to complete these before initial operation will depend on the mills initial production targets and goals. The second Turbine Generator will be required before Kemira start the chlorate plant, and the second pulp dryer will likely be required when the Fiberline and Recovery boiler begin operations at greater than 50% load.

The audit team noted, that, consistent with other projects of this type, the Recovery boiler cannot combust odorous gases until it is under a significant liquor firing load (50-60% of rating). Prior to this time gases may only be combusted in the back up odorous gas boilers. This provides less flexibility and increases the likelihood of venting of odorous gases, and as such the mill will need to take special care during initial operation, and work to minimize operational time at low loads. Botnia mill management recognize this.

6.5 Operational Status

The mill was not in operation at the time of our second visit, and was not yet ready to start-up.

In general terms, mills of this type generally start up with levels of mechanical, electrical and instrumentation (MEI) completion of 95-98%, as some items may be completed while the mill is operating. Botnia's reported overall completion level was 94.1% on August 10th, and this reported level was consistent with our observations. Before start-up all systems which are MEI complete and required for start-up need to be commissioned. The level of commissioning on August 10th was 85.1%, again this reported level and this reported level was consistent with our observations.

Before start-up, all required areas need to be complete. Botnia Orion had many areas, as of mid-August 2007, which had outstanding items to complete. In many projects of this type, start-up has waited for only one or two main areas. In that many areas where being completed in parallel it is more difficult to assess and assure when the mill will be ready for start-up. Botnia was estimating that all areas would be complete in 2-3 weeks after we left site. Without the detail schedules covering the balance of erection and commissioning activities the audit team was not in a position to accurately assess the accuracy of this estimate. The actual final readiness for start-up most likely will be determined by completion of any one the outstanding items listed by area in Section 6.4 including issuing of permits.

The level of project staffing, organization, operators and operator training, vendor support and Botnia staff, appeared to be comparable to similar mill projects that are close to start-up. At the time of our second visit the installation and commissioning of the mill's manufacturing processes and the mill's planned and required pre-startup activities were close to completion.

7.0 MILL OPERATIONS

Botnia-Orion is planning to include the operating techniques described in the CIS report with respect to process control and optimization, maintenance and planning and maintenance systems.

In the CIS, four operating plans are identified as being part of BAT for mill operations. These are:

- Training, education and motivation of staff and operators
- Process control and process optimization
- Ensuring sufficient maintenance of the mill
- Design of the environmental management systems

As the mill is not yet operating, the current assessment is based on current plans and preparation for mill operation.

In this section the process control and process optimization plans and maintenance systems will be reviewed. Some general observations on mill operating procedures are also made.

7.1 Process Control and Process Optimization

Process control at Botnia-Orion is based on a computerized distributed control system (DCS) purchased from Honeywell. This system is being configured with the aid of a dynamic process simulation system provided by Andritz.

The DCS system and simulation system is considered to be current technology for modern pulp and paper mills. The advanced control features which are described in the CIS report for the recovery boiler, lime kiln, digester and bleach plant control are being implemented. The advanced control features on the recovery boiler and kiln primarily relate to minimizing air emission discharges and those on the digester and bleach plant relate to minimizing chemical use and bleach plant liquid effluent discharge.

The DCS system stores process data which can be accessed by mill engineering and operational staff. This storage and access capability provides a convenient, comprehensive and efficient means to collect, analyze and assess data on environmental performance, process performance and provides a sound basis for process optimization.

The use of the process simulator for operator training, as described in the CIS report (section A12.2.2.1) was used for a shorter period of time than originally planned because the DCS system configuration was significantly behind schedule (about 6 months during our April visit) and the simulator can only be used once the DCS configuration is complete. The primary purpose and usefulness of the simulator is to test and troubleshoot the computer based control systems. This has occurred at Orion. After use for testing and troubleshooting the control system, the simulator is then reconfigured and connected to the operator training stations.

Botnia rescheduled the operator training to occur on a 2-shift basis instead of only on day shift and purchased additional simulator stations. In the second mill visit it was confirmed that simulator training had occurred in the evaporator, digester and auxiliary boiler area.

Botnia's response[1] to the audit team's concern on simulator training expressed after the phase1 visit was:

Audit Team Concern:

There was particular concern regarding the impact of compacted commissioning on the final phase of operator training where participation in commissioning checks and the use of process simulators was planned.

Botnia Response:

We have commenced commissioning activities throughout all systems within the Mill and are well advanced in most. We are ready to commence process simulator training for our operators within the Evaporation Plant and the Auxillary Boilers. We strongly believe that since we will have experienced Finnish operators working alongside our locally employed operators during Start-Up of the Mill, process simulator training prior to Start-Up is not essential, however it will be mandatory that all of our locally employed operators will undertake process simulator training albeit before or after Start-Up of the Mill.

Botnia is of the opinion that dynamic simulator training of operators before start-up is not essential for a successful start-up. In about half of the recent mill start-ups known to Botnia and the auditors, the dynamic simulators were not completed in time for mill start-up and operator training was completed with more traditional means. A component of this more traditional training includes working beside experienced operators from other mills, which Botnia have completed at mill visits in Finland and Brazil, and will continue during the start-up and initial operation phase of Orion.

Botnia expects that the dynamic simulators will be available to mill process engineers and operators within a month after mill-start up and so will be available for ongoing training and optimization.

Botnia and Andritz are providing additional staff to assist with start-up and initial process optimization. The additional staff includes Andritz start-up personnel for the first 3-6 months of operation and key Botnia personnel in process areas and management who will remain for two years following start-up. Compared to several recent startups known to the AMEC audit team, these time commitments are significantly longer and should provide a good opportunity to ensure stable operation and initial process optimization.

Kemira is supporting the initial operation of the sodium chlorate and peroxide plants with staff from its European operations. Praxair, the operator of the oxygen plant (under contract to Kemira) is using similar operational systems to their plants in Brazil and Europe. Kemira is using the same DCS system for the chemical plant as that used in the pulp mill, with reporting, data collection and maintenance information collection functions. The start-up and operation of the chlorine dioxide plant is being supported by personnel from Erco systems, the supplier of the plant. The AMEC audit team is familiar with operation of chlorine dioxide, sodium chlorate and oxygen plants, and the plans for process optimization are consistent with those in the pulp mill and as generally described in the CIS.

7.2 Maintenance Systems and Strategy

Responsibility for the maintenance services for the Orion plant owned and operated by Botnia and maintenance responsibility/organization for the chemical plant (owned by Kemira.) has been contracted to Andritz. The maintenance organization is described in section 2.0.

A comprehensive system is being implemented to ensure that the pulp mill equipment is kept in good operating condition. The system aims to use best

[1] Correspondence from T Piilonen and S Saarela, 27 July 2007

practices in maintenance management. This practice includes the use of a computerized maintenance management system (CMMS) with the following features:

- On-site data collection from the DCS system, with on-site diagnostics
- On-line sensors for vibration, acoustic analysis, load analysis. The on-line vibration/acoustic monitoring will have more than 200 points connected.
- Off-line measurement with vibration sensor monitors, equipment temperature profiles, lubrication status, oil analysis, visual inspection of equipment, thickness and clearance measurements. Between 5000 and 8000 points for off-line analysis are planned.

Maintenance planning is based on: vendor recommendations, plant performance, use of predictive tools (such as the online and offline test points above) use of fault analysis, use of diagnostic tools (for failure analysis) and maintenance history. Maintenance follow-up will also be initiated based on analysis of process alarms and observation of process deviations and malfunctions, using a systematic process.

Andritz staff will participate in daily and special mill management and production planning meetings.

A key component of best management practice as required by the US Environmental Protection Agency, is to have regular visual inspections of the operating plant. The suggested frequency is at least once per day. At the Orion mill, operating equipment in processing areas where losses of liquors or chemicals historically occur (e.g. Fiberline, Bleaching, Recovery, and Recausticizing) will be inspected on a regular basis. Maintenance staff will carry out this inspection at least once per day and operators will inspect the equipment at least once per shift.

Kemira also indicated that operating personal would visually inspect all process equipment at least once per shift, in the chemical plant.

Maintenance planning at Botnia and Kemira is consistent with the description in the CIS report.

7.3 Mill Operating Procedures

For future mill operation Botnia plan for mill operating procedures to be integrated into an Operational Management System, with key documents stored and available electronically in a “Kronodoc” system. The Kronodoc system is a computer based document record system. In this system, policies, procedures, work instructions, guidelines, standard forms and key reference materials will be stored. These documents will be accessible electronically to those that need them, including operators, engineers and managers. The development schedule for the OMS is focused on attainment of certification by one year after start-up. The OMS system will include information for certification for environmental, quality and occupational safety and health systems.

The OMS and Kronodoc system, at the time of our first visit, were still under development, with an electronic shell (for Kronodoc) constructed and indexed. Consequently it has not been the principal source of information for operator training or reference, and would appear that it will not be the principal source of procedures for initial operation.

At the time of our second visit the system had been further developed, and we observed that it was being used for operating procedures and meeting minutes.

Mill operating procedures and guidance in carrying out these procedures are communicated to the mill staff by a number of different means. These include operator training written material, vendor documentation, procedures developed or to be developed by Botnia as part of the DCS system documentation, and the provision of experienced operators and staff working side-by-side with inexperienced operators and staff during the start-up and initial operating period.

The structure and organization used by Botnia, for developing and documenting mill procedures has many strengths, with vendor knowledge and information from other mills captured in the training and vendor documentation.

In the first audit visit initial review of operator training material, the OMS system and vendor supplied training material and procedures and Botnia procedures, the following areas of weakness were identified by the auditors:

- Systems for which vendors are not normally responsible for or have less experience with. One example is mill-wide systems, and in particular, the spill control and recovery system (for example, operation procedures, strategy and set points for spill recovery from the fiberline and recovery areas). Another example is the start of the evaporators and the integration of the non condensable gases into the strong gas NCG system, particularly with respect to the operation of a local vent on the evaporator condenser vacuum pump.

- Maintenance planning and operator training documentation lacked references to techniques or procedures which would prevent the discharge of liquids and gases to the environment preceding or during maintenance activities, plant shutdowns and plant startups. These procedures may either be part of the maintenance systems, or part of the operating procedures for mill start-up and shut down, in preparation for maintenance. Procedures may include tank clean out and emptying procedure and procedure for liquor management during shutdowns.

During our second audit visit we were able to confirm that many operating procedures in the areas of spill recovery system, storm water system and many other “mill wide” areas, which had not been prepared at the time of the first visit, were now written and operators had been trained in these areas.

During our second audit visit we were also able to confirm that maintenance workers had undergone general environmental awareness training, and there was clear instruction and demarcation between operating responsibilities and maintenance responsibilities with respect to shut down work. Mill operations are responsible for cleaning and securing equipment for maintenance, including draining all process liquids.

These last two points addressed the main concerns from the Phase 1 audit visit in the area of mill operating techniques with respect to process control and optimization, maintenance and planning and maintenance systems, as described in the CIS report.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Orion Mill Project Organization

The Botnia organizational concept is based on having the specialist skills required to lead construction completion, commissioning and initial operation in place to meet the scheduled start-up. Most of these skills will come from foreign personnel. However Botnia has planned that within two years of start-up, the mill personnel will be nearly completely Uruguayan based personnel.

Our impression, based on the review conducted, is that Botnia has built a strong organization for the development and operation of the Orion Fray Bentos mill. The caliber of personnel appears to compare favourably with other projects of this type. The mill appears well-positioned from an organizational aspect to meet its operational objectives including its environmental management goals.

8.2 Process Equipment and Technology

All process equipment and technology installed or planned to be installed at Botnia-Orion is similar or equivalent to best available technology as described in the CIS. The CIS description of BAT was developed by review of IPPC BREF (2001) and more recent BAT definitions from other jurisdictions.

8.3 Environmental Management

Planning and responsibility for environmental management at Botnia-Orion has been assessed in four distinct areas:

a. As part of the core operating and maintenance staff training and work procedures (i.e. “the Botnia way”), with every employee up to the mill manager responsible.
b. As part of the Fire and Accident prevention planning and response, with the safety supervisor the responsible manager.
c. In the Environmental and Quality area, with permits, monitoring, laboratory services and testing, with the Environment and Quality Manager responsible.
d. As part of the operational management system – ISO 9001, 14001, 16001, with ultimate responsibility with the mill manager.

The first two of these areas (the Botnia Way and Accident Prevention and Response) were well developed at the time of the auditor's first visit. The third area (permitting and monitoring, laboratory testing and analysis) was being developed at the time of the Phase 1 visit. At the time of the second visit the laboratory was fully staffed and functional and monitoring plans were developed. The fourth area, the operational management system, was in an early stage of development at the time of the Phase 1 visit and by the second visit, the system was starting to be used, with a number of mill procedures entered into the system. The system is not scheduled to be complete until one-year after start-up.

Our review concluded that the mill management team has an appropriate level of environmental awareness for a project of this type. Botnia has included key commitments made in the CIS in their environmental permits. A comprehensive environmental management system, based on ISO 14001, is being developed, as was described in the CIS.

8.4 Personnel Training

There is a comprehensive personnel training program in place at the Botnia-Orion mill. This covers aspects that are normally found for a project of this type and includes classroom training, observation in other mills and participation in commissioning at the Botnia-Orion mill so as to become familiar with the physical plant.

For the key local engineering staff, the training has been much more extensive that is often carried out, and a strong mentoring program has been developed.

During the first audit visit it was noted that development of operating procedures and training for the spill control and recovery system, storm water system and parts of the NCG system was required and had not yet occurred, and general training for site environmental awareness was recommended. These procedures had been written at the time of the second visit and operator and maintenance staff environmental awareness training was in various stages of completion.

8.5 Commissioning and Operational Status

Based on the information received, site interviews and observations it was concluded that both Botnia and Kemira commissioning plans and the people selected to carry out these plans have the features and characteristics that are normal for a project of this type.

It was also concluded at the end of the phase I site visit that the measured overall delay in the erection program of eight weeks was approximately correct and that the commissioning plan would experience significant compaction if the mid-August target startup date was to be maintained. At the end of the phase II visit it was clear that mid-August target date had not been met. Botnia's project director, Botnia's project manager and Andritz's project director all stated that all construction completion activities and commissioning checks could be completed in three weeks.

The impact of the compacted project completion schedule on commissioning and on the final phase of operator training, where participation in commissioning checks and the use of the process simulators was planned, has been mitigated by the increased reliance on foreign expertise and the later than scheduled start-up date, which has provided a longer than planned overall training period for operators.

8.6 Mill Operations

Botnia-Orion is planning to use the BAT operating techniques described in the CIS report with respect to process control and optimization, maintenance and planning and maintenance systems.

The auditor's overall impression is that Botnia-Orion is a well designed and generally well executed project. Modern process technologies are used that promise to perform with low emission and world-leading environmental performance. The staff we met are competent and motivated. The foreign nationals who are working on the project and supporting the initial mill operation have good mill operating experience.

Appendix 1

A1.1 Summary of the BAT Evaluation Methodology from the CIS Report Section A13.1

A1.2 Schedule of Meetings during the Site Visits

A1.3 Personnel Interviewed

A1.4 Documents required for the Site Visits

The Summary of BAT Evaluation is taken directly from EcoMetrix (2006) [a], Annex A – Process and Technology, Section A13.0. The relevant sections are reproduced below for reference. Edits to these sections have been made by AMEC to remove reference to the proposed ENCE mill, which is now not proceeding at Fray Bentos. The original text can be obtained online at
http://www.ifc.org/ifcext/lac.nsf/Content/Uruguay_Pulp_Mills_CIS_Final.

[a] EcoMetrix Incorporated, 2006. "Cumulative Impact Study – Uruguay Pulp Mills." A report prepared for the International Finance Corporation, September 2006

A13.0 SUMMARY OF BAT EVALUATION

In order to assess BAT for the Botnia-Orion mill, a careful methodology was presented in Section A1 and systematically executed for the purposes of this CIS. The methodology and results can be summarized as follows:

1. *Assessment of the mill compliance with the emission levels achievable with the use of BAT:* Based on emission levels from the IPPC-BAT (2001) and Tasmanian-AMT (2004) standards, it was found that the mill is implementing BAT. Furthermore, a comparison was made between the proposed mill emission rates and other mills including state-of-the-art BEKP mills in Brazil, as well as other well-operated Botnia mills. It was found that the proposed emission rates for the new pulp mill were generally in the same order or better than these mills.

2. *Assessment of whether the environmental regulating body in Uruguay, DINAMA, has a comprehensive plan to ensure the BAT standard will be met through their permitting process and requirements:* DINAMA is employing a staged process to issue management plans for the pulp mill as engineering and construction activities progress, which should eventually lead to the AAO or operating permit for the mill. Both concentration-based and loading-based discharge requirements are expected for the effluent, and well-defined atmospheric emission limits. The mill proponents and DINAMA are currently discussing monitoring and reporting requirements, which will be used as the basis for the operating permit renewal required every 3 years.

3. *Assessment of whether BAT has been included in the mill equipment design:* The summary of IPPC-BAT (2001), Tasmanian-AMT and certain USEPA Cluster Rule (2000) requirements has been summarized in Tables A13-1 and A13-2, and targeted issues have been discussed in greater detail in earlier sections of this Annex. The mill will employ state-of-the-art process technology.

4. *Assessment of BAT operating requirements:* The Botnia-Orion mill was evaluated regarding their plans for solid waste management practices, monitoring plans including those implemented in other operating mills, training and motivation of mill personnel, process control, equipment maintenance, environmental management systems (EMS), and plans for communication with the community. Expectations for state-of-the-art practices in regards to these issues are in place.

Table A13-1: Summary of BAT Analysis for the Botnia-Orion Pulp Mill

IPPC Requirements Related to Emissions to Water	
Dry debarking of wood	Logs will be dry-debarked at the plantations, therefore debarking drums at the mill will remove only the remaining bark and impurities such as soil and sand. Water used in washing of the logs will be recycled, with only a minimum purge going to the effluent treatment plant, in order to avoid accumulation of impurities. The water consumption at the mill is expected to be below the definition for dry debarking, i.e. 0-5-2.5 m^3/ADt.
Modified cooking either in batch or continuous system	Cooking will be done in a Downflow Lo-Solids® continuous digester.
Highly efficient brown stock washing and closed cycle brown stock screening	Brown stock will be washed first in the digester, then in high-efficiency drum displacement washers (DD-Washers®, E10=23); three in parallel before oxygen delignification, and two in parallel before bleaching. Brown stock screening will be done in a three-stage closed cycle.
Oxygen delignification	Before bleaching, pulp will be delignified in a two-stage oxygen delignification process. Final kappa number will be under 11.
ECF or TCF final bleaching and some, mainly alkaline, process water recycling in the bleach plant	ECF bleaching with the sequence A/D-E_{OP}-D-P; DD-washers® will be used in the intermediate washing stages. Botnia will install the necessary equipment to recycle the alkaline filtrate from the bleaching plant, however Botnia has stated that the implementation of this option requires that the mill is running for at least two years.
Purification and reuse of condensates	Segregation of condensates will be as follows: o primary (clean): returned to the feed water tank of the recovery boiler o secondary, type A: used in the fiberline o secondary, type B: used in the white liquor plant o foul: stripped to be returned to the process. TRS and methanol removal efficiency in stripping: >98%.
Effective spill monitoring, containment, and recovery system	Spills will be collected and returned to the process. The floor channels and sumps will be monitored with sensors (pH or conductivity).
Sufficient black liquor evaporation plant and recovery boiler to cope with the additional liquor and dry solids loads due to collection of spills, bleach plant effluents etc.	Evaporation plant and recovery boiler have been designed with adequate additional capacity. Evaporation capacity: 20% above normal operation. Recovery boiler: 27% above design capacity for peaks (9% for continuous operation).
Collection and reuse of clean cooling waters	Contaminated cooling water will be directed to the effluent treatment plant.
Provision of sufficiently large buffer tanks for storage of spilled cooking and recovery liquors and dirty condensates to prevent sudden peaks of loading and occasional upsets in the external effluent treatment plant	Spills will be collected and returned to the process. However, if an unexpected load goes into the effluent sewers, it will be contained in the equalization and safety basins (3 basins, 25,000 m^3 each). No effluent will be sent from these basins to the biological treatment without being checked by an operator.
Primary treatment of wastewater	Fiber-containing effluents from the process will go to a primary clarifier before being sent to the equalization basins.
External biological wastewater treatment	Activated sludge treatment, with two parallel lines (two aeration basins + two secondary clarifiers). Total volume of biological treatment: 150,000 m^3.

USEPA Cluster Rule Requirements Related to Emissions to Water	
Adequate chip thickness control	The selected chippers (HHQ-Chipper) will produce chip size distribution sufficiently even to be classified by flat screens used only for cooking of eucalyptus pulp.
Use of dioxin- and furan-free defoamers (i.e. water-based defoamers or defoamers made with precursor-free oils)	Only dioxin- and furan-free defoamers will be used.
Oxygen- and hydrogen peroxide-enhanced extraction (which allows elimination of hypochlorite and/or use of a lower kappa factor in the first bleaching stage)	Oxygen and hydrogen peroxide enhanced extraction is in use.
Use of strategies to minimize kappa factor and dioxin & furan precursors in brown stock pulp	The eucalyptus is delignified in Lo-Solids cooking system and two stage oxygen delignification system. Efficient washing with E10=23 will be used to minimize the organic solids content in front of bleaching. Hexenuronic acids are removed by acidic hydrolysis (A-stage) in front of the final bleaching.
High shear mixing during bleaching to ensure adequate mixing of pulp and bleaching chemicals	Ahlmix high share chemical mixers are used in all bleaching stages.

IPPC Requirements Related to Emissions to Air	
Collection and incineration of concentrated malodorous gases from the fibre line, cooking plant, evaporation plant, condensate stripper, and control of the resulting SO2. The strong gases can be burnt in the recovery boiler, the lime kiln or a separate, low NOx fournace. The flue gases of the latter have a high concentration of SO2 that is recovered in a scrubber.	The concentrated odorous gases are collected from the cooking and evaporation plant and condensate stripper. The gases are primarily fired in the recovery boiler, and as a back-up only in an odorous gas boiler equipped with a scrubber for bisulphite production.
Collection and incineration of diluted malodorous gases from e.g. the fibre line, various sources as tanks, chip bins, smelt dissolver etc. The weak malodorous gases can be burnt in e.g. the recovery boiler mixed with combustion air or in an auxiliary boiler depending on the volume.	The diluted odorous gases are collected in the brown stock fibreline, oxygen delignification, evaporation and recausticizing. The gases are burnt as the secondary air in the recovery boiler, and as a back-up only in an odorous gas boiler for weak gases.
Mitigation of the TRS emissions of the recovery boiler by computerized combustion control and CO measurement and in the case of the lime kiln by controlling the excess oxygen, by using low S-fuel, and by controlling the residual soluble sodium from the lime mud fed to the kiln.	The TRS emissions of the recovery boiler are mitigated by computerized combustion control and CO measurement. No odorous gases are fired in the lime kiln, mitigating the TRS emissions. The residual soluble sodium to the lime kiln is minimized.
Control of SO2 emissions from the recovery boilers by firing high dry solids concentration black liquor in the recovery boiler to mitigate SO2 formation and/or by	The black liquor will be concentrated close to 80 % dry solids to mitigate SO2 formation.

using a flue gas scrubber.	
Control of NOx emissions from the recovery boilers and lime kiln by controlling the firing conditions and by ensuring proper mixing and division of air in the boiler, and for new or altered installations also by appropriate design;	- Low NOx burner will be installed. - Firing conditions will be controlled. - Vertical four level air distribution.
Control of NOx emissions from auxiliary boilers by controlling firing conditions and for new or altered installations also by appropriate design.	N/A
Reducing SO2 emissions from auxiliary boilers by using bark, gas, low sulphur oil and coal or controlling S emissions with a scrubber (n/a in the case of Botnia).	N/A
Cleaning of the recovery boilers, auxiliary boilers (in which other biofuels and/or fossil fuels are incinerated) and lime kiln flue gases with efficient electrostatic precipitators to mitigate dust emissions.	The recovery boiler and lime kiln flue gases are cleaned with high efficient (99,9%) electrostatic precipitators.

USEPA Cluster Rule Requirements Related to Emissions to Air	
Bleach plant vent control and collection. The control device shall reduce the total chlorinated HAP mass with 99 wt-% or more, achieve an outlet concentration of 10 ppmv or less; or achieve an outlet mass emission rate of 1 g/ODt.	All bleaching vents are collected to the bleaching scrubber.
Collection and treatment of CNCG should include digester, turpentine system, evaporation and stripper system. For DNCG the identified sources are at least; knotting/screening, oxygen delignification, pulp washing and weak black liquor storage. Reducing the total HAP emissions using a boiler, lime kiln or recovery furnace by introducing the HAP emission stream with the primary fuel or in the flame zone is an available option.	CNCG are collected from cooking, evaporation and stripper system and fired primarily in the recovery boiler and as a back-up in the strong odorous gas boiler equipped with a scrubber. DNCG are collected in the brown stock fibreline, oxygen delignification, evaporation and recausticizing. DNCG are fired primarily in the recovery boiler secondary air and as a back-up in a separate weak odorous gas boiler for mild gases.
Foul condensates from digesters, evaporators and NCG collection systems. Different options are mentioned for treatment. For stripper systems the reduction of total HAP should be at least 92- wt%.	Foul condensates are collected from cooking, evaporation and NCG collection systems. The foul condensates are purified in a stripper. The system includes also methanol segregation. (The gases from the system are led to the CNCG collection system and fired.)
For new sources electrostatic precipitators are considered for recovery boilers and lime kilns, and for smelt dissolving tanks wet scrubbers. This to reduce particulate hazardous air pollutants (PMHAP).	Efficient electrostatic precipitators are used for both the recovery boiler and lime kiln. The gases from the smelt dissolving tank are fired in the recovery boiler.

A1.2 BOTNIA ORION PULP MILL PRE-STARTUP AUDIT

Agenda – Site Visit rev 01 – Schedule of Meetings

Note: All activities assume Botnia participation unless marked with an asterisk*

22 April (Sun)	23 April (Mon)	24 April (Tues)	25 April (Wed)	26 April (Thurs)	27 April (Fri)	28 April (Sat)
	Arrive Fray Bentos	8.00-8.15 Review day plan	8.00-8.15 Review day plan	8.00-8.15 Review day plan	8.00-8.15 Review day plan	Travel Montevideo
		8.15 -10.00 -Tour fiberline	8.15-10.00 Review general management struct.	8.15-12.00 -Detail Review(As above)	8.15-10.30 Electrical and controls	
		10.00-11.30	-Project	-Recovery	10.30-12.00	
		-Tour dryer	-Operations	-Evaps	Progress Status	
			-Maintenance	-Recaust	-erection	
		11.30-12.00	-Training	-T/G's	-recovery schedules	
		-office follow up	-Environmental			
			10.00-12.00			
			-Detail review Fiberline(as above)			
		12.00-13.00	12.00-13.00	12.00-13.00	12.00-13.00	
		-lunch	-lunch	-lunch	-lunch	
	13.00-15.00(Office)	13.00-1600	13.00-15.30	13.00-14.30	13.00-1600	
	-Orientation /agenda	-Tour Recovery/Evap	-Chem.Prep(Detail)	-Wood.prep(detail)	-Document review*	
	-project organization	-Tour Recaust/T.G's		14.30-1700		
	-	16.00-15.00	15.30-17.00	-Water/Effluent	16.00	
		-Tour Chem.Prep.	-Dryer(Detail)		Wrap up comments	
	15.00-17.00					
	-site tour					
	17.00-19.00*	17.00-19.00*	17.00-19.00*	17.00-19.00*		
	-Document review	-Document review	-Document review	-Document review		

BOTNIA ORION PULP MILL PRE-STARTUP AUDIT, Phase 2

Site Visit – Schedule of Meetings – August 2007

Note: All activities assume Botnia participation unless marked with an asterisk*

12 Aug(Sun)	13 Aug (Mon)	14 Aug (Tues)	15 Aug (Wed)	16 Aug (Thurs)	17 Aug (Fri)
Arrive Fray Bentos about 7pm.	8.00-12.00	8.00-8.15 Review day plan	8.00-8.15 Review day plan	8.00-8.15 Review day plan	
	General -Feed back Phase 1 report	8.15 -12.00 RECOVERY/EVAPS/TG REVIEW -Master book review	8.15-12.00 WATER/EFFLUENT -Master Book Review -Civil/Struct	8.15-12.00 Review outstanding information requests	
	-Final report content	-Civil/struct	-MEI		
	-Requested documents	-MEI	-Commissioning	-Laboratory and Document management Systems	
	-Project progress	-Commissioning	-Maintenance		
	-Agenda for week	-Maintenance	-Training	Electrical and Control Systems	
	Site overview tour	-Training	-Area tour		
		-Area tour		Odorous Gas System review	Travel
	12.00-13.00	12.00-13.00	12.00-13.00	12.00-13.00	
	-Lunch	-lunch	-lunch	-lunch	
	13.00-17.30	13.00-15.30	13.00-15.30		
	FIBERLINE REVIEW -Master book review	NCG SYSTEMS -discussion -site tour	-Chem.Prep -Civil/struct/MEI -Commissioning		
	-Civil/structural	15.00-17.30	-Maintenance /training	14.30-1700	
	-MEI	DRYER REVIEW	15.30-17.30	-Feedback/Wrap up	
	-Commissioning	-Master book review	-WOOD PREP -Civil/Struct/MEI	-Preparation for final report	
	-Maintenance	-Civil/struct/MEI/Comm	-Commissioning		
	-training	-Maintenance/Training	-Maint/training	17.00	
	-Area tour	-Area tour	-Area Tour	-Travel to Montevideo	
	Review with Training Manager		Review With Environmental Manager		
	17.30-19.00 Document Review*	17.30-19.00 Document Review*	17.30-19.00 Document Review*		

A1.3 Personnel Interviewed by Company and Position

Botnia S.A.

Mill Manager

Safety / Security manger Botnia Oy

Quality Engineer

Project Manager
Operational management system and laboratory

Supervisory Engineer Recovery

Recovery Line Superintendent

Project Engineer
Recovery

Project Manager
Recovery

Production Manager and General Supervisor

Project Engineer,
Cooking & Bleaching
Uruguay Project

Asistente Ejecutiva
Fray Bentos

Scheduling Coordinator

Fiberline Superintendent

Environmental Coordinator

Training Manager

Director
Mill Services and Supply Control

Fiberline Superintendent

Project Manager
Fibre Line
Uruguay Project

Project Engineer
Drying and baling
Uruguay Project

Gerente de Proyecto, Electrificación
Automatización y Sistemas

Electricity and Infrastructure Manager

Project Engineer Water Treatment

Construction Manager

Wood Prep Supervisor

Project Engineer, Evaporation and Energy

Andritz (Uruguay S.A , Oy Finland, AG Austria)

Kraft Mill Systems
Manager, Start-ups

Pulp Mill Services
Jefe de Mantenimiento
Fábrica de Celulosa
Fray Bentos

Pulp Mill Systems
General Site Manager
Botnia S.A.
Fray Bentos

Pulp Mill Systems
Project Director

Pulp Mill Systems
Project Coordinator
Botnia S.A.
Fray Bentos

Head of Maintenance for Automation
Andritz Uruguay SA

Maintenance, Area Engineer Fiberline
Andritz Uruguay SA

Maintenance, Head of Energy and Recovery Area
Andritz Uruguay SA

Area Manager, Chemical Systems
Andritz Uruguay SA

Product Manager, Recovery Boiler Business Unit
Andritz Uruguay SA

Project Engineer
Andritz Uruguay SA

Project Engineering – Wood Processing
Andritz Oy, Finland

Site Manager, Field Installation and Service
Andritz, AG, Austria

Senior Start-up Engineer, Pulp Drying Lines
Andritz, AG, Austria

Automation Engineer
Andritz Oy, Finland

Kemira Uruguay S.A.

Ing. Químico Responsible de
Calidad, Mediio Ambiente
y Seguridad Laboral

Ing. Quím.
Gerente Técnico

Ing. Quim.
Gerente General

Project Manager

Plant Manager, Sweden
Start-up Manager,
Uruguay
Hydrogen Peroxide Plant
Kemira Pulp

A1.4 List of Documents required –

Site Visit Phase 1

General

- Hard copy or electronic copies are acceptable.
- Special programs to open electronic copies to be identified.
- Documents should be available on site the 23rd April.
- Additional documents requirements will be notified in the course of the visit.

Permits/environmental

- Main operating permit draft
- List of minor permits in progress or issued.
- Environmental plan
- Mill Environmental reporting to date

Drawings and Specifications

- Mill Definition Engineering Report.
- Mill one line process diagram(s)
- Process and instrument diagrams for main process areas.
- Mill layout.
- Areas layouts(Ground floor and main process floors)
- Electrical one line diagram.
- DCS/control configuration concept diagram.
- Mill fire and emergency concept diagram.

Project control documents

- Master schedule.
- Progress by area(Planned and actual)
- Procurement plan (Original and present).
- Area checkout tracking system by discipline (Relative to Mechanical completion and operations acceptance).
- Area acceptance procedure/description.
- Project and mill operations organization chart.
- Contact list for mill/project personnel.

Vendor documents

- Process description by major area
- Performance guarantees for process areas.
- Operations acceptance criteria for process areas

Site Visit Phase 2

General

- Hard copy or electronic copies are acceptable.
- Special programs to open electronic copies to be identified.
- Documents should generally be available on site on the 13th August .
- Additional documents requirements will be notified in the course of the visit.

All Areas and Project control documents

- Electronic copy of all diagrams and Botnia documents to be included in final report (use the draft report as a guide) in format suitable for public reporting.
- Latest management review committee minutes (copy) and last 4 months meetings (to review)
- Master schedule Progress by area(Planned and actual)
- MEI completion by area
- Commissioning completion by Area
- Procurement plan – Outstanding items only
- Project and mill operations organization chart (if changed since April).
- Contact list for mill/project personnel (Changes since April)
- Botnia comments on draft report

Permits/environmental

- -Main operating permit draft (or final if issued)
- -List of minor permits in progress or issued since April 2007.
- -Mill Environmental reporting from April 2007 to date

Training/Operating Procedures

- Overall Environmental awareness training material for operators and maintenance personnel.
- Operator training material and work instructions for spill recovery/sump operation in fiberline, recovery, recausticizing.
- Operator training material and work instructions for Storm water system
- Revised training schedule showing operator training in above areas.
- Updated training schedule for operators with respect to dynamic simulator training and statement/assessment criteria regarding operator readiness for start-up.
- Copy of procedure and description of interlocks for the evaporator area hogging vacuum pump and connection to the odorous gas system (on startup and shutdown in the evaporators)
- Copy of NCG system review as recommended in the Draft (Phase I) report.

- Training material related to prevention of accidental losses on start-up and shut down (for operators and maintenance personnel).

Drawings and Specifications

- -Mill one line process diagram(s) (only if changed since April)
- -Process and instrument diagrams for main process areas (for on-site reference).
- -Mill layout (for on site reference)
- -Areas layouts (Ground floor and main process floors for onsite reference)
- -Electrical one line diagram. (only if changed since April)
- -DCS/control configuration concept diagram. (only if changed since April)
- -Mill fire and emergency concept diagram.(only if changed since April)

Area Information

Master book for each area including

- -Area checkout tracking system by discipline (Relative to Mechanical completion and operations acceptance).
- -Area acceptance procedure/description.
- Certificate's of end of erection and Certificate's of completion for all mill areas

Vendor documents

- -Operations acceptance criteria for process areas

Appendix 2

A2.1 Botnia Target Organization 2008-2009

A2.2 Kemira Uruguay S.A.

A2.3 Botnia Site Organization

A2.4 Commissioning Organization of Botnia S.A. Pulp Mill

A2.5 Andritz Recovery and Auxiliary Boilers Commissioning Organization

A2.6 Botnia Raw Water Pumping Commissioning Team

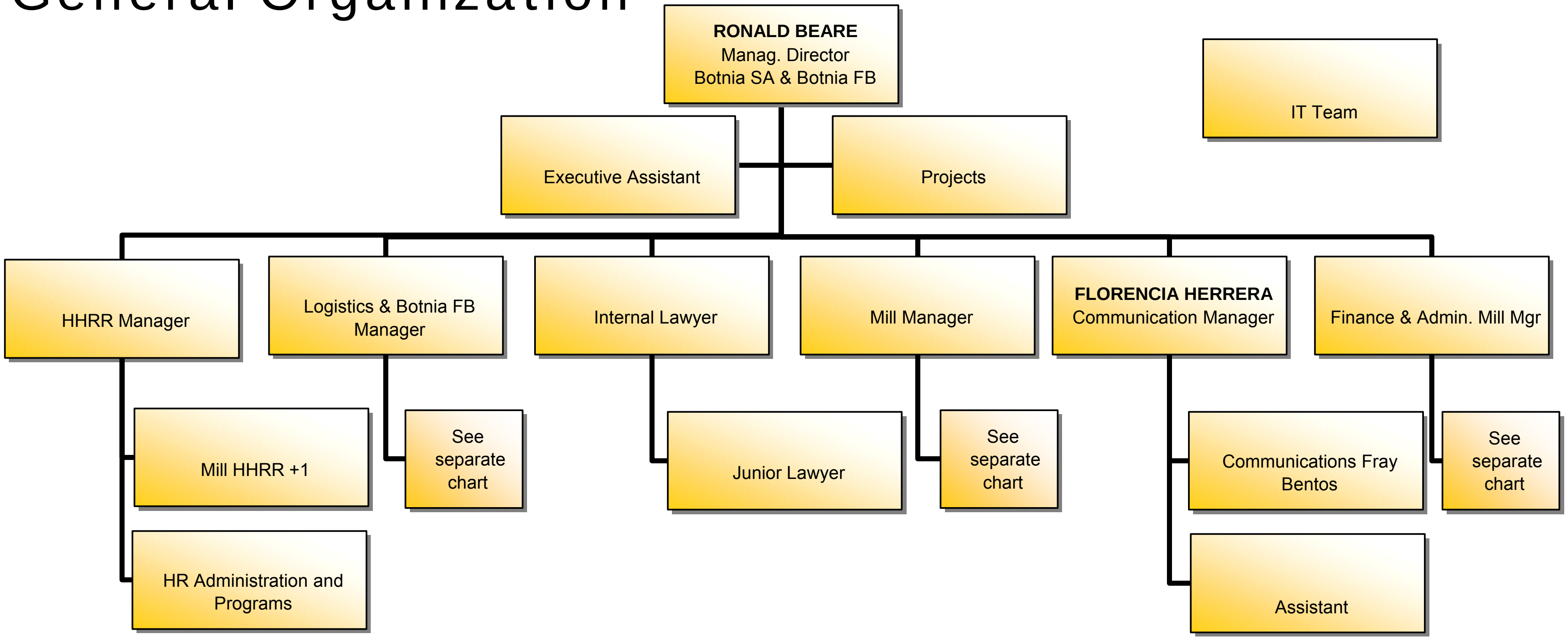
A2.7 Andritz Maintenance Organization

A2.8 Botnia Fire and Accident Rescue Organization

Botnia SA & Botnia FB SA

Target Organization – 2008/2009

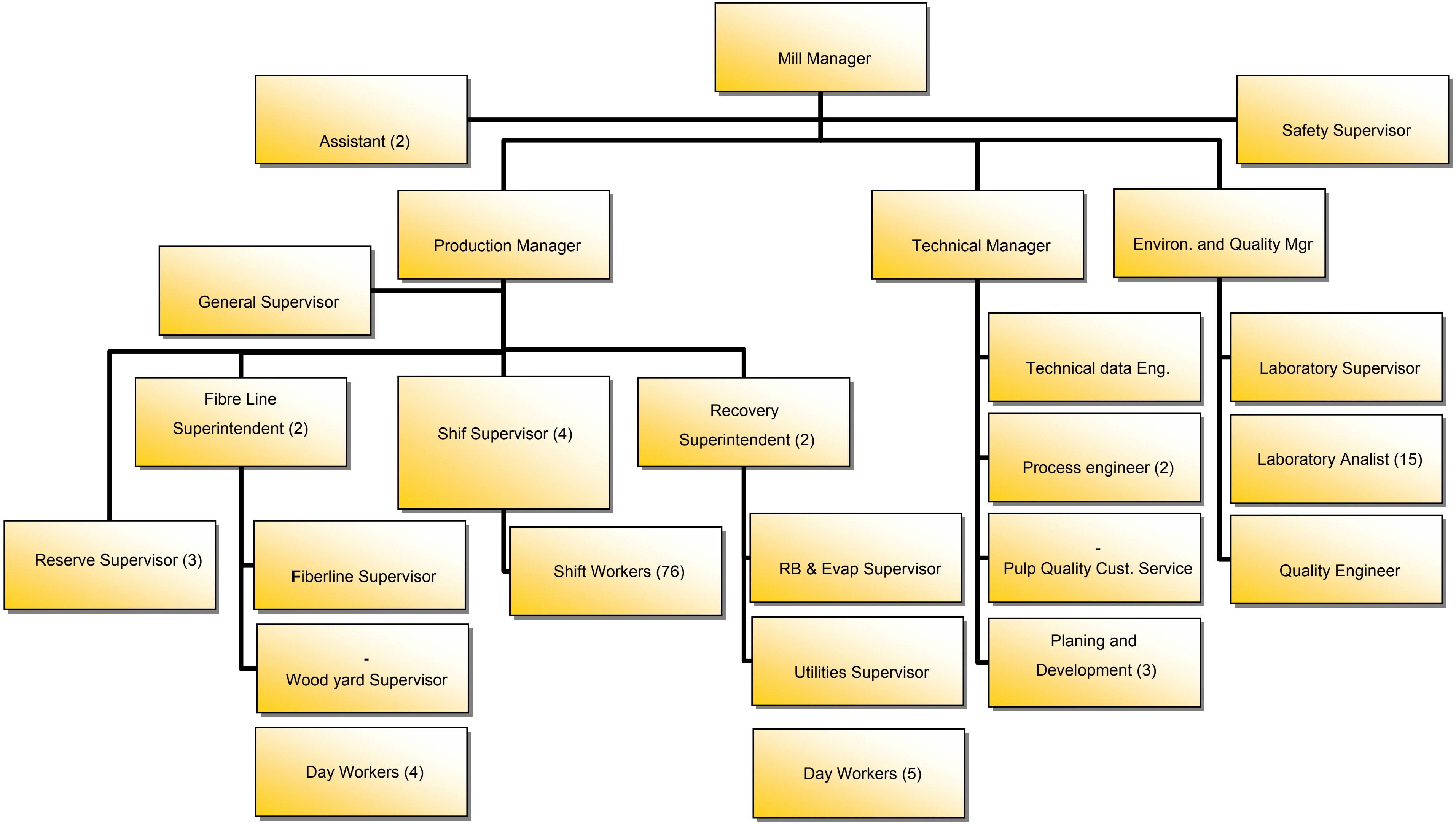
General Organization



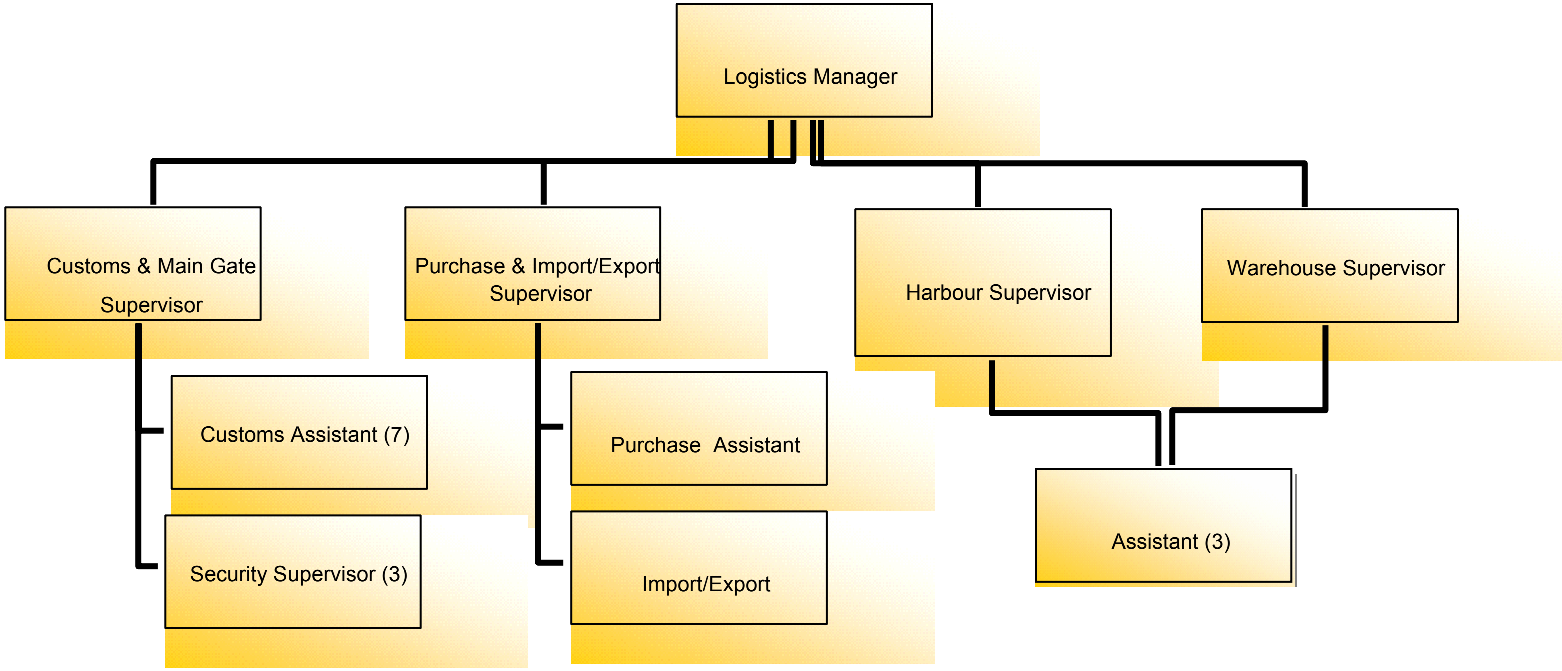
	White Collar	Blue Collar	Total Area
Manag. Direction	3	0	3
Finance & Administration	12	0	12
Communication	3	0	3
Mill	31	100	131
Legal	2	0	2
Logistic	9	0	9
Human Resources	4	0	4
IT	2	0	2
TOTAL Botnia SA	**66**	**100**	**166**

	White Collar	Blue Collar	Total Area
Customs and FT Zone	11	0	11
TOTAL Botnia Fray Bentos SA	**11**	**0**	**11**

Mill Organization

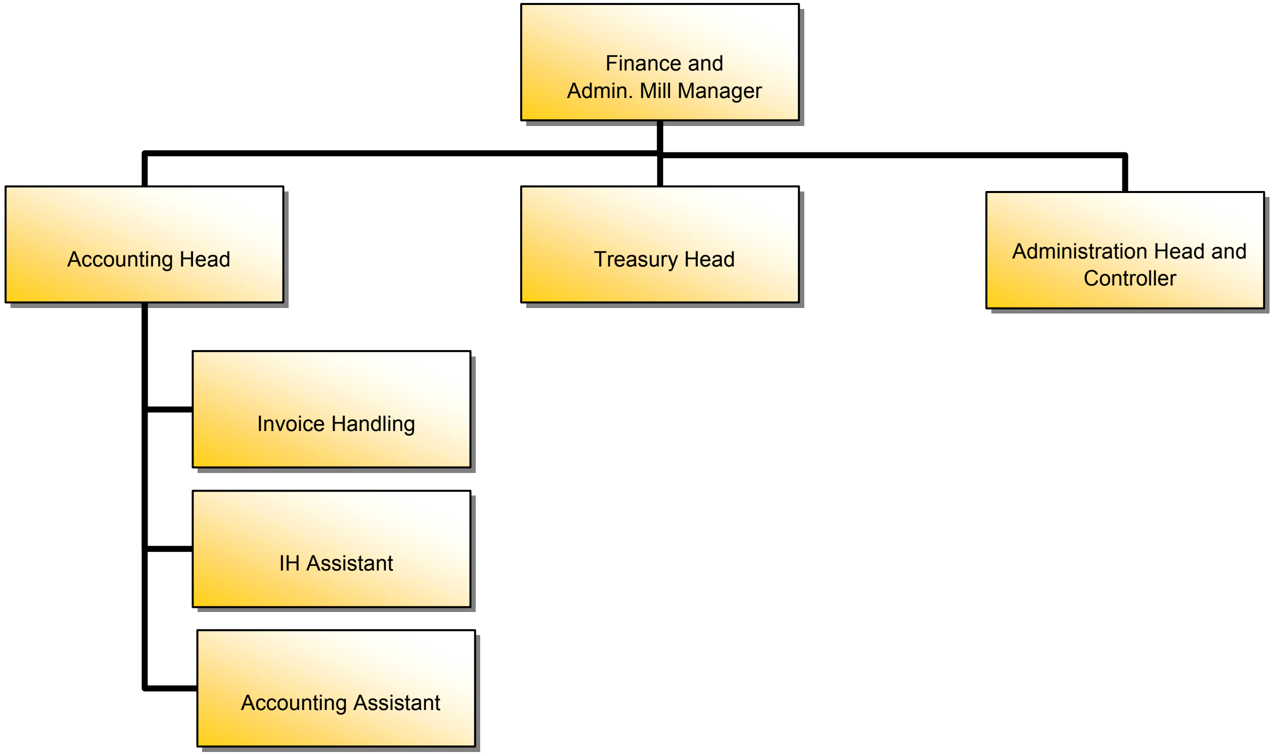


Logistics

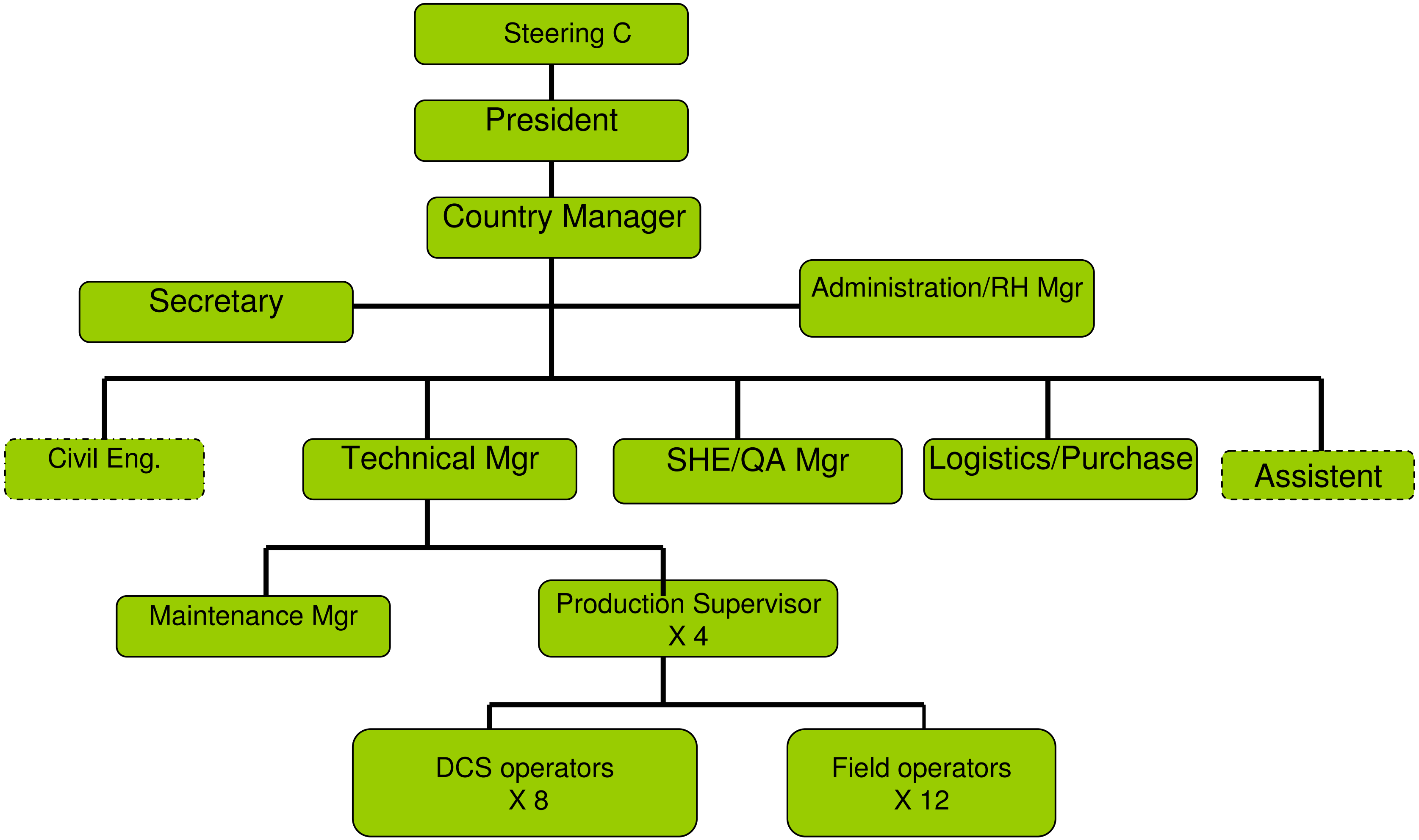


Logistics Manager
Customs & Main Gate Supervisor
Purchase & Import/Export Supervisor
Harbour Supervisor
Warehouse Supervisor
Customs Assistant (7)
Security Supervisor (3)
Purchase Assistant
Import/Export
Assistant (3)

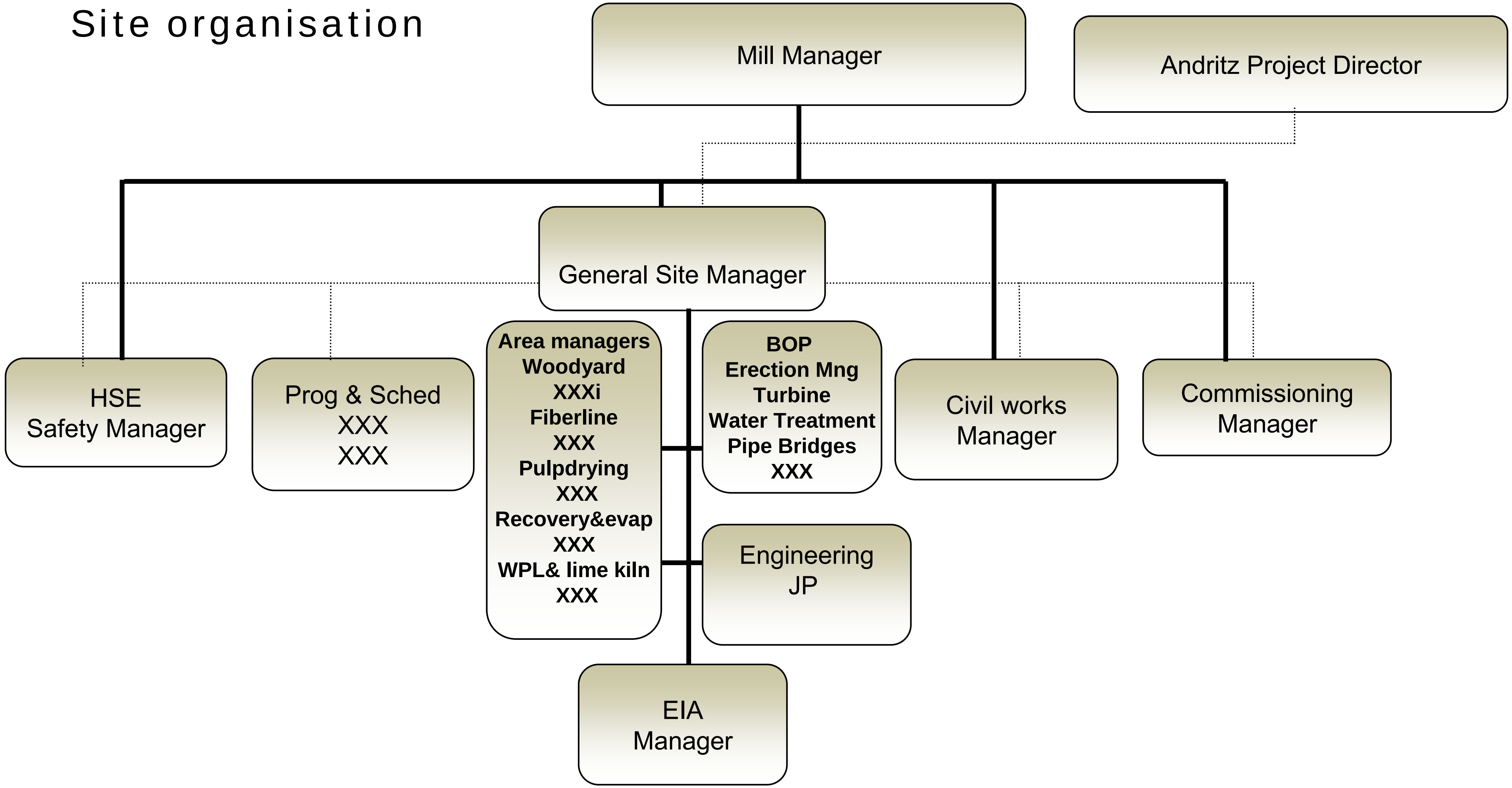
Finance


Finance and
Admin. Mill Manager
Accounting Head
Treasury Head
Administration Head and
Controller
Invoice Handling
IH Assistant
Accounting Assistant

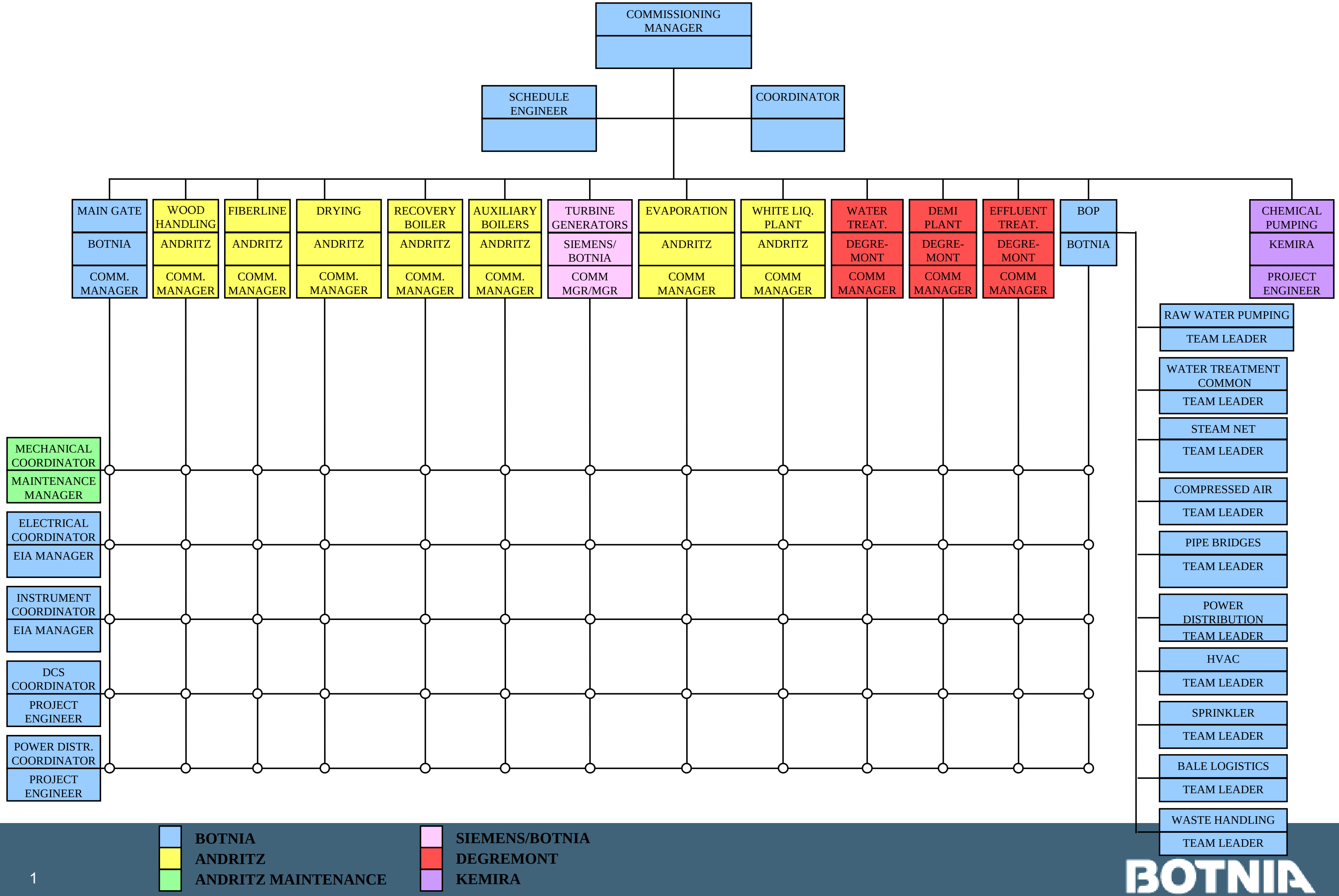
KEMIRA URUGUAY SA



BOTNIA S.A.
Mill project organisation
Site organisation



Commissioning organization of Botnia S.A. pulp mill



BOTNIA

Recovery and auxiliary boilers commissioning organization

ANDRITZ

Project Manager
Recovery Boiler
XXX

Area Site Manager
Recovery Boiler and
Evaporation
XXX

Secretary
XXX

BOTNIA - PROCESS
Engineers
XXX XXX
XXX XXX

Recovery Boiler
Start-up and Training
XXX

Recovery Boiler
Maintenance supervisor and
maintenance team

Recovery Boiler
Start-up Engineer
XXX

Recovery Boiler
Start-up Engineer
XXX

Recovery Boiler
Start-up engineer
XXX

Recovery Boiler
AE&I Installation
Project engineer XXX

Recovery Boiler
AE&I Commissioning
Project engineer XXX

Recovery & Auxl. Boilers
BMS Commissioning
XXX / XXX

Honeywell
XXX

ANDRITZ OY
Home Office

ANDRITZ OY
SITE OFFICE

CONSTRUCTION
SUBCONTRACTORS

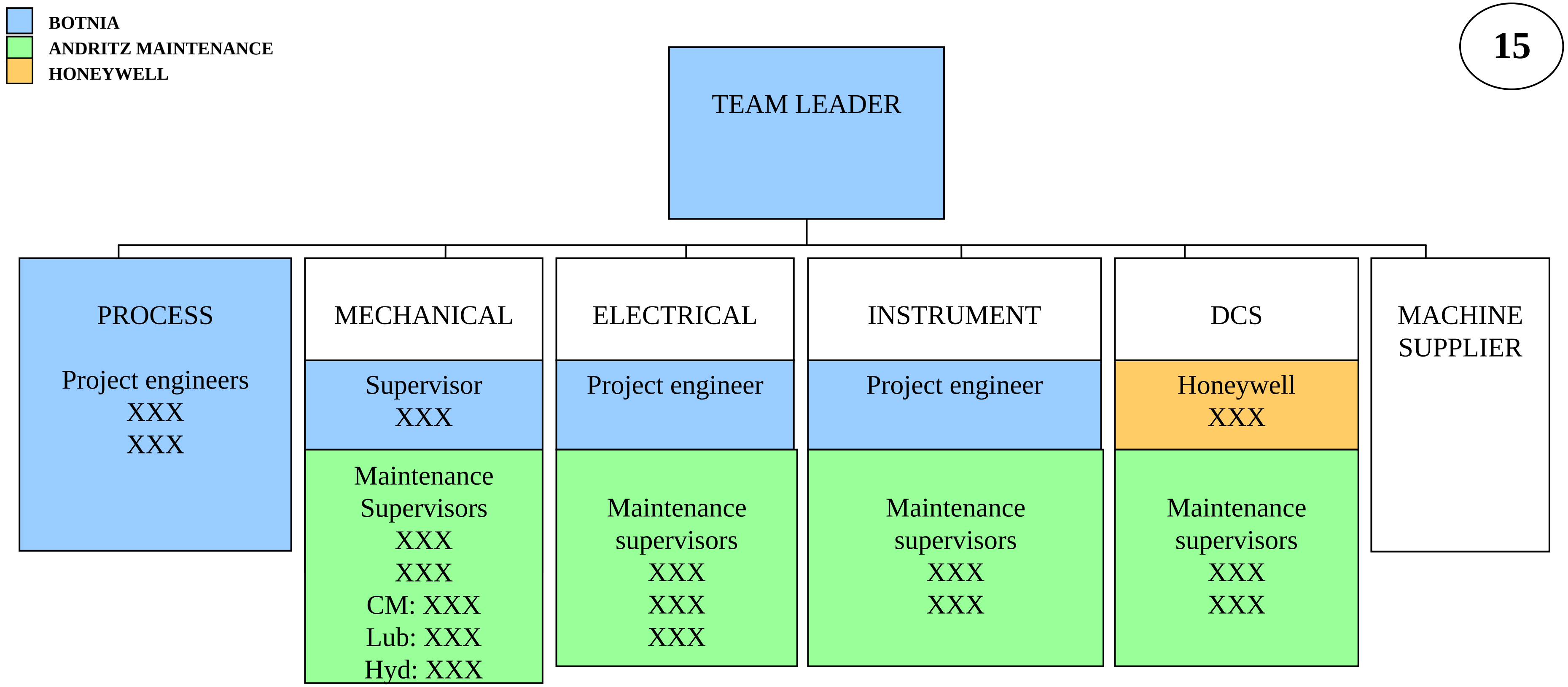
Quality Control / PED&ASME	all **
Mechanical Construction Hutni Erection manager XXX	RB
Piping Butting Erection manager XXX	RB
Electrostatic Precipitator ALSTOM Erection supervisor XXX	
Burners Oilon Erection supervisor XXX	GOL/ GOS
Insulation Erection supervisor XXX	
Inspecta (GOL/GOS) Project engineer XXX	
DCS System Honeywell XXX	all

** will be revised later

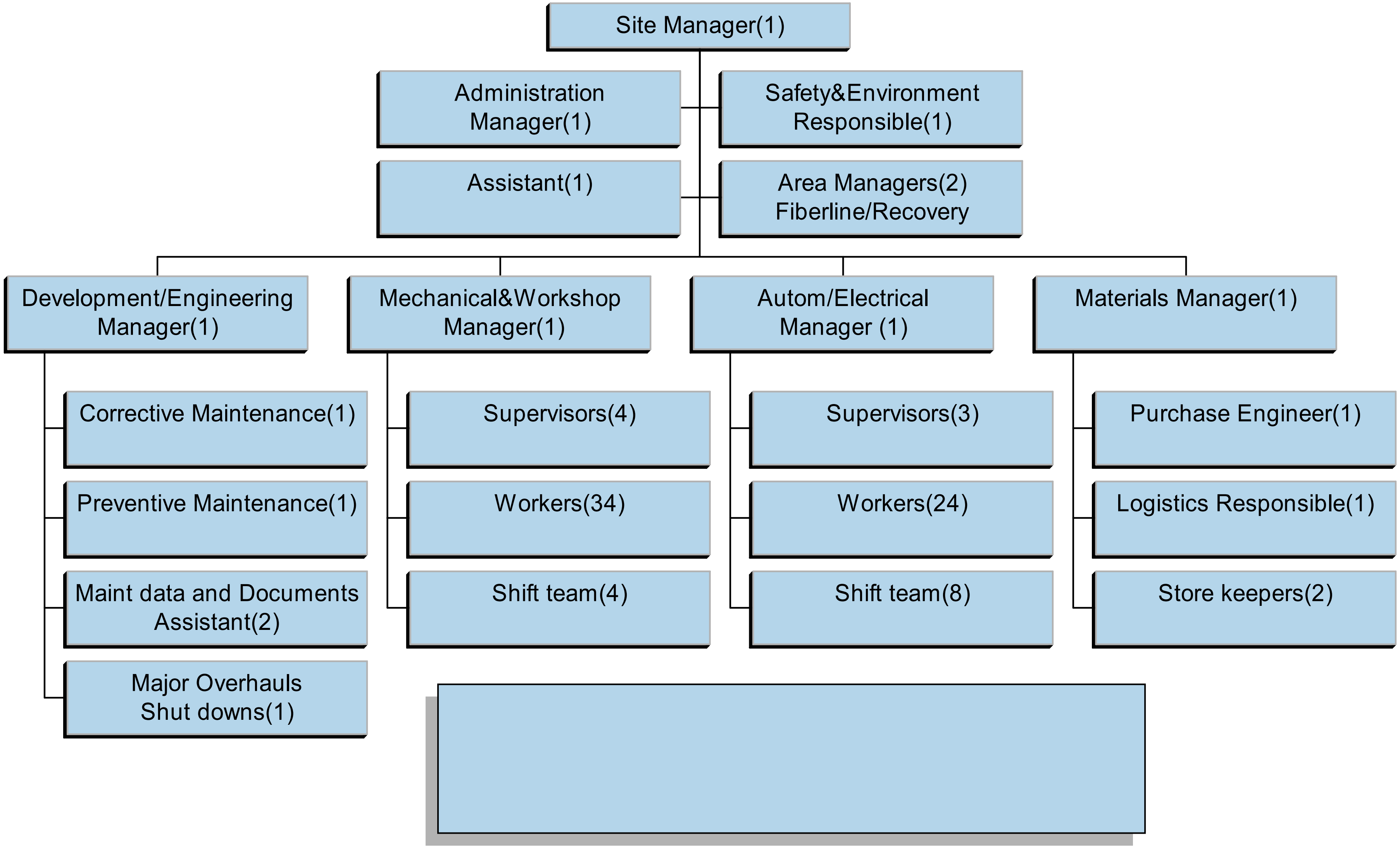
ANDRITZ MAINTENANCE
BOTNIA
ANDRITZ
HONEYWELL

BOTNIA

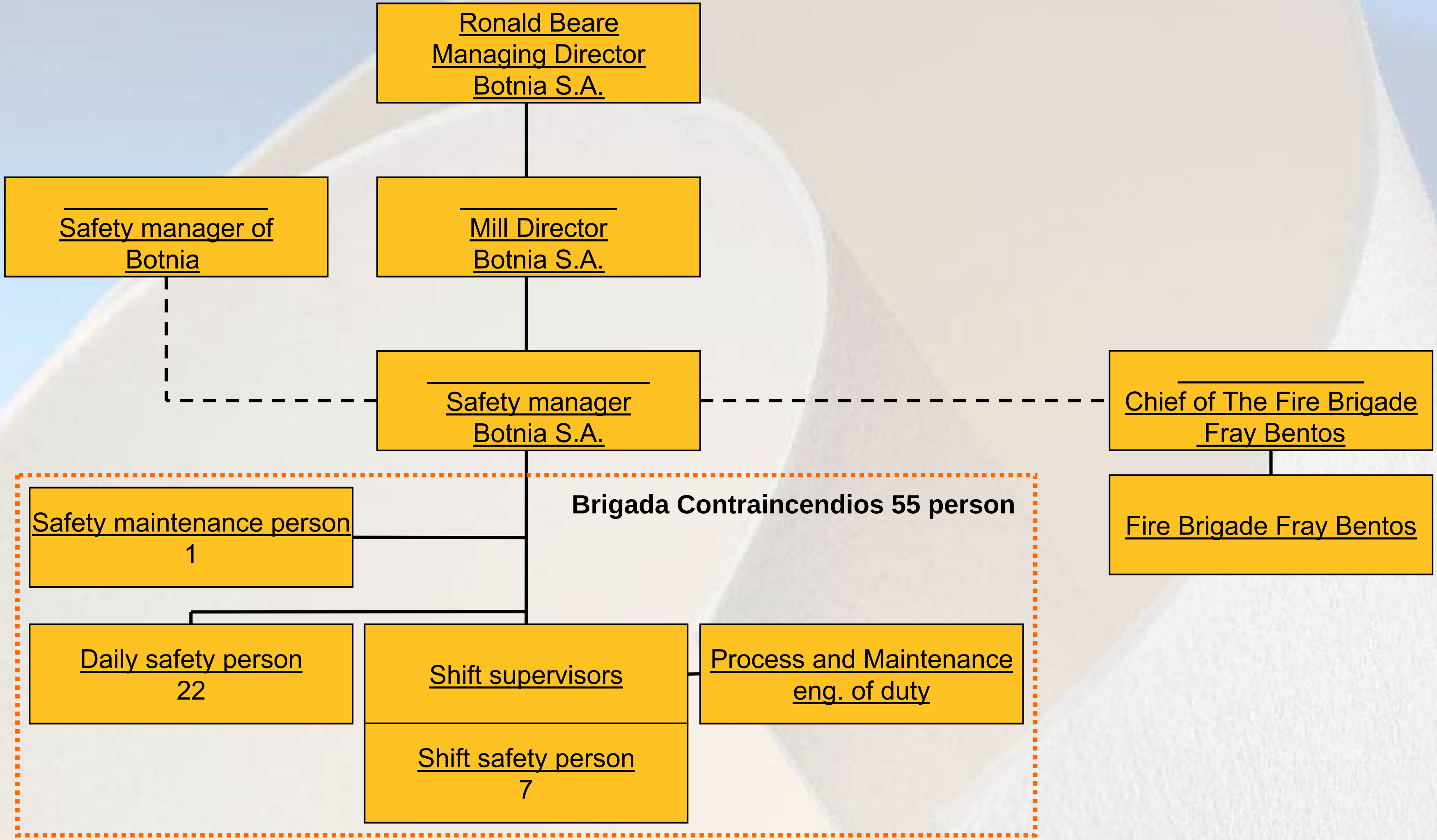
Raw water pumping commissioning team



Andritz Uruguay S.A. Maintenance organization



FIRE AND ACCIDENT RESCUE ORGANIZATION BOTNIA S.A.



BOTNIA

Appendix 3

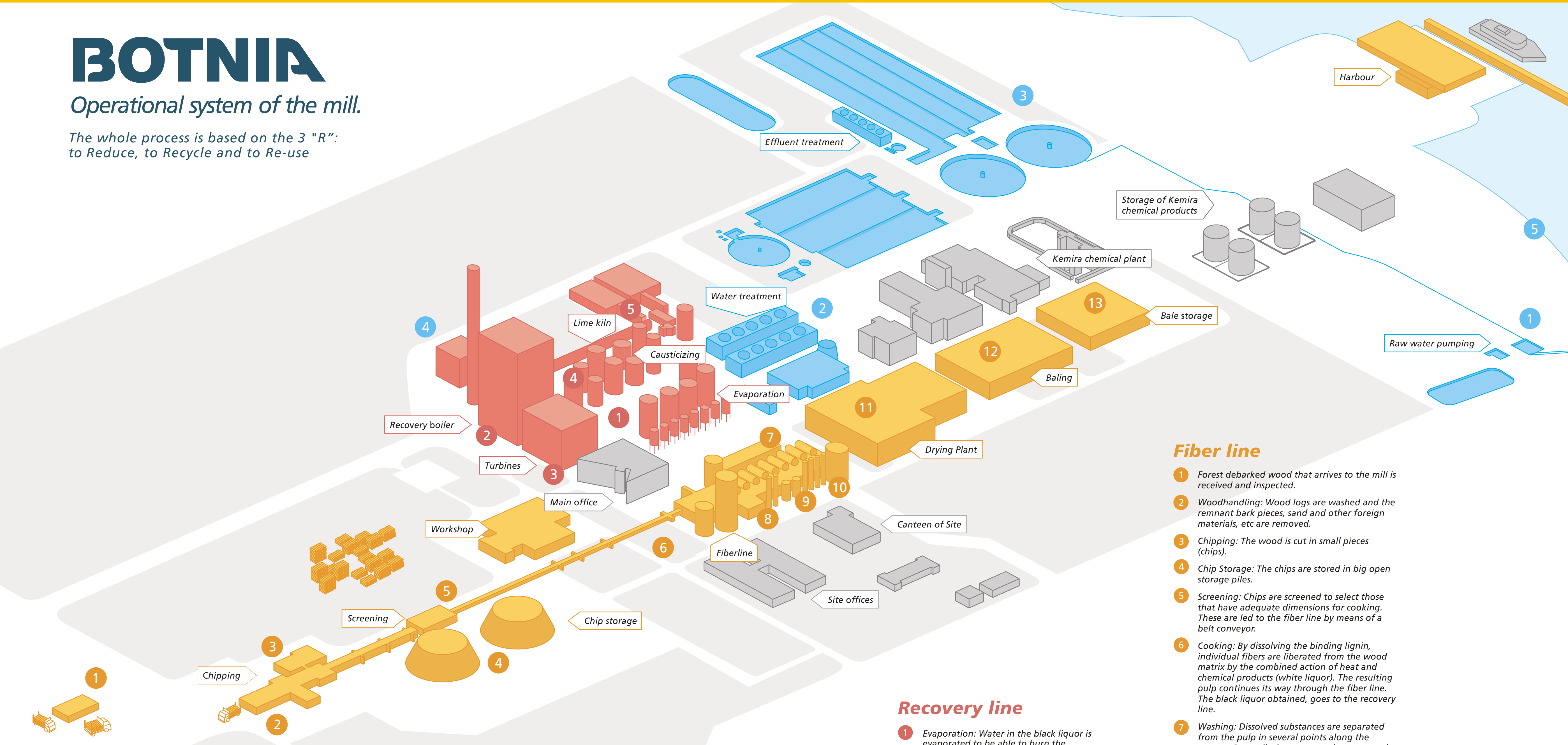
A3.1 Botnia Overall Mill Diagram

A3.2 Process Descriptions from the CIS Report Section A7.0

BOTNIA

Operational system of the mill.

The whole process is based on the 3 "R": to Reduce, to Recycle and to Re-use



Water treatment and effluent treatment

1. Raw water pumping: Water intake from the river.
2. Water treatment: Water undergoes several treatments before it can be used in the different processes in the recovery area and fiber line area.
3. Effluent treatment: Mill effluents go through decanting and activated sludge processes and the resulting water is discharged to the river.
4. Gases: After passing through electrostatic precipitators, the gases from the recovery boiler and from the lime kiln are led to the atmosphere through the stack. Main components are steam and carbon dioxide.
5. Effluent discharge: The treated effluents are discharged to the river.

Recovery line

1. Evaporation: Water in the black liquor is evaporated to be able to burn the concentrated liquor in the recovery boiler.
2. Recovery boiler: The concentrated black liquor from evaporation is burned generating high pressure steam which is led to the turbines and a smelt which will be used to regenerate the cooking chemicals (white liquor).
3. Turbines: With the high pressure steam from the recovery boiler, two turbines produce electric energy enough to cover the mill needs and a surplus which is led to UTE grit. Also, steam is distributed to the different users throughout the mill process areas.
4. Causticizing: Green liquor -coming from the dissolution of the boiler smelt- is converted into white liquor to be used in the cooking process. Lime is used in this process, obtaining lime mud as a result.
5. Calcination: Lime is regenerated from the lime mud which is obtained in the causticizing process.

Fiber line

1. Forest debarked wood that arrives to the mill is received and inspected.
2. Woodhandling: Wood logs are washed and the remnant bark pieces, sand and other foreign materials, etc are removed.
3. Chipping: The wood is cut in small pieces (chips).
4. Chip Storage: The chips are stored in big open storage piles.
5. Screening: Chips are screened to select those that have adequate dimensions for cooking. These are led to the fiber line by means of a belt conveyor.
6. Cooking: By dissolving the binding lignin, individual fibers are liberated from the wood matrix by the combined action of heat and chemical products (white liquor). The resulting pulp continues its way through the fiber line. The black liquor obtained, goes to the recovery line.
7. Washing: Dissolved substances are separated from the pulp in several points along the process. Drum displacement washers are used for that purpose.
8. Oxygen delignification: Additional lignin present in the fibers is still removed by using oxygen, alkali and heat.
9. Screening: Pulp impurities are removed by means of screens and centrifugal cleaners.
10. ECF Bleaching: Delignification is finalized and pulp brightness is increased by the action of several chemical substances, mainly chlorine dioxide, hydrogen peroxide and caustic soda. The process takes place in a series of reactors.
11. Pulp drying: Pulp dryness is increased by means of filtration, pressing and evaporation in drying machines (2 parallel lines). At the machines' outlet end, the pulp web is cut into sheets.
12. Baling: Pulp sheets are baled, identified and grouped in units for transport to customers (4 parallel lines).
13. Bale storage.

Español

A7.0 PULP MILL PROCESS DESCRIPTION

The Botnia-Orion Pulp Mill Process Description is taken directly from EcoMetrix (2006)[a] , Annex A – Process and Technology, Section A7.3. The relevant sections are reproduced below for reference.

Edits to these sections have been made by AMEC to communicate observations and comments from the site visits conducted by AMEC in April and August 2007. These edits are shown in text boxes to distinguish them from the original CIS report. The original text can be obtained online at http://www.ifc.org/ifcext/lac.nsf/Content/Uruguay_Pulp_Mills_CIS_Final.

For information the approximate percentage complete for mechanical, electrical and instrumentation is indicated for each area at the time of our first and second visits, The civil work was more than 90% complete at the time of the first visit..

[a]EcoMetrix Incorporated, 2006. "Cumulative Impact Study – Uruguay Pulp Mills." A report prepared for the International Finance Corporation, September 2006

A7.3 Botnia-Orion Pulp Mill Process Description

The proposed project is a kraft pulp mill producing 1 000 000 air-dry tonne per year (ADt/y) of bleached eucalyptus pulp destined mainly for Europe and Asia. A general flowsheet of the Botnia-Orion mill process is given in Figure A7.3-1.

A7.3.1 Wood Handling

Logs will be dry-debarked at the plantations so that the residuals can be returned to the soil, and thus the debarking drums at the mill must remove only the remaining bark and impurities such as remnant soil and sand. Water used in washing of the logs will be recycled, with a minimum purge going to the effluent treatment plant. The water consumption from wood handling are expected to be between 0,5 and 2,5 m^3/ADt.

Because the mill will use different eucalyptus species, there will be two separate chipping lines and storage. This will allow certain chip mixtures of desired fiber properties to be produced, and process conditions will be optimized based on raw material. Bark residues and fines from screening will be returned to the plantations. The chips will be stored in outdoor storage piles, equipped with an automatic loading and unloading systems designed to minimize fugitive chip dust emissions. After chipping, the wood will be screened and transported by belt conveyors to the cooking process.

*The wood handling area is constructed as described.
The area was about 46% complete at the time of our first visit and 94%complete at the time of the second visit.
The process guarantee is for effluent flow to be less than 1,0 m^3/ADt*

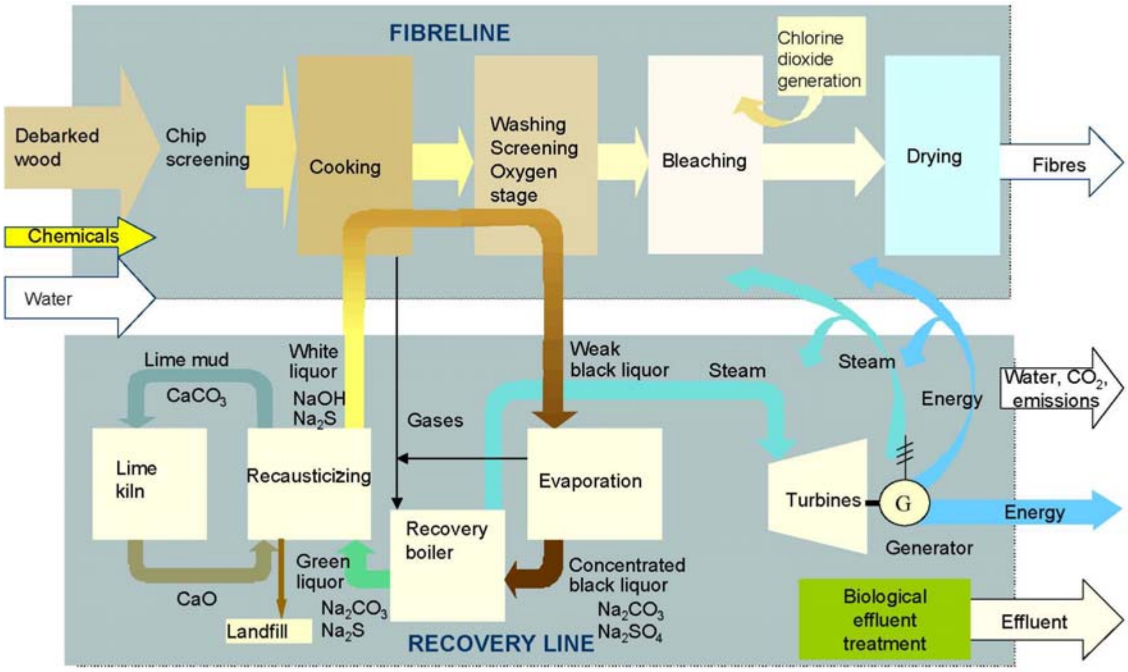


Figure A7.3-1: Botnia-Orion Pulp Mill Processes

A7.3.2 Cooking, Washing, Screening and Oxygen Delignification

Cooking will be done in a Downflow Lo-Solids® continuous digester, and brown stock washing is designed so that the pulp going to oxygen delignification contains less than 60 kg COD per tonne of pulp. Brown stock pulp will be washed first in the digester, then in 3 high-efficiency drum displacement washers in parallel before oxygen delignification, and there will be two more washers in parallel after oxygen delignification and before bleaching. The design washing loss to bleaching is 6 kg COD per tonne of pulp. This indicates that brown stock washing removes about 99,5% of the washable material from the digester and oxygen delignification stages.

Brown stock screening will be done in a three-stage closed cycle, with slotted pressure screens. The design strategy is to reject the impurities and shives at an early stage in the process, so that the purity of the end product is enhanced and the consumption of bleaching chemicals is minimized.

Before bleaching, pulp will be delignified in a two-stage oxygen delignification, after which the kappa number will be under 11.

The cooking, washing, screening and oxygen delignification area is being constructed as described. The area was about 60% complete at the time of our visit and 95%complete at the time of the second visit.
The process guarantee for COD loss is less than 7 kg COD per tonne of pulp.

A7.3.3 Bleaching

The 4-stage Botnia-Orion ECF bleaching sequence will be AD-PO-D-P, with DD-washers used in the intermediate washing stages. The AD stage removes hexenuronic acids and furthers delignification. The PO stage is the extraction stage while the D stage is used for removal and bleaching of residual lignin. The P stage is a polishing stage, and helps preventing brightness reversion. Botnia-Orion recycles acid and alkaline filtrates within the bleach plant, to reduce chemical use and effluent flow, with a design bleach effluent flow of 12 m^3/ADt. Botnia-Orion has also designed for and will consider recycling part of the alkaline filtrate from the bleach plant back to recovery once the mill has reached and maintained full production for some time.

Bleaching at Botnia-Orion uses a combination of acid, chlorine dioxide, peroxide and oxygen and so can be described as ECF bleaching. Figure A7.3-2 shows the ECF bleaching sequence at Botnia-Orion's pulp mill.

Botnia-Orion has a low kappa number to the bleach plant, and uses peroxide and oxygen to reinforce bleaching. This results in a comparatively low predicted consumption of chlorine dioxide (less than 10 kg/ADt) compared with most ECF mills. For this reason, the mill may be more accurately described as an "ECF-Light" mill. It should be noted that the term "ECF-Light", is not well defined in the technical community.

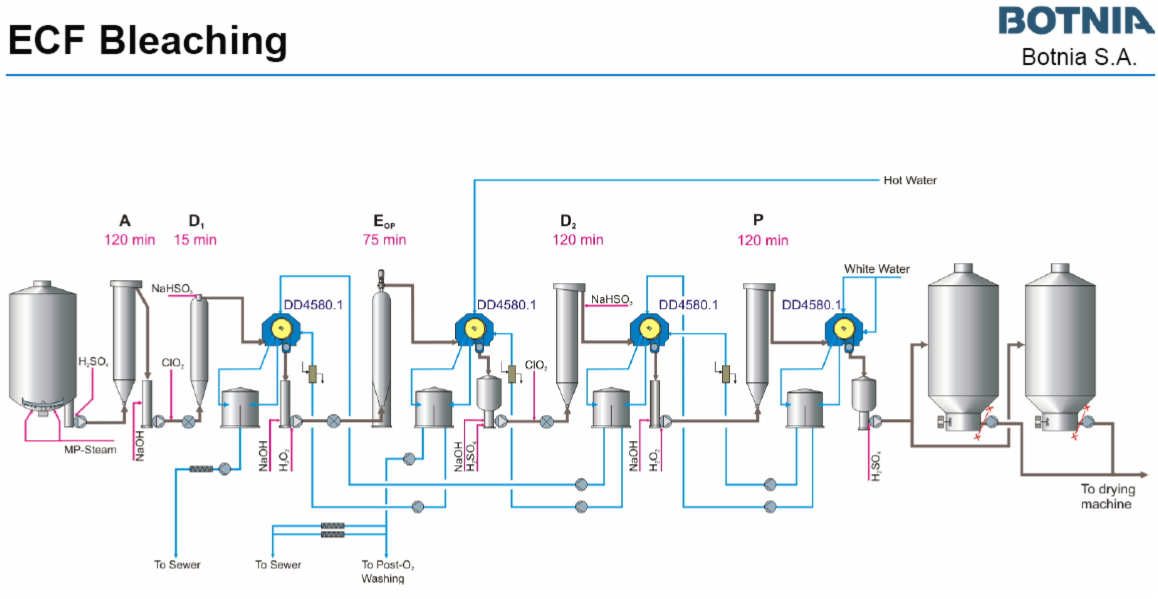


Figure A7.3-2: ECF Bleaching Sequence at the Botnia-Orion Pulp Mill

The bleaching area is being constructed as described. The vendor process guarantee values for bleaching chemical consumption and effluent loadings where reviewed and are consistent with the CIS The area was about 60% complete at the time of our first visit and 95%complete at the time of the second visit.

A7.3.4 Pulp Drying, Baling and Bale Storage

Two drying machines will be used at the Botnia-Orion mill with each a capacity of 60% of the fiber line capacity. The fact that the mill will be working with two parallel drying machines will help with controlling the mill water and steam balance.

Pulp baling consists of four baling lines, which can produce 250 kg bales wrapped bales unitized into 2 000 kg units, as well as 1 000 kg unwrapped bales unitized into 2 000 kg units. The units are loaded inside the bale storage area onto a terminal truck, which in turn transports the units to the barge harbour located on the mill site. The units are lifted straight onto the barge. The bale storage capacity on site will be only 1 – 3 days for special cases. The pulp will be transported by barge to a large storage facility in Nueva Palmira.

The pulp drying, baling and bale storage area is being constructed as described. The planned covered pulp storage area on site is described as being 1 day of production. The area was about 65% complete at the time of our first visit and 97%complete at the time of the second visit.

A7.3.5 Black Liquor Evaporation

The seven-effect evaporator train has a design capacity of 1 100 t/h of evaporated water. In addition to evaporating weak back liquor from brown stock washing, it will treat biosolids from the effluent treatment plant and salt cake from the ClO_2 plant. The evaporation plant was designed with an additional capacity of 20% above normal operation (as defined for a production of 1 000 000 ADt of pulp/y). This additional capacity allows sufficient margin to recover intermittent discharges and possible future bleach filtrate recycle. The weak black liquor will be evaporated to a minimum level of 75% dry solids. High levels of dry solids help ensure higher lower furnace temperatures and low sulphur dioxide emissions from the recovery boiler.

The clean primary condensates will be returned to the feed water tank of the recovery boiler while secondary condensates will be used in the fiberline and the white liquor plant. The foul condensates, with high content of volatile compounds, are purified in a stripping column to be reused in the process. Non-condensable gases from stripping enter the methanol separation system, where methanol is separated and purified, and the remaining gases enter the collection system of concentrated odorous gases. The stripping column was designed for a foul condensate treatment capacity (MCR) of 55 kg/s and TRS and methanol reduction efficiencies of 98%.

The stripper gas containing methanol will be fed first to the methanol distillation and further to the LVHC gas system and burned either in the recovery boiler or the dedicated odorous gas boiler. The vacuum system hot well gas and the foul condensate tank vent are also collected into the LVHC gas system.

The black liquor evaporation area is being constructed as described. The vendor process guarantee values for the stripper where reviewed and are consistent with the CIS. The area was about 60% complete at the time of our first visit and 91% complete at the time of the second visit.

A7.3.6 Recovery Boiler and Turbine Generator

The recovery boiler treats heavy black liquor (about 4 800 tonnes of dry solids per day with ash), which is sprayed into the furnace at a high solids content. The boiler, which will require fuel oil only for start-up and as support fuel, is a state-of-the-art low odour design with low emissions of TRS, sulphur dioxide and nitrous oxides. Dust in the flue gas is separated by an electrostatic precipitator. The recovery boiler will be equipped with a burner for low volume high concentration (LVHC) gases. Gases from the smelt dissolving tank will be fed directly to the recovery boiler, thus eliminating one air pollution source relative to most pulp mills.

The recovery boiler was designed according to the following criteria:

- additional capacity of 27% above design for peaks (9% for continuous operation);
- steam produced at 93 bars (absolute) and 488°C;
- low sulphur emissions through high dry solids black liquor firing;
- low NO_x emissions through a fourth level of air entry;
- low particle emissions through removal with an electrostatic precipitator with three chambers/four fields per chamber; and
- incineration of both high volume low concentration (HVLC) and LVHC gases under normal operation.

The plant will use two Siemens turbogenerators. One is an extraction-back-pressure turbo generator while the other is an extraction-back-pressure turbogenerator with condensing tail. The rated capacity of both machines is 70 MW. Two turbogenerators are needed because of power supply from the national grid is limited. There are two possibilities to connect the mill to the national 150 kV grid:

1. Connection to the Fray Bentos sub-station (3 – 4 km away):

   - investment estimate: USD 1,4 millions
   - maximum available power: 55 MW
   - estimated construction time: < 1 year

2. Connection to the Palmar 500/150 kV sub-station (85 km away):

   - investment estimate: USD 6,8 millions
   - no power limitation for the pulp/chemical mills
   - estimated construction time: 2 to 3 years

The first option requires investing in two generators, in order to enable the running of the mill during the turbine maintenance. Including all costs, this is economically the most feasible solution; it has the additional benefit of lowering the dependency on external electricity suppliers. In addition, it can easily be completed before the start-up.

At design capacity, the power generation will be 119 MW. The power demand of the pulp mill is estimated to be 71,5 MW. The additional 47,5 MW would be used for the chemical plant to be operated on-site by a third party, and/or sold to the national grid. Depending on market conditions, it is anticipated that 0 – 30 MW would be sold to the national grid with a likely amount of 15 MW.

The plant will also employ two heavy fuel oil tube boilers for back-up. Both will be used as back-up odorous gas incinerators. The capacity of the boilers is 50 t/h of steam at a pressure of 16 bars.

The Recovery Boiler and turbine generator areas are being constructed as described. The area was about 55% complete at the time of our first visit and 97% complete at the time of the second visit.
One change from the description in the CIS is that the connection to the UTE 150 kV grid is now at Fray Bentos, as the National Utility (UTE) has installed a new (second) 150 KV line to Fray Bentos, in effect placing Fray Bentos in the main supply between San Javier and Mercedes, rather than on a branch line. This arrangement provides for greater supply stability, and relieves the grid limitation described in the CIS, as the mill can be fed from either direction (San Javier or Mercedes). San Javier is a major node in the National Grid, being on the 500 kV network and with connection to the Argentinean Grid.

A7.3.7 Lime Kiln and Recausticizing

A single lime kiln will be installed. The lime mud will be washed efficiently and dried, and the lime kiln will be equipped with an electrostatic precipitator to control particulate emissions. The kiln capacity will be about 800 tonnes per day of lime, and will be fired with fuel oil. Limestone will be used as make-up. Because of anticipated difficulties of purchasing make-up lime (CaO), a large silo of a capacity of 6 000 tonnes will be used.

White liquor will be prepared by adding lime to green liquor in a system comprising a slaker-classifier and causticizing tanks. A portion of the white liquor will be oxidised by air or oxygen in order to oxidise sulphides, and be used in the oxygen delignification system and subsequent bleaching stages. Botnia-Orion is exploring the possibility to take the dregs and the grits from the recausticizing plant back to the forest plantations. These streams contain many of the trace elements and nutrients that enter the mill with wood. Initially dregs and grits will go to landfill. Figure A7.3-3 the lime kiln and recausticizing process at the Botnia-Orion pulp mill.

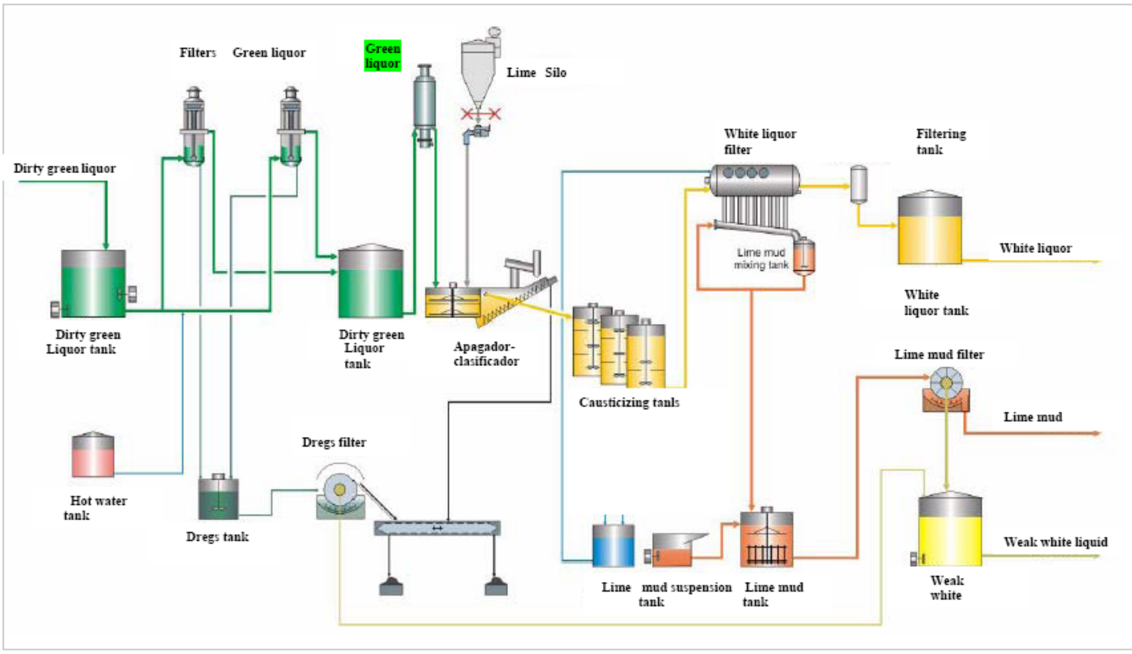


Figure A7.3-3: Lime Kiln and Recausticizing at the Botnia-Orion Pulp Mill

The Lime Kiln and Recausticizing area is being constructed as described. The area was about 60% complete at the time of our first visit and 94%complete at the time of the second visit.

A7.3.8 Chemical Island

The bleaching chemicals preparation system includes on-site production units for chlorine dioxide, hydrogen peroxide, oxygen and sodium chlorate. All other chemicals will be purchased. The storing and handling systems for purchased sodium hydroxide, sulphuric acid, magnesium sulphate and talc are included in the chemicals preparation plant. The chemical island will be owned and operated by a third party chemical supplier (Kemira). Botnia-Orion will be responsible for the emissions regarding air, water and residuals from the chemical preparation plant except for the Alox waste from the hydrogen peroxide plant that will be returned by Kemira for recycling.

The chlorine dioxide plant consists of a chlorine dioxide generator, absorption tower and storage tanks for chlorine dioxide water and chilled water plant. From the chlorine dioxide production, salt cake solution is obtained as a by-product which will be used as chemical make-up. Oxygen production is based on a cryogenic process, where oxygen is separated from the air by nitrogen liquefaction. A liquid oxygen storage tank and oxygen evaporator system is also included for back-up.

The chemical island area is being constructed as described. The area was about 32% complete at the time of our first visit and 83% complete at the time of the second visit.

A7.3.9 Water Treatment

Raw water will be pumped from the Rio Uruguay at an average rate of 87 000 m^3/d and subsequently treated in a large feed tank where chemicals (including sodium hydroxide and polymers) will be added prior to passing through clarifiers and sand filters. The filtered water will be stored in a tank prior to consumption in the various process areas.

Water to be used for steam production will be further demineralized in one of two lines using cation and anion exchange technology, followed by mixed bed ion exchange.

In order to reduce both the volume of river water required by the mill, and simultaneously the volume of the effluent, cooling towers will be used to recycle water. The cooling load for the main turbogenerator and the cooling load for the evaporator surface condensers will be provided by these cooling towers.

The water treatment area is being constructed as described. The area was about 35% complete at the time of our first visit and 97%complete at the time of the second visit.

A7.3.10 Effluent Treatment Plant

The effluent treatment plant will use the activated sludge treatment (AST) process which will consist of two parallel lines of one aeration basin and one secondary clarifier each, treating an average discharge flow of approximately 73 000 m^3/d (25 m^3/ADt). The total volume of the aerated basins is 150 000 m^3. An analysis of the WWTP design and estimated removal efficiencies is done in section A8.2 of this Annex.

Note that the reference above refers to section A8.2 of the CIS report.

Two different sewer flows will be collected at the pulp mill and sent for treatment to the WWTP:

- Low solids effluent: the low solids effluent will be adjusted for pH by quick lime in a pre-neutralization tank before being directed to the equalization basins.
- High solids effluent: the high solids effluent will first be directed to a mechanical screen chamber for coarse solids removal and then to a primary clarifier. The primary clarifier supernatant is then sent to the equalization basins.

The effluent treatment system will be equipped with a system of three equalization and safety basins. Three basins, with a capacity of 25 000 m^3 each, are operated so that during normal operation one of the basins is empty, one is being filled with process effluent, and the third one is being emptied to the biological treatment system. The temperature of the effluent out of the equalization and safety basins, about 50 to 60°C, will be reduced in a series of cooling towers to between 30 and 37°C. Urea and phosphoric acid nutrients will be added to the wastewater and its pH adjusted prior to treatment in the AST basins. Sanitary wastewater from the mill will be added directly to the aeration basins without pre-treatment. The activated sludge system employs two aeration basins each of 75 000 m^3 which contain an anoxic zone and a selector stage. A degassing tank ends each basin before the effluent from the AST process is directed to the secondary clarifiers. The treated effluent (after sampling for permit requirements) will be mixed with river water prior to discharge, in order to lower the effluent temperature and minimize any color differences between the effluent and river.

The primary sludge is sent to the dewatering system consisting of a sludge mixing tank and belt presses. Polyelectrolyte solution may be added to the primary sludge to enhance the performance of the belt presses. The primary sludge will either be mixed with wood waste and bark and landspread on plantations, or sent to composting. Most of the secondary sludge is recirculated back to the activated sludge basins as return activated sludge (RAS) while the waste activated sludge (WAS) will be sent to the biosludge pits and then to the centrifuge dewatering unit. The secondary sludge will be mixed with weak black liquor prior to being treated in the evaporators and fired into the recovery boiler.

Process water runoff, including water from debarking and woodhandling and stormwater collected within a safety area around the plant are collected and sent to ponds prior to the WWTP. Stormwater from outside the safety area is collected and sent to three stormwater ponds. At these three ponds, conductivity is measured and TV surveillance and a skimmer to collect oil and foams are installed.

The effluent treatment area, and storm water systems are being constructed as described. The area was about 25% complete at the time of our first visit and 87% complete at the time of the second visit.

A7.3.11 Non-Condensable Gases (NCGs)

The concentrated NCGs or LVHC gases will either be burnt directly in the recovery boiler or in the dedicated odorous gas burner. Either light fuel oil or liquid methanol will be used as a support fuel in the burner. This separate burner is equipped with a small boiler and a scrubber and the resulting sodium bisulphite from the scrubber could be used in the bleach plant instead of sulphur dioxide. The exhaust gases will be discharged in the main stack.

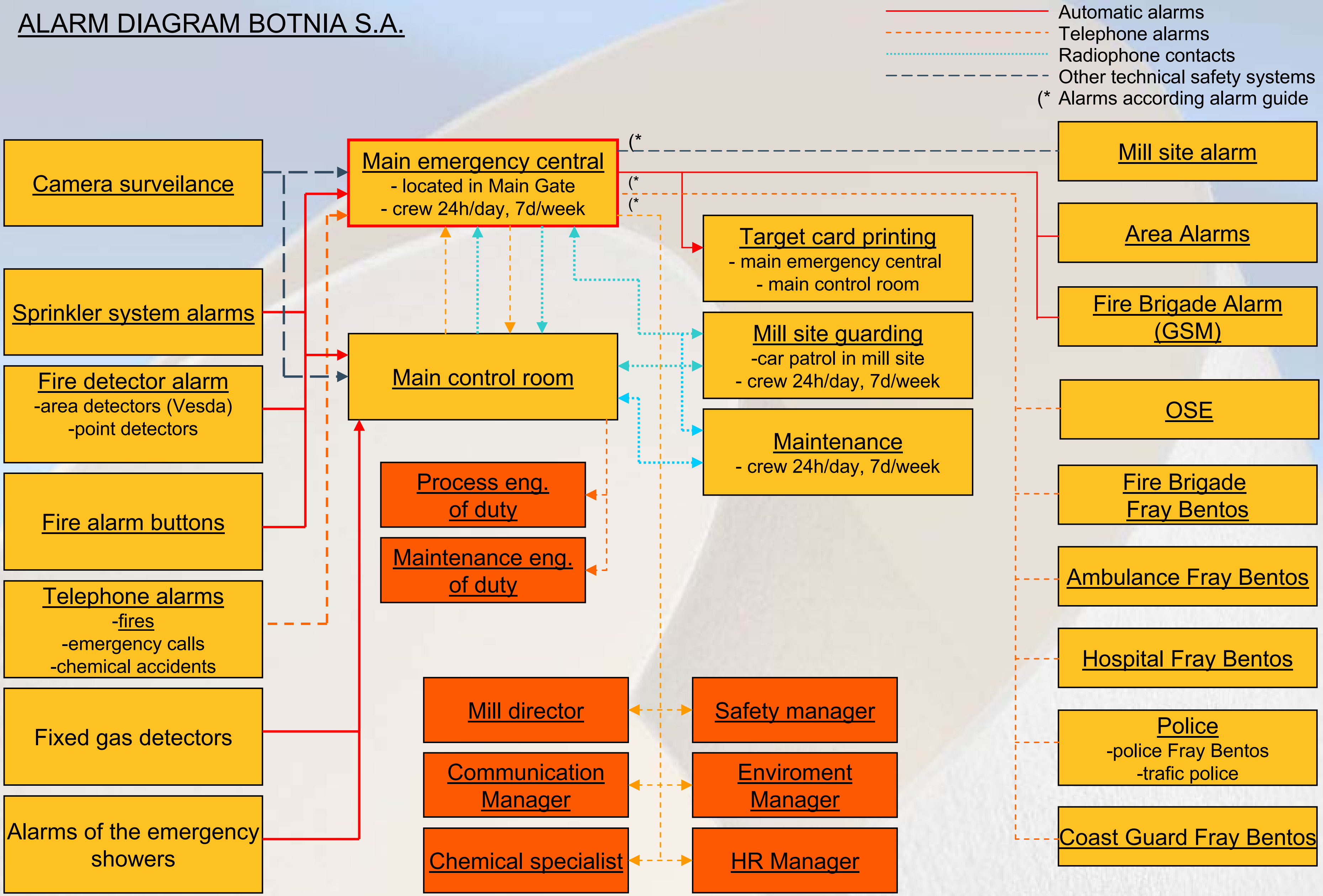
The dilute NCGs or HVLC odorous gases from tanks and equipment vents will be collected and mixed with feed air into the recovery boiler. A separate small boiler, fired on oil will be used to burn the HVLC gases should the recovery boiler not be available. The back-up boiler exhaust gases will be fed to the main stack. This system will eliminate one of the major causes of odour from traditionally designed mills.

The Non-Condensable Gases (NCGs) systems are being constructed as described. The area was about 60% complete at the time of our first visit and 95% complete at the time of the second visit.
Some specific comment on the NCG system is included in the body of the report.

Appendix 4

A4.1 Botnia Alarm Diagram

ALARM DIAGRAM BOTNIA S.A.



BOTNIA

Appendix 6

A6.1 **Botnia Mechanical, Instrumentation and Electrical (MEI) Progress Curve and Commissioning Progress Curve 13 August 2007.**

A6.2 **Botnia Target Time Schedule 1 April 2007 and 1 August 2007.**

A6.3 **Botnia Commissioning Master Time Schedules 13 April and 10 August 2007.**

A6.4 **Botnia Commissioning and Test Principles Diagram**

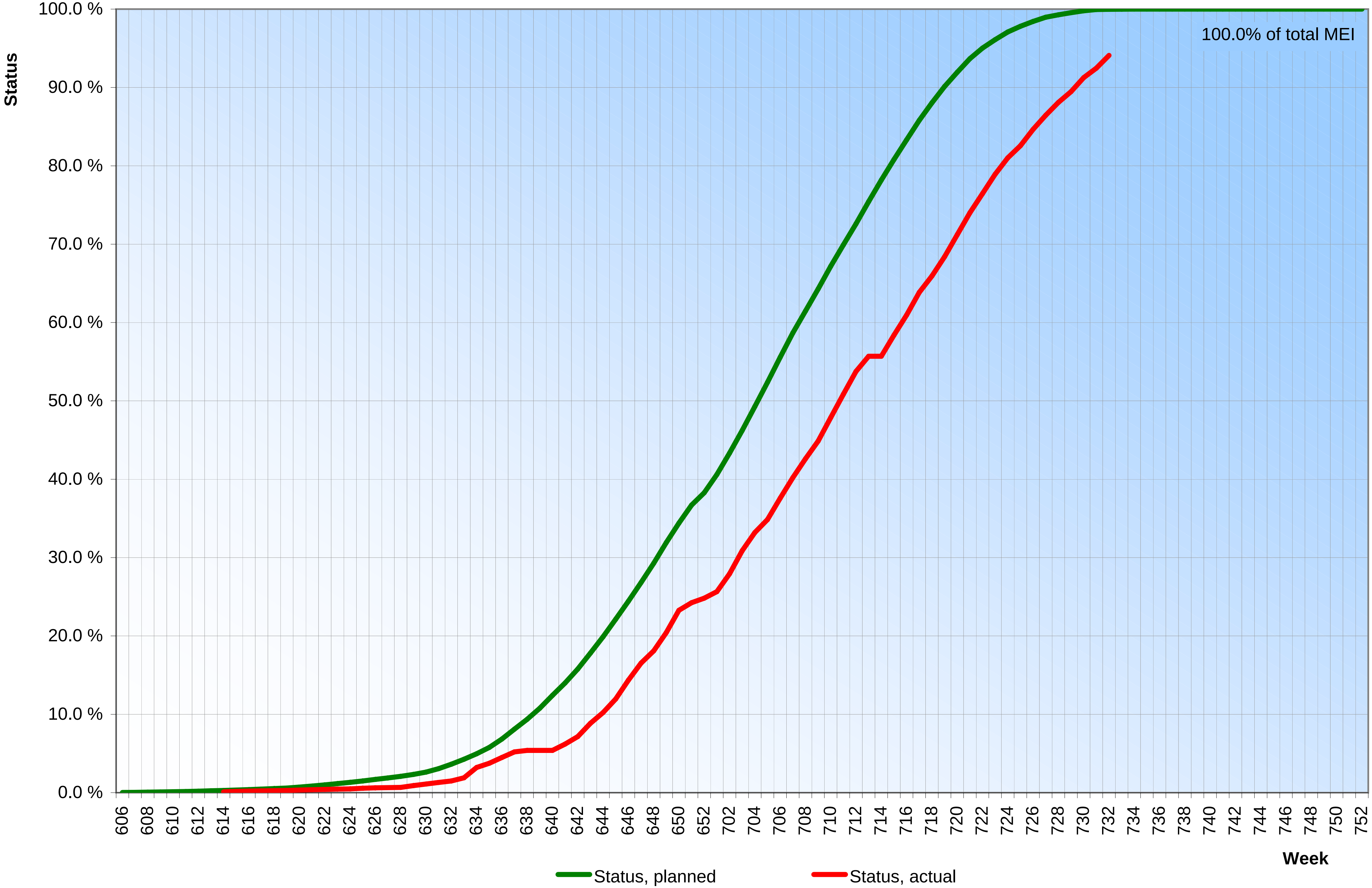
A6.5 **Botnia Stages of the Project**

00 Project total Total

Status 94.1 %

00 Project total

13.8.2007

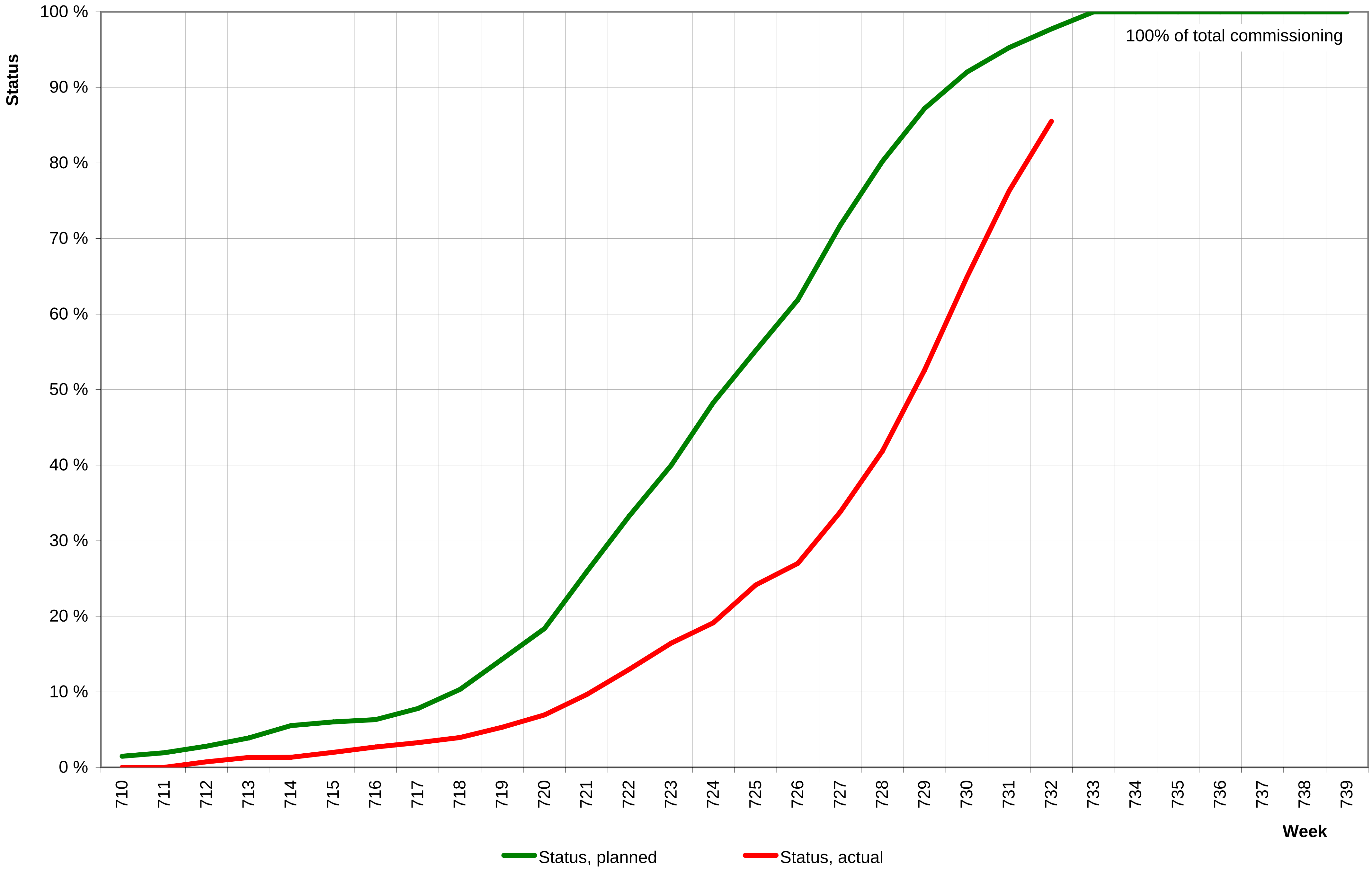


Total

Commissioning at 13 August 2008

Status 85.5 %

All departments

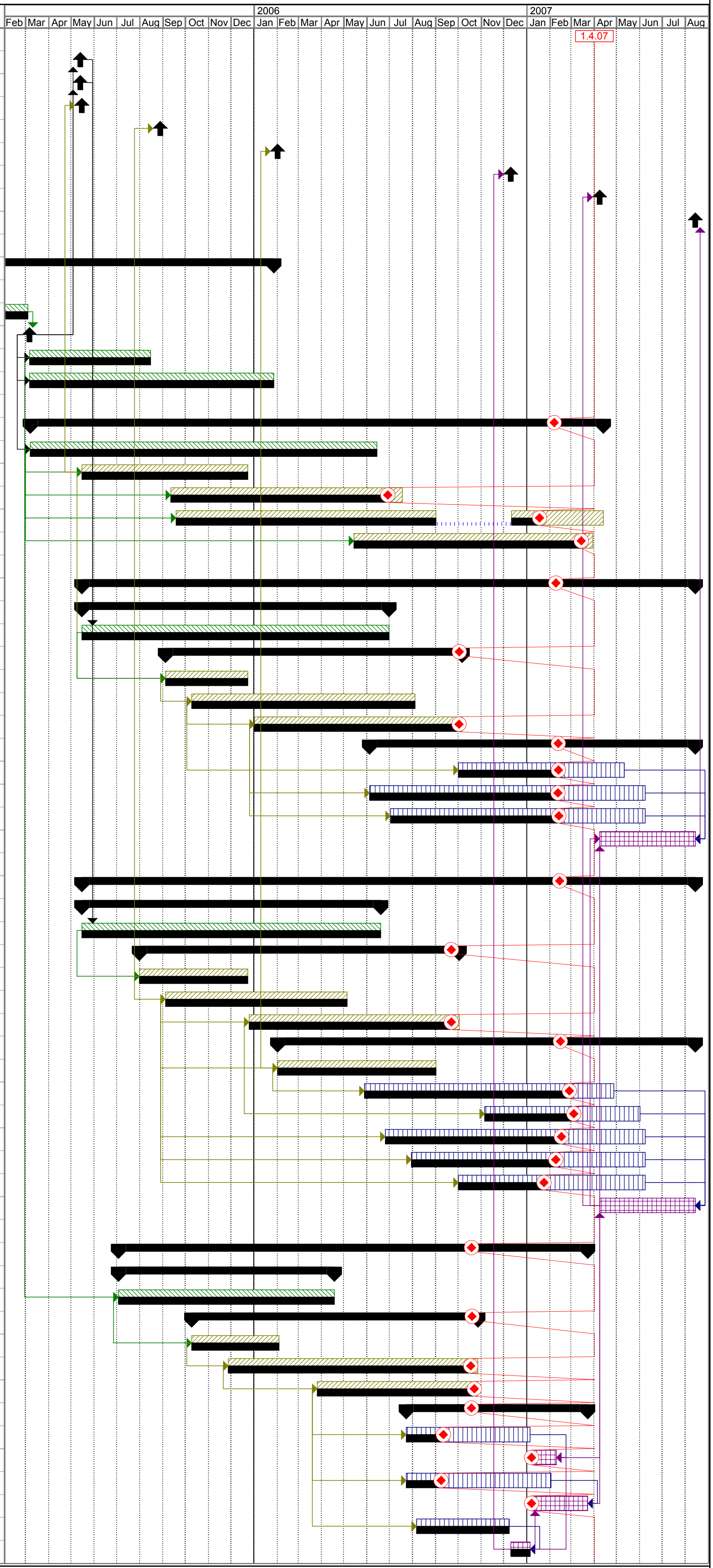


BOTNIA

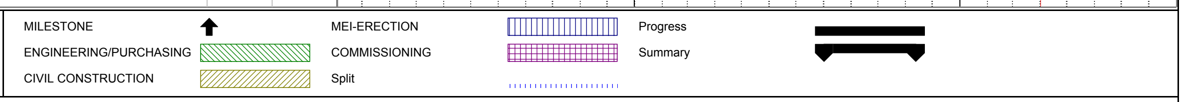
BOTNIA S.A.
PROJECT URUGUAY
TARGET TIME SCHEDULE, PROGRESS 1.4.2007

PÖYRY

ID	Task Name	Start	Finish
1	**MILESTONES**	1.6.05	1.6.06
2	RECOVERY BOILER CONTRACT	14.5.05	14.5.05
3	COOKING CONTRACT	14.5.05	14.5.05
4	START SITE PREPARATION	16.5.05	16.5.05
5	START EXCAVATION RECOVERY ISLAND	29.8.05	29.8.05
6	START RECOVERY BOILER STEEL STR.ERCTION	2.2.06	2.2.06
7	START COMMISSIONING UTILITIES	11.12.06	11.12.06
8	START COMMISSIONING PROCESS DEPARTMENTS	9.4.07	9.4.07
9	START PRODUCTION (FIRST COOKING)	15.8.07	15.8.07
10			
11	**PRE-ENGINEERING AND PURCHASING**	**19.4.04**	**27.1.06**
12	PRE- ENGINEERING	19.4.04	17.12.04
13	EXTENDED PRE-ENGINEERING	20.12.04	4.3.05
14	GO-AHEAD DECISION	7.3.05	7.3.05
15	PUCHASING OF MAIN EQUIPMENT	7.3.05	15.8.05
16	PUCHASING OF AUX.EQUIPMENT AND CONSTRUCTION	7.3.05	27.1.06
17			
18	**MILL COMMON**	**8.3.05**	**13.4.07**
19	BALANCE OF PLANT ENGINEERING	8.3.05	14.6.06
20	SITE PREPARATION	16.5.05	23.12.05
21	ROADS, UNDERGROUND PIPES	12.9.05	18.7.06
22	HARBOUR	19.9.05	13.4.07
23	PIPE BRIDGES	15.5.06	30.3.07
24			
25	**FIBRE LINE**	**16.5.05**	**14.8.07**
26	**ENGINEERING**	**16.5.05**	**30.6.06**
27	DETAIL ENGINEERING	16.5.05	30.6.06
28	**CIVIL CONSTRUCTION**	**5.9.05**	**6.10.06**
29	EXCAVATION	5.9.05	23.12.05
30	FOUNDATIONS AND BUILDING FRAME	10.10.05	4.8.06
31	OTHER CIVIL CONSTRUCTION	2.1.06	6.10.06
32	**MEI ERECTION AND COMMISSIONING**	**5.6.06**	**14.8.07**
33	WOODHANDLING MEI-ERECTION	2.10.06	11.5.07
34	COOKING AND BLEACHING PLANT MEI-ERECTION	5.6.06	8.6.07
35	PULP DRYING MEI-ERECTION	3.7.06	8.6.07
36	COMMISSIONING	9.4.07	14.8.07
37			
38	**RECOVERY ISLAND**	**16.5.05**	**14.8.07**
39	**ENGINEERING**	**16.5.05**	**19.6.06**
40	DETAIL ENGINEERING	16.5.05	19.6.06
41	**CIVIL CONSTRUCTION**	**1.8.05**	**2.10.06**
42	EXCAVATION	1.8.05	23.12.05
43	FOUNDATIONS AND BUILDING FRAMES	5.9.05	5.5.06
44	OTHER CIVIL CONSTRUCTION	26.12.05	2.10.06
45	**MEI-ERECTION AND COMMISSIONING**	**2.2.06**	**14.8.07**
46	BOILERS STEEL STRUCTURE	2.2.06	1.9.06
47	RECOVERY BOILER MEI-ERECTION	29.5.06	27.4.07
48	TURBOGENERATOR MEI-ERECTION	6.11.06	1.6.07
49	EVAP MEI- ERECTION	26.6.06	8.6.07
50	LIME KILN / RECAUSTICISING MEI-ERECTION	31.7.06	8.6.07
51	CHEMICAL PLANT MEI-ERECTION	2.10.06	8.6.07
52	COMMISSIONING	9.4.07	14.8.07
53			
54	**UTILITIES (WATER/ EFFL. TR., POWER DISTR.)**	**4.7.05**	**23.3.07**
55	**ENGINEERING**	**4.7.05**	**18.4.06**
56	DETAIL ENGINEERING	4.7.05	18.4.06
57	**CIVIL CONSTRUCTION**	**10.10.05**	**27.10.06**
58	EXCAVATION	10.10.05	3.2.06
59	FOUNDATIONS AND BASINS	28.11.05	27.10.06
60	OTHER CIVIL CONSTRUCTION	27.3.06	27.10.06
61	**MEI-ERECTION AND COMMISSIONING**	**24.7.06**	**23.3.07**
62	MEI-ERECTION OF WATER TREATMENT PLANT	24.7.06	5.1.07
63	COMMISSIONING OF WATER TREATMENT PLANT	8.1.07	9.2.07
64	MEI-ERECTION OF EFFLUENT TR.PLANT	24.7.06	2.2.07
65	COMMISSIONING OF EFFLUENT TR.PLANT	8.1.07	23.3.07
66	POWER DISTRIBUTION	7.8.06	8.12.06
67	COMMISSIONING OF POWER DISTR.	11.12.06	5.1.07



Project: 16A2093-T0005 Rev.D
Progress Date: 1.4.2007
Print Date:31.3.07

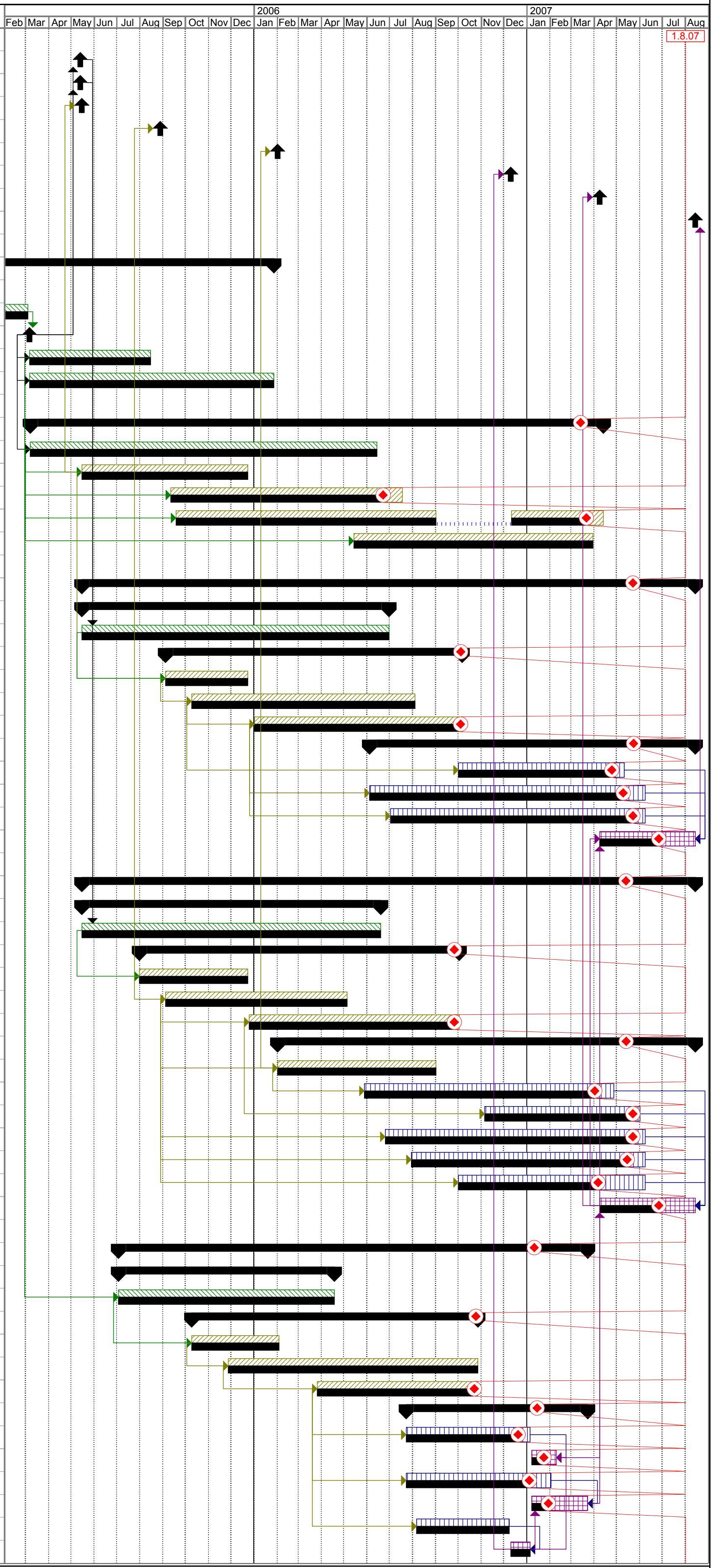


BOTNIA

BOTNIA S.A.
PROJECT URUGUAY
TARGET TIME SCHEDULE, PROGRESS 1.8.2007

PÖYRY

ID	Task Name	Start	Finish
1	**MILESTONES**	1.6.05	1.6.06
2	RECOVERY BOILER CONTRACT	14.5.05	14.5.05
3	COOKING CONTRACT	14.5.05	14.5.05
4	START SITE PREPARATION	16.5.05	16.5.05
5	START EXCAVATION RECOVERY ISLAND	29.8.05	29.8.05
6	START RECOVERY BOILER STEEL STR.ERCTION	2.2.06	2.2.06
7	START COMMISSIONING UTILITIES	11.12.06	11.12.06
8	START COMMISSIONING PROCESS DEPARTMENTS	9.4.07	9.4.07
9	START PRODUCTION (FIRST COOKING)	15.8.07	15.8.07
10			
11	**PRE-ENGINEERING AND PURCHASING**	**19.4.04**	**27.1.06**
12	PRE- ENGINEERING	19.4.04	17.12.04
13	EXTENDED PRE-ENGINEERING	20.12.04	4.3.05
14	GO-AHEAD DECISION	7.3.05	7.3.05
15	PUCHASING OF MAIN EQUIPMENT	7.3.05	15.8.05
16	PUCHASING OF AUX.EQUIPMENT AND CONSTRUCTION	7.3.05	27.1.06
17			
18	**MILL COMMON**	**8.3.05**	**13.4.07**
19	BALANCE OF PLANT ENGINEERING	8.3.05	14.6.06
20	SITE PREPARATION	16.5.05	23.12.05
21	ROADS, UNDERGROUND PIPES	12.9.05	18.7.06
22	HARBOUR	19.9.05	13.4.07
23	PIPE BRIDGES	15.5.06	30.3.07
24			
25	**FIBRE LINE**	**16.5.05**	**14.8.07**
26	**ENGINEERING**	**16.5.05**	**30.6.06**
27	DETAIL ENGINEERING	16.5.05	30.6.06
28	**CIVIL CONSTRUCTION**	**5.9.05**	**6.10.06**
29	EXCAVATION	5.9.05	23.12.05
30	FOUNDATIONS AND BUILDING FRAME	10.10.05	4.8.06
31	OTHER CIVIL CONSTRUCTION	2.1.06	6.10.06
32	**MEI ERECTION AND COMMISSIONING**	**5.6.06**	**14.8.07**
33	WOODHANDLING MEI-ERECTION	2.10.06	11.5.07
34	COOKING AND BLEACHING PLANT MEI-ERECTION	5.6.06	8.6.07
35	PULP DRYING MEI-ERECTION	3.7.06	8.6.07
36	COMMISSIONING	9.4.07	14.8.07
37			
38	**RECOVERY ISLAND**	**16.5.05**	**14.8.07**
39	**ENGINEERING**	**16.5.05**	**19.6.06**
40	DETAIL ENGINEERING	16.5.05	19.6.06
41	**CIVIL CONSTRUCTION**	**1.8.05**	**2.10.06**
42	EXCAVATION	1.8.05	23.12.05
43	FOUNDATIONS AND BUILDING FRAMES	5.9.05	5.5.06
44	OTHER CIVIL CONSTRUCTION	26.12.05	2.10.06
45	**MEI-ERECTION AND COMMISSIONING**	**2.2.06**	**14.8.07**
46	BOILERS STEEL STRUCTURE	2.2.06	1.9.06
47	RECOVERY BOILER MEI-ERECTION	29.5.06	27.4.07
48	TURBOGENERATOR MEI-ERECTION	6.11.06	1.6.07
49	EVAP MEI- ERECTION	26.6.06	8.6.07
50	LIME KILN / RECAUSTICISING MEI-ERECTION	31.7.06	8.6.07
51	CHEMICAL PLANT MEI-ERECTION	2.10.06	8.6.07
52	COMMISSIONING	9.4.07	14.8.07
53			
54	**UTILITIES (WATER/ EFFL. TR., POWER DISTR.)**	**4.7.05**	**23.3.07**
55	**ENGINEERING**	**4.7.05**	**18.4.06**
56	DETAIL ENGINEERING	4.7.05	18.4.06
57	**CIVIL CONSTRUCTION**	**10.10.05**	**27.10.06**
58	EXCAVATION	10.10.05	3.2.06
59	FOUNDATIONS AND BASINS	28.11.05	27.10.06
60	OTHER CIVIL CONSTRUCTION	27.3.06	27.10.06
61	**MEI-ERECTION AND COMMISSIONING**	**24.7.06**	**23.3.07**
62	MEI-ERECTION OF WATER TREATMENT PLANT	24.7.06	5.1.07
63	COMMISSIONING OF WATER TREATMENT PLANT	8.1.07	9.2.07
64	MEI-ERECTION OF EFFLUENT TR.PLANT	24.7.06	2.2.07
65	COMMISSIONING OF EFFLUENT TR.PLANT	8.1.07	23.3.07
66	POWER DISTRIBUTION	7.8.06	8.12.06
67	COMMISSIONING OF POWER DISTR.	11.12.06	5.1.07



Project: 16A2093-T0005 Rev.D
Progress Date: 1.8.2007
Print Date:1.8.07

MILESTONE	MEI-ERECTION	Progress	
ENGINEERING/PURCHASING	COMMISSIONING	Summary	
CIVIL CONSTRUCTION	Split		

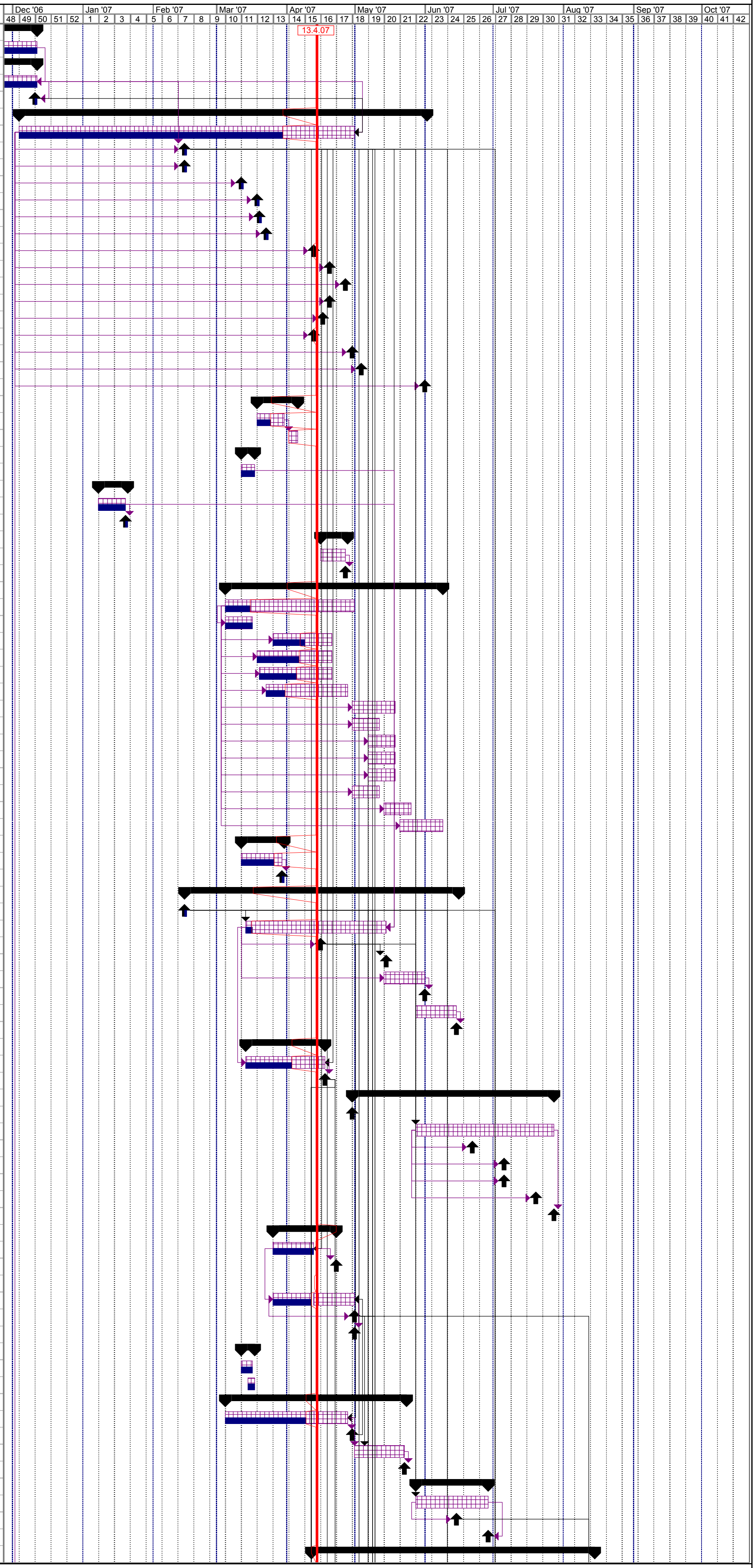
BOTNIA

BOTNIA S.A
PROJECT URUGUAY
COMMISSIONING MASTER TIME SCHEDULE

PÖYRY

13.04.2007

ID	Task Name	Start	Finish	PROG
1	**150 kV TRANSMISSIONING LINE**	**14.11.06**	**11.12.06**	**100%**
2	Commissioning	14.11.06	11.12.06	100%
3	**150 kV SWITCH YARD**	**14.11.06**	**11.12.06**	**100%**
4	Commissioning	14.11.06	11.12.06	100%
5	Power On	11.12.06	11.12.06	100%
6	**POWER DISTRIBUTION**	**4.12.06**	**1.6.07**	**74%**
7	Checkout and commissioning	4.12.06	30.4.07	78%
8	Power distribution start partly	15.2.07	15.2.07	100%
9	Power on raw water pumping	15.2.07	15.2.07	100%
10	Power on water treatment plant	12.3.07	12.3.07	100%
11	Power on turbine plant	19.3.07	19.3.07	100%
12	Power on recovery boiler	20.3.07	20.3.07	100%
13	Power on fibre line	23.3.07	23.3.07	100%
14	Power on woodhandling plant	13.4.07	13.4.07	0%
15	Power on drying plant 1	20.4.07	20.4.07	0%
16	Power on drying plant 2	27.4.07	27.4.07	0%
17	Power on drying plant baling	20.4.07	20.4.07	0%
18	Power on evaporation plant	17.4.07	17.4.07	0%
19	Power on caustizising plant	13.4.07	13.4.07	0%
20	Power on effluent treatmant plant	30.4.07	30.4.07	0%
21	Power on chemical plant	4.5.07	4.5.07	0%
22	Power on harbour	1.6.07	1.6.07	0%
23	**DIESEL POWER STATION**	**19.3.07**	**5.4.07**	**38%**
24	Check-out and commissioning	19.3.07	30.3.07	50%
25	Load test	2.4.07	5.4.07	0%
26	**DCS (FIRST PART)**	**12.3.07**	**17.3.07**	**100%**
27	Commissioning	12.3.07	17.3.07	100%
28	**COMPRESSED AIR CENTRE (RECOVERY PART)**	**8.1.07**	**20.1.07**	**100%**
29	Commissioning	8.1.07	19.1.07	100%
30	Ready for operation	20.1.07	20.1.07	100%
31	**COMPRESSED AIR CENTRE (FIBRE LINE)**	**16.4.07**	**27.4.07**	**0%**
32	Commissioning	16.4.07	26.4.07	0%
33	Ready for operation	27.4.07	27.4.07	0%
34	**HVAC**	**5.3.07**	**8.6.07**	**28%**
35	Checkout and commissioning	5.3.07	30.4.07	20%
36	HVAC on raw water pumping	5.3.07	16.3.07	100%
37	HVAC on water treatment plant	26.3.07	20.4.07	50%
38	HVAC on on turbine plant	19.3.07	20.4.07	60%
39	HVAC on on recovery boiler	20.3.07	20.4.07	55%
40	HVAC on on fibre line	23.3.07	27.4.07	25%
41	HVAC on on woodhandling plant	30.4.07	18.5.07	0%
42	HVAC on drying plant 1	30.4.07	11.5.07	0%
43	HVAC on drying plant 2	7.5.07	18.5.07	0%
44	HVAC on drying plant baling	7.5.07	18.5.07	0%
45	HVAC on evaporation plant	7.5.07	18.5.07	0%
46	HVAC on caustizising plant	30.4.07	11.5.07	0%
47	HVAC on effluent treatmant plant	14.5.07	25.5.07	0%
48	HVAC on chemical plant	21.5.07	8.6.07	0%
49	**WATER INTAKE**	**12.3.07**	**30.3.07**	**81%**
50	Checkout & commissioning	12.3.07	29.3.07	80%
51	Pipe line ready	30.3.07	30.3.07	100%
52	**WATER TREATMENT PLANT**	**15.2.07**	**15.6.07**	**5%**
53	Start of filling mill water tank	15.2.07	15.2.07	100%
54	Checkout & commissioning, Phase I	14.3.07	14.5.07	6%
55	Start pumping of water (well water)	16.4.07	16.4.07	0%
56	Start test run, Phase I (chem.treated water)	15.5.07	15.5.07	0%
57	Checkout & commissioning, Phase II	14.5.07	31.5.07	0%
58	Start test run, Phase II	1.6.07	1.6.07	0%
59	Checkout & commissioning, Phase III	28.5.07	14.6.07	0%
60	Start test run, Phase III	15.6.07	15.6.07	0%
61	**DEMIN WATER PLANT**	**14.3.07**	**18.4.07**	**60%**
62	Checkout & commissioning	14.3.07	17.4.07	60%
63	Demini plant ready for operation	18.4.07	18.4.07	0%
64	**EFFLUENT TREATMENT PLANT**	**30.4.07**	**27.7.07**	**0%**
65	Effluent treatment ready to take flusing first waters	30.4.07	30.4.07	0%
66	Checkout & commissioning	28.5.07	27.7.07	0%
67	Area 1 primary and sludge treatment ready	22.6.07	22.6.07	0%
68	Area 2 Equalization / spill basins ready	6.7.07	6.7.07	0%
69	Area 3 Secondary treatment ready	6.7.07	6.7.07	0%
70	Area 4 all cooling towers ready	20.7.07	20.7.07	0%
71	Area 5 Biological treatment ready	27.7.07	27.7.07	0%
72	**FUEL OIL SYSTEM**	**26.3.07**	**23.4.07**	**99%**
73	Checkout and commissioning	26.3.07	12.4.07	100%
74	Fuel oil system ready	23.4.07	23.4.07	0%
75	**GOL/GOS BOILERS**	**26.3.07**	**1.5.07**	**50%**
76	Checkout and commissioning	26.3.07	30.4.07	50%
77	GOL boiler first fire	1.5.07	1.5.07	0%
78	GOS boiler first fire	1.5.07	1.5.07	0%
79	**STEAM NETWORKS LV AND MV**	**12.3.07**	**17.3.07**	**100%**
80	Pressure test of MP network	12.3.07	16.3.07	100%
81	Pressure test of LP network	15.3.07	17.3.07	100%
82	**PIPE BRIDGES**	**5.3.07**	**23.5.07**	**48%**
83	Checkout & commissioning	5.3.07	27.4.07	65%
84	All pipe bridge connection ready	30.4.07	30.4.07	0%
85	Pipe bridges steam blowing	1.5.07	22.5.07	0%
86	Steam to the departments	23.5.07	23.5.07	0%
87	**COOLING TOWERS (ON WATER TREATMENT PLANT)**	**28.5.07**	**29.6.07**	**0%**
88	Checkout and commissioning	28.5.07	28.6.07	0%
89	Start-up of 3 first towers	15.6.07	15.6.07	0%
90	Start-up of 8 rest towers	29.6.07	29.6.07	0%
91	**RECAUSTICIZING AND LIME KILN**	**12.4.07**	**15.8.07**	**0%**



Project: 16A2093-T0017 Rev.13.4.07
Issue Date: 13.4.2007
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MILESTONE | CHEMICAL FILLING | COMMISSIONING | Progress | Summary

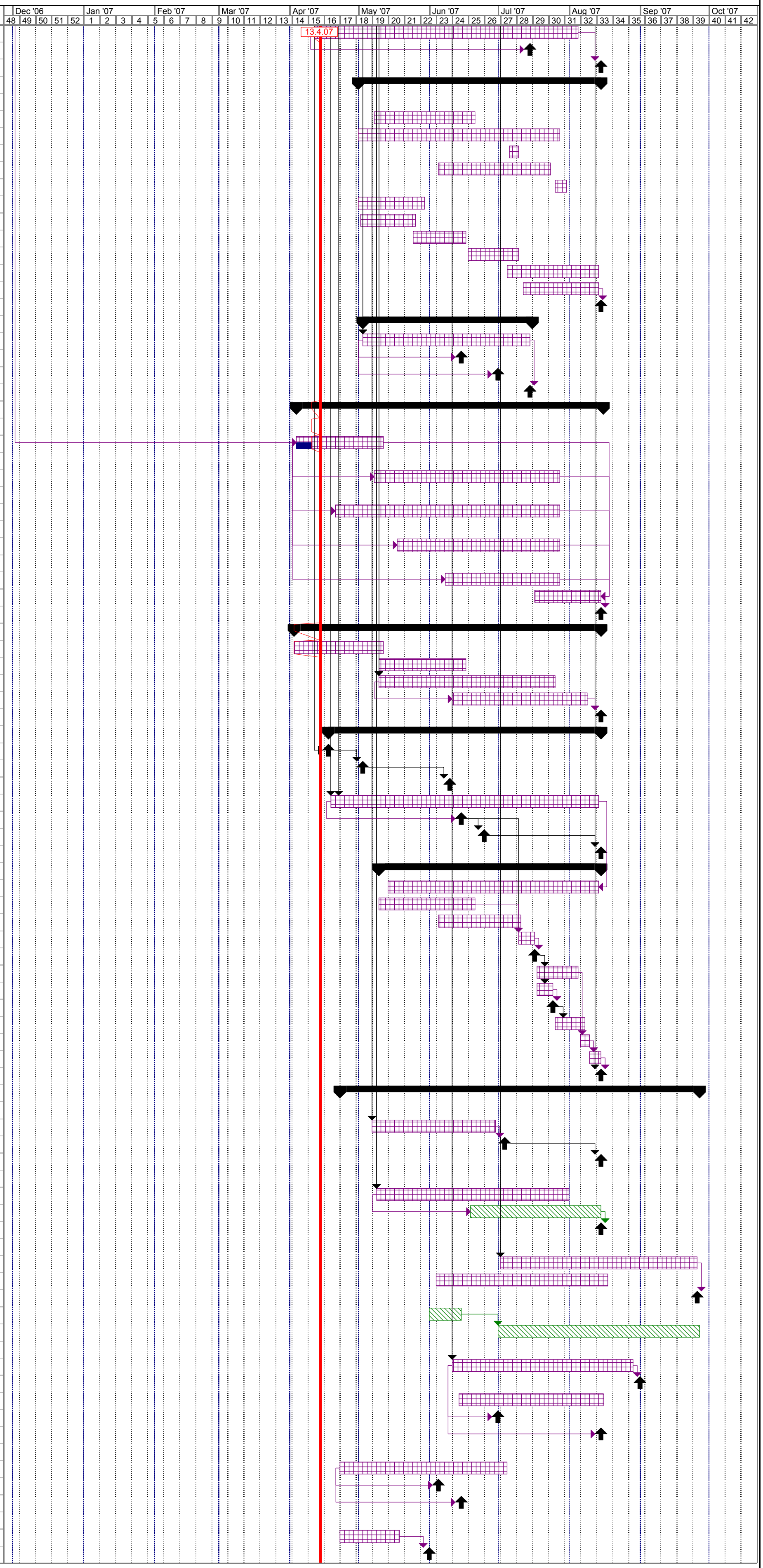
BOTNIA

BOTNIA S.A
PROJECT URUGUAY
COMMISSIONING MASTER TIME SCHEDULE

PÖYRY

13.04.2007

ID	Task Name	Start	Finish	PROG
92	Checkout and commissioning	12.4.07	4.8.07	0%
93	Recausticizing ready to produce cooking chemicals	15.7.07	15.7.07	0%
94	Start trial run	15.8.07	15.8.07	0%
95	**STOCK PREPARATION, PULP DRYING,BALING**	**1.5.07**	**15.8.07**	**0%**
96	Check-out,commissioning and water runs	1.5.07	13.8.07	0%
97	- Tower area	8.5.07	20.6.07	0%
98	- Line 1, Screening, wet end, dryer, cutter	1.5.07	27.7.07	0%
99	- Water runs Line 1,	6.7.07	9.7.07	0%
100	- Line 2, Screening, wet end, dryer, cutter	5.6.07	23.7.07	0%
101	- Water runs Line 2	26.7.07	30.7.07	0%
102	- Baling Line 1	1.5.07	29.5.07	0%
103	- Baling Line 2	2.5.07	25.5.07	0%
104	- Baling Line 3	25.5.07	16.6.07	0%
105	- Baling Line 4	18.6.07	9.7.07	0%
106	- Common items for baling lines	5.7.07	13.8.07	0%
107	Test run with other pulp	12.7.07	13.8.07	0%
108	Start test run with own pulp	15.8.07	15.8.07	0%
109	**WOODHANDLING**	**3.5.07**	**15.7.07**	**0%**
110	Checkout and commissioning	3.5.07	14.7.07	0%
111	Start trial run woodhandling, first chipping line	15.6.07	15.6.07	0%
112	Start trial run woodhandling, second chipping line	1.7.07	1.7.07	0%
113	Start trial run woodhandling	15.7.07	15.7.07	0%
114	**FIBRE LINE**	**4.4.07**	**15.8.07**	**2%**
115	**UTILITIES**	**4.4.07**	**11.5.07**	**15%**
116	Checkout and commissioning	4.4.07	11.5.07	15%
117	**COOKING**	**8.5.07**	**27.7.07**	**0%**
118	Checkout and commissioning	8.5.07	27.7.07	0%
119	**BROWN STOCK WASHING**	**21.4.07**	**27.7.07**	**0%**
120	Checkout and commissioning	21.4.07	27.7.07	0%
121	**SCREENING**	**18.5.07**	**27.7.07**	**0%**
122	Checkout and commissioning	18.5.07	27.7.07	0%
123	**BLEACHING**	**8.6.07**	**27.7.07**	**0%**
124	Checkout and commissioning	8.6.07	27.7.07	0%
125	**HOT WATER RUNS**	17.7.07	14.8.07	0%
126	**FIRST COOKING**	15.8.07	15.8.07	0%
127	**EVAPORATION**	**3.4.07**	**15.8.07**	**0%**
128	Checkout and commissioning,utilities	3.4.07	11.5.07	0%
129	Hydro tests of units	10.5.07	16.6.07	0%
130	Checkout and commissioning, process	10.5.07	25.7.07	0%
131	Water Runs	11.6.07	8.8.07	0%
132	Start test run with liqour	15.8.07	15.8.07	0%
133	**RECOVERY BOILER+ESP**	**18.4.07**	**15.8.07**	**0%**
134	Deminwater available for rec.boiler pressure test	18.4.07	18.4.07	0%
135	Recovery boiler pressure test 1	3.5.07	3.5.07	0%
136	Recovery boiler pressure test 2	10.6.07	10.6.07	0%
137	Check out and commissioning	19.4.07	13.8.07	0%
138	Readyness of oil firing	15.6.07	15.6.07	0%
139	Start oil firing (steam blow up to turbine)	25.6.07	25.6.07	0%
140	Start black liqour firing	15.8.07	15.8.07	0%
141	**TURBO GENERATOR AND POWER DISTRIBUTION**	**10.5.07**	**14.8.07**	**0%**
142	Checkout and commissioning	14.5.07	13.8.07	0%
143	Cold commissioning of ENK 71/91	10.5.07	20.6.07	0%
144	Cold commissioning of ENK 71/71	5.6.07	10.7.07	0%
145	No load commissioning of ENK 71/91	10.7.07	16.7.07	0%
146	First synchronisation ENK 71/91	17.7.07	17.7.07	0%
147	Load commissioning of ENK 71/91	18.7.07	4.8.07	0%
148	No load commissioning of ENK 71/71	18.7.07	24.7.07	0%
149	First synchronisation ENK 71/71	25.7.07	25.7.07	0%
150	Load commissioning of ENK 71/71	26.7.07	7.8.07	0%
151	Load shading / Island tests	6.8.07	9.8.07	0%
152	4 Days pre-test	10.8.07	14.8.07	0%
153	Turbo-generator ready for operation	14.8.07	14.8.07	0%
154	**CHEMICAL PLANT**	**23.4.07**	**26.9.07**	**0%**
155	**CHLORINE DIOXIDE PLANT;ClO2**	**7.5.07**	**15.8.07**	**0%**
156	Check-out and commissioning	7.5.07	29.6.07	0%
157	Start chemical run	4.7.07	4.7.07	0%
158	Start commercial production	15.8.07	15.8.07	0%
159	**SODIUM CHLORATE PLANT,NaClO3**	**9.5.07**	**15.8.07**	**0%**
160	Check-out and commissioning	9.5.07	31.7.07	0%
161	Importation of sodium chlorate,NaClO3	19.6.07	14.8.07	0%
162	Start commercial production	15.8.07	15.8.07	0%
163	**HYDROGEN PEROXIDE PLANT, H2O2**	**1.6.07**	**26.9.07**	**0%**
164	Check-out and commissioning	2.7.07	25.9.07	0%
165	Storage area commissioning	4.6.07	17.8.07	0%
166	Start commercial production	26.9.07	26.9.07	0%
167	Importation of H2O2	1.6.07	14.6.07	0%
168	H2O2, Filling of the tanks	1.7.07	26.9.07	0%
169	**OXYGEN PLANT**	**11.6.07**	**1.9.07**	**0%**
170	Check-out and commissioning	11.6.07	28.8.07	0%
171	Plant ready for production	1.9.07	1.9.07	0%
172	Storage area commissioning	14.6.07	15.8.07	0%
173	Importation of N2	1.7.07	1.7.07	0%
174	Importation of O2	15.8.07	15.8.07	0%
175	**CHEMICAL STORAGE AREA, NaOH & H2SO4**	**23.4.07**	**4.7.07**	**0%**
176	Check-out and commissioning	23.4.07	4.7.07	0%
177	Importation of NaOH	5.6.07	5.6.07	0%
178	Importation of H2SO4	15.6.07	15.6.07	0%
179	**SALT STORAGE AND DISSOLVING**	**23.4.07**	**1.6.07**	**0%**
180	Check-out and commissioning	23.4.07	18.5.07	0%
181	Start filling salt staorage	1.6.07	1.6.07	0%



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MILESTONE | CHEMICAL FILLING | COMMISSIONING | Progress | Summary

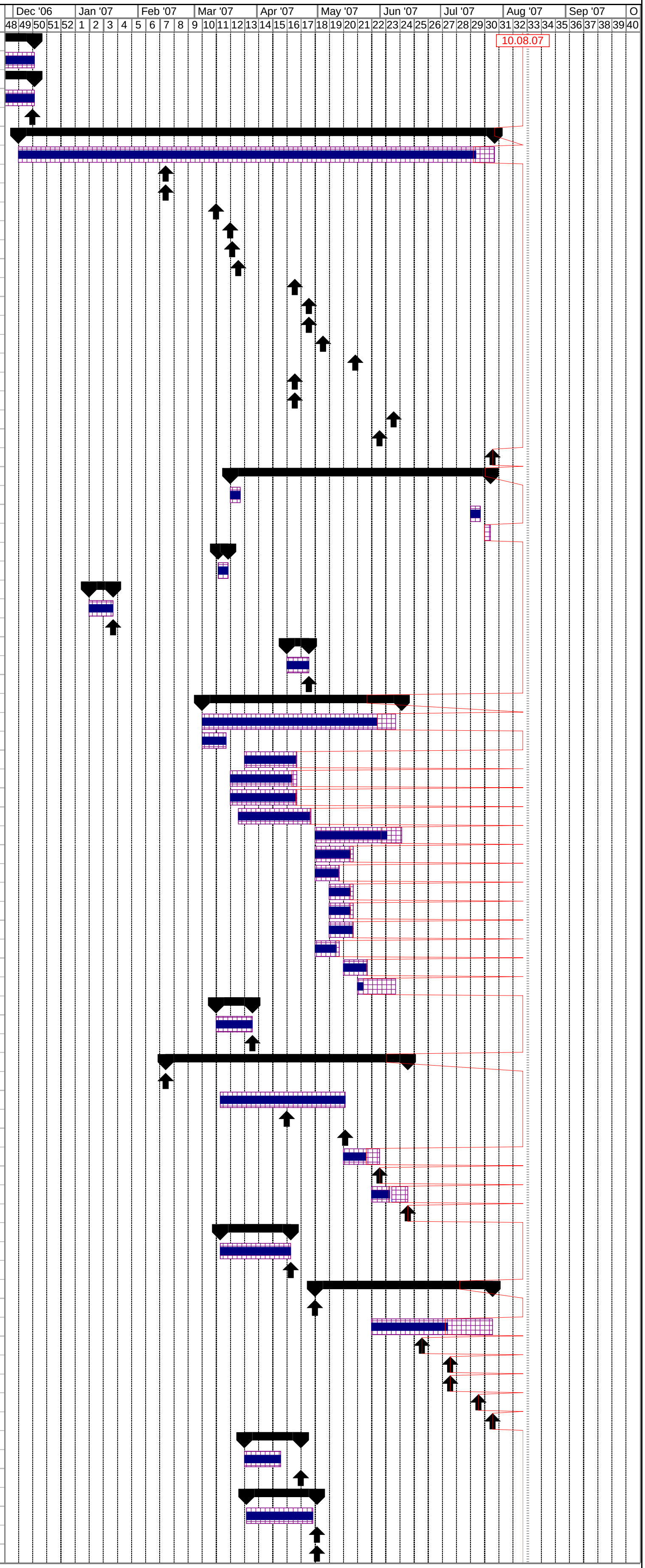
BOTNIA

BOTNIA S.A.
PROJECT URUGUAY
COMMISSIONING MASTER TIME SCHEDULE

PÖYRY

10.08.2007

ID	Nombre de tarea	Start	Finish	PROG
1	**150 kV TRANSMISSIONING LINE**	**14.11.06**	**11.12.06**	**100%**
2	Commissioning	14.11.06	11.12.06	100%
3	**150 KV SWITCH YARD**	**14.11.06**	**11.12.06**	**100%**
4	Commissioning	14.11.06	11.12.06	100%
5	Power On	11.12.06	11.12.06	100%
6	**POWER DISTRIBUTION**	**04.12.06**	**27.07.07**	**95%**
7	Checkout and commissioning	04.12.06	27.07.07	95%
8	Power distribution partly ready	15.02.07	15.02.07	100%
9	Power on raw water pumping	15.02.07	15.02.07	100%
10	Power on water treatment plant	12.03.07	12.03.07	100%
11	Power on turbine plant	19.03.07	19.03.07	100%
12	Power on recovery boiler	20.03.07	20.03.07	100%
13	Power on fibre line	23.03.07	23.03.07	100%
14	Power on woodhanling plant	20.04.07	20.04.07	100%
15	Power on main office	27.04.07	27.04.07	100%
16	Power on drying plant 1	27.04.07	27.04.07	100%
17	Power on drying plant 2	04.05.07	04.05.07	100%
18	Power on drying plant baling	20.05.07	20.05.07	100%
19	Power on evaporation plant	20.04.07	20.04.07	100%
20	Power on caustizising plant	20.04.07	20.04.07	100%
21	Power on effluent treatment plant	08.06.07	08.06.07	100%
22	Power on chemical plant	01.06.07	01.06.07	100%
23	Power on harbour	27.07.07	27.07.07	0%
24	**DIESEL POWER STATION**	**19.03.07**	**25.07.07**	**77%**
25	Checkout and commissioning,phase I	19.03.07	23.03.07	100%
26	Checkout and commissioning,phase II	16.07.07	20.07.07	100%
27	Load test	23.07.07	25.07.07	0%
28	**DCS (FIRST PART)**	**13.03.07**	**17.03.07**	**100%**
29	Commissioning	13.03.07	17.03.07	100%
30	**COMPRESSED AIR CENTRE (RECOVERY PART)**	**08.01.07**	**20.01.07**	**100%**
31	Commissioning	08.01.07	19.01.07	100%
32	Ready for operation	20.01.07	20.01.07	100%
33	**COMPRESSED AIR CENTRE (FIBRE LINE)**	**16.04.07**	**27.04.07**	**100%**
34	Commissioning	16.04.07	26.04.07	100%
35	Ready for operation	27.04.07	27.04.07	100%
36	**HVAC**	**05.03.07**	**11.06.07**	**88%**
37	Checkout and commissioning	05.03.07	08.06.07	90%
38	HVAC on raw water pumping	05.03.07	16.03.07	100%
39	HVAC on water treatment plant	26.03.07	20.04.07	98%
40	HVAC on turbine plant	19.03.07	20.04.07	90%
41	HVAC on recovery boiler	19.03.07	20.04.07	98%
42	HVAC on fibre line	23.03.07	27.04.07	98%
43	HVAC on main office	30.04.07	11.06.07	80%
44	HVAC on woodhanling plant	30.04.07	18.05.07	90%
45	HVAC on drying plant 1	30.04.07	11.05.07	98%
46	HVAC on drying plant 2	07.05.07	18.05.07	85%
47	HVAC on drying plant baling	07.05.07	18.05.07	85%
48	HVAC on evaporation plant	07.05.07	18.05.07	95%
49	HVAC on caustizising plant	30.04.07	11.05.07	85%
50	HVAC on effluent treatment plant plant	14.05.07	25.05.07	95%
51	HVAC on maintence shop	21.05.07	08.06.07	20%
52	**WATER INTAKE**	**12.03.07**	**30.03.07**	**100%**
53	Checkout and commissioning	12.03.07	29.03.07	100%
54	Pipe line ready	30.03.07	30.03.07	100%
55	**WATER TREATMENT PLANT**	**15.02.07**	**15.06.07**	**84%**
56	Start of filling mill water tank	15.02.07	15.02.07	100%
57	Checkout and commissioning,Phase I	14.03.07	14.05.07	100%
58	Start pumping of water (well water)	16.04.07	16.04.07	100%
59	Start test run, Phase I (chem.treated water)	15.05.07	15.05.07	100%
60	Checkout and commissioning,Phase II	14.05.07	31.05.07	65%
61	Start test run, Phase II	01.06.07	01.06.07	0%
62	Checkout and commissioning,Phase III	28.05.07	14.06.07	50%
63	Start test run, Phase III	15.06.07	15.06.07	0%
64	**DEMIN WATER PLANT**	**14.03.07**	**18.04.07**	**100%**
65	Checkout and commissioning	14.03.07	17.04.07	100%
66	Demin plant ready for operation	18.04.07	18.04.07	100%
67	**EFFLUENT TREATMENT PLANT**	**30.04.07**	**27.07.07**	**60%**
68	Effluent treatment ready to take first flushing waters	30.04.07	30.04.07	100%
69	Checkout and commissioning	28.05.07	26.07.07	60%
70	Area 1 Primary and sludge treatment ready	22.06.07	22.06.07	20%
71	Area 2 Equalization / spill basins ready	06.07.07	06.07.07	50%
72	Area 3 Secondary treatment ready	06.07.07	06.07.07	30%
73	Area 4 All cooling towers ready	20.07.07	20.07.07	10%
74	Area 5 Biological treatment ready	27.07.07	27.07.07	0%
75	**FUEL OIL SYSTEM**	**26.03.07**	**23.04.07**	**100%**
76	Checkout and commissioning	26.03.07	12.04.07	100%
77	Fuel oil system ready	23.04.07	23.04.07	100%
78	**GOL/GOS BOILERS**	**27.03.07**	**01.05.07**	**100%**
79	Checkout and commissioning	27.03.07	28.04.07	100%
80	GOL boiler first fire	01.05.07	01.05.07	100%
81	GOS boiler first fire	01.05.07	01.05.07	100%



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Tarea	Hito	Tareas externas
División	Resumen	Hito externo
Progreso	Resumen del proyecto	Fecha límite

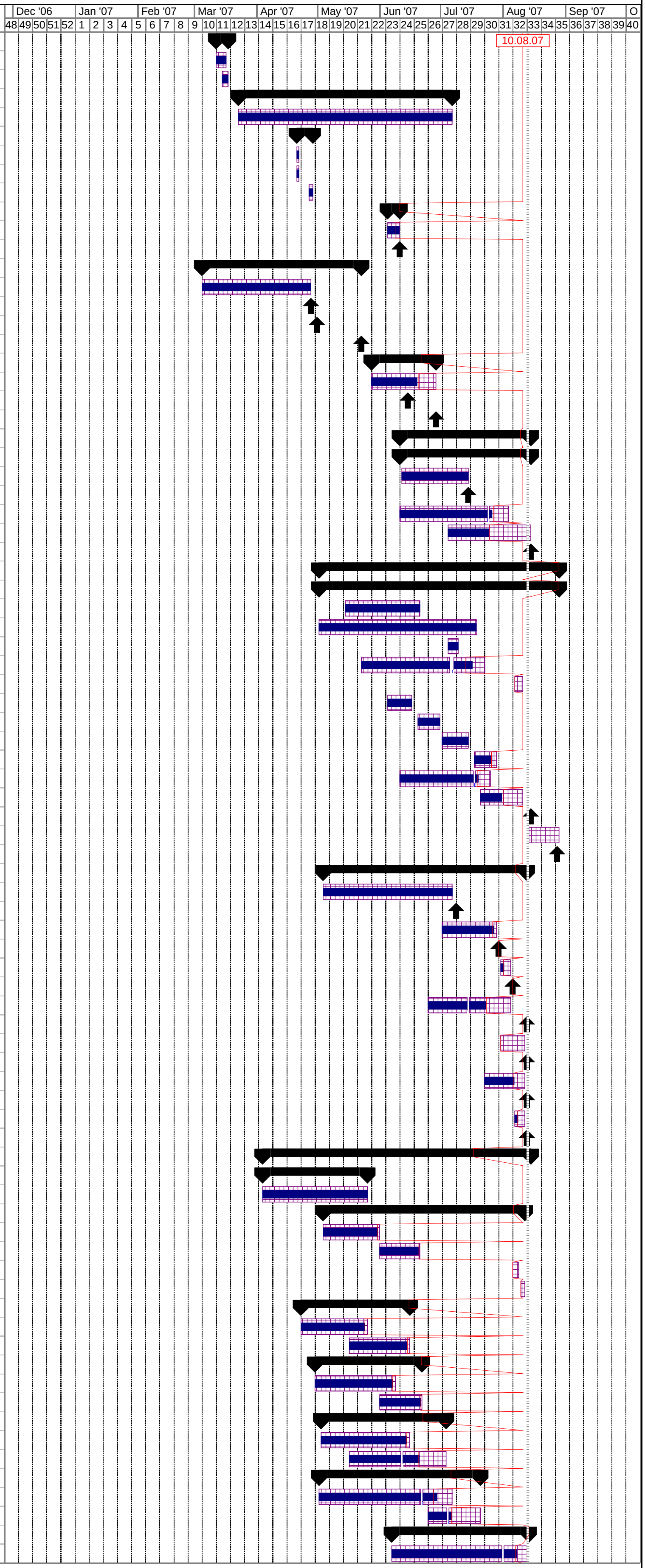
BOTNIA

BOTNIA S.A.
PROJECT URUGUAY
COMMISSIONING MASTER TIME SCHEDULE

PÖYRY

10.08.2007

ID	Nombre de tarea	Start	Finish	PROG
82	**STEAM NETWORKS LP AND MP**	**12.03.07**	**17.03.07**	**100%**
83	Pressure test of MP network	12.03.07	16.03.07	100%
84	Pressure test of LPnetwork	15.03.07	17.03.07	100%
85	**TURBINE PLANT AUX.SYSTEMS**	**23.03.07**	**06.07.07**	**100%**
86	Checkout and commissioning	23.03.07	06.07.07	100%
87	**WATER SYSTEMS ON PIPE BRIDGES**	**21.04.07**	**28.04.07**	**100%**
88	Pressure test of mill water network	21.04.07	21.04.07	100%
89	Pressure test of cooling water network	21.04.07	21.04.07	100%
90	Pressure test of fire water network	27.04.07	28.04.07	100%
91	**POTABLE WATER SYSTEM**	**05.06.07**	**11.06.07**	**95%**
92	Checkout and commissioning	05.06.07	10.06.07	95%
93	System and piping on pipe bridges ready	11.06.07	11.06.07	100%
94	**PIPE BRIDGES**	**05.03.07**	**23.05.07**	**100%**
95	Checkout and commissioning	05.03.07	27.04.07	100%
96	All pipe bridge connections ready	28.04.07	28.04.07	100%
97	Pipe bridge steam blowing	01.05.07	01.05.07	100%
98	Steam to all departments	23.05.07	23.05.07	100%
99	**COOLING TOWERS (ON WATER TREATMENT PLANT)**	**28.05.07**	**29.06.07**	**71%**
100	Checkout and commissioning	28.05.07	28.06.07	71%
101	Start-up of 3 first towers	15.06.07	15.06.07	100%
102	Start-up of 8 rest towers	29.06.07	29.06.07	100%
103	**RECAUSTICIZING AND LIME KILN**	**11.06.07**	**15.08.07**	**77%**
104	**Checkout and commissioning**	**11.06.07**	**15.08.07**	**77%**
105	Systems needed for synthetic liqour preparation	12.06.07	14.07.07	100%
106	Recusticizing ready to produce cooking chemicals	15.07.07	15.07.07	100%
107	Causticizing systems	11.06.07	03.08.07	85%
108	Lime kiln systems	05.07.07	14.08.07	50%
109	Start trial run	15.08.07	15.08.07	0%
110	**STOCK PREPARATION, PULP DRYING, BALING**	**02.05.07**	**28.08.07**	**85%**
111	**Check-out,commissioning and water runs**	**02.05.07**	**28.08.07**	**85%**
112	Tower area	15.05.07	20.06.07	100%
113	Line 1, Screening,wet end, dryer, cutter	02.05.07	18.07.07	100%
114	Water runs Line 1	05.07.07	09.07.07	100%
115	Line 2, Screening,wet end, dryer, cutter	23.05.07	22.07.07	88%
116	Water runs Line 2	07.08.07	10.08.07	0%
117	Baling Line 1	05.06.07	16.06.07	100%
118	Baling Line 2	20.06.07	30.06.07	100%
119	Baling Line 3	02.07.07	14.07.07	100%
120	Baling Line 4	18.07.07	28.07.07	80%
121	Common items for baling lines	11.06.07	25.07.07	85%
122	Start run with purchased pulp Line 1	21.07.07	10.08.07	50%
123	Start run with own pulp Line 1	15.08.07	15.08.07	0%
124	Start run with purchased pulp Line 2	14.08.07	28.08.07	0%
125	Start run with own pulp Line 2	28.08.07	28.08.07	0%
126	**WOODHANDLING**	**04.05.07**	**13.08.07**	**76%**
127	Checkout and commissioning, chipping line 1+pile 1	04.05.07	06.07.07	100%
128	Start trial run, chipping line 1+ pile 1	09.07.07	09.07.07	100%
129	Checkout and commissioning, chipping line 2	02.07.07	28.07.07	95%
130	Start trial run, second chipping line to pile 1	30.07.07	30.07.07	0%
131	Checkout and commissioning, pile 2	31.07.07	04.08.07	30%
132	Start trial run, pile 2	06.08.07	06.08.07	0%
133	Checkout and commissioning, reclaimer 1 to screening	25.06.07	04.08.07	70%
134	Start trial run, reclaimer 1 to screening	13.08.07	13.08.07	0%
135	Checkout and commissioning, reclaimer 2 to screening	31.07.07	11.08.07	0%
136	Start trial run, reclaimer 2 to screening	13.08.07	13.08.07	0%
137	Checkout and commissioning, screening	23.07.07	11.08.07	70%
138	Start trial run, screening	13.08.07	13.08.07	0%
139	Checkout and commissioning, feeding to digester	07.08.07	11.08.07	30%
140	Start trial run, feeding to digester	13.08.07	13.08.07	0%
141	**FIBRE LINE**	**04.04.07**	**15.08.07**	**83%**
142	**UTILITIES**	**04.04.07**	**25.05.07**	**100%**
143	Checkout and commissioning	04.04.07	25.05.07	100%
144	**COOKING**	**04.05.07**	**11.08.07**	**83%**
145	Checkout and commissioning	04.05.07	31.05.07	95%
146	Cooking water runs	01.06.07	20.06.07	95%
147	Cooking heat-up	06.08.07	08.08.07	0%
148	Pumps hot aligment	10.08.07	11.08.07	0%
149	**BROWN STOCK WASHING**	**23.04.07**	**15.06.07**	**95%**
150	Checkout and commissioning	23.04.07	25.05.07	95%
151	Water runs	17.05.07	15.06.07	95%
152	**SCREENING**	**30.04.07**	**21.06.07**	**95%**
153	Checkout and commissioning	30.04.07	08.06.07	95%
154	Water runs	01.06.07	21.06.07	95%
155	**OXYGEN DELIGNIFICATION**	**03.05.07**	**03.07.07**	**82%**
156	Checkout and commissioning	03.05.07	15.06.07	95%
157	Water runs	17.05.07	03.07.07	70%
158	**BLEACHING**	**02.05.07**	**20.07.07**	**72%**
159	Checkout and commissioning	02.05.07	06.07.07	85%
160	Water runs	25.06.07	20.07.07	45%
161	**CHEMICALS**	**07.06.07**	**13.08.07**	**90%**
162	Checkout and commissioning	07.06.07	13.08.07	90%



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Tarea	Hito	Tareas externas
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START UP T0017A 10.08.07.mpp/JKP

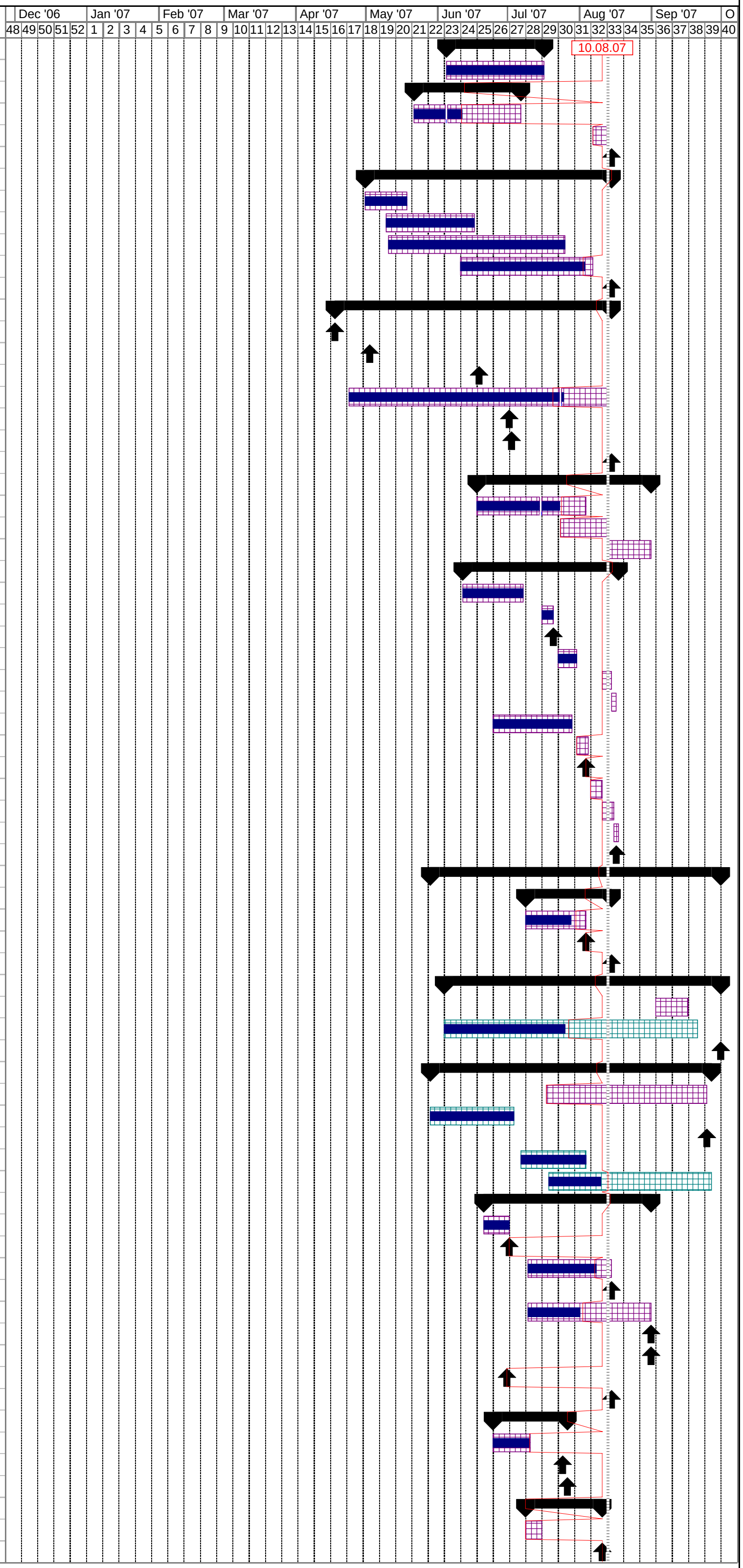
BOTNIA

BOTNIA S.A.
PROJECT URUGUAY
COMMISSIONING MASTER TIME SCHEDULE

PÖYRY

10.08.2007

ID	Nombre de tarea	Start	Finish	PROG
163	**STEAM**	**05.06.07**	**16.07.07**	**100%**
164	Checkout and commissioning	05.06.07	16.07.07	100%
165	**EFFLUENT AN GENERAL**	**22.05.07**	**06.07.07**	**40%**
166	Checkout and commissioning	22.05.07	06.07.07	40%
167	**HOT WATER RUNS**	07.08.07	13.08.07	0%
168	**FIRST COOKING**	15.08.07	15.08.07	0%
169	**EVAPORATION**	**01.05.07**	**15.08.07**	**98%**
170	Checkout and commissioning, utilities	01.05.07	18.05.07	100%
171	Hydro tests of units	10.05.07	16.06.07	100%
172	Checkout and commissioning, process	11.05.07	25.07.07	100%
173	Water runs	11.06.07	06.08.07	95%
174	Start test run with liqour	15.08.07	15.08.07	0%
175	**RECOVERY BOILER**	**18.04.07**	**15.08.07**	**81%**
176	Demiwater available for rec.boiler pressure test	18.04.07	18.04.07	100%
177	Recovery boiler pressure test 1	03.05.07	03.05.07	100%
178	Recovery boiler pressure test 2	19.06.07	19.06.07	100%
179	Checkout and commissioning	24.04.07	13.08.07	81%
180	Readyness for oil firing	02.07.07	02.07.07	100%
181	Start oil firing (steam blow up to turbine)	03.07.07	03.07.07	100%
182	Ready to start black liqour firing	15.08.07	15.08.07	0%
183	**ESP**	**18.06.07**	**31.08.07**	**42%**
184	Checkout and commissioning, ESP3	18.06.07	03.08.07	75%
185	Checkout and commissioning, ESP2	24.07.07	12.08.07	0%
186	Checkout and commissioning, ESP1	13.08.07	31.08.07	0%
187	**TURBO GENERATOR AND POWER DISTRIBUTION**	**12.06.07**	**17.08.07**	**75%**
188	Cold commissioning of ENK 71/91	12.06.07	07.07.07	100%
189	No load commissioning of ENK 71/91	16.07.07	20.07.07	100%
190	First synchronisation ENK 71/91	21.07.07	21.07.07	100%
191	Load commissioning of ENK 71/91	23.07.07	30.07.07	100%
192	4 days pre-test	11.08.07	14.08.07	0%
193	Load shding / island test	15.08.07	16.08.07	0%
194	Cold commissioning of ENG 71/71	25.06.07	28.07.07	100%
195	No load commissioning of ENG 71/71	31.07.07	04.08.07	0%
196	First synchronisation ENG 71/71	04.08.07	04.08.07	0%
197	Load commissioning of ENG 71/71	06.08.07	10.08.07	0%
198	4 days pre-test	11.08.07	15.08.07	0%
199	Load shding / island test	16.08.07	17.08.07	0%
200	Both turbo-generators ready for operation	17.08.07	17.08.07	0%
201	**CHEMICAL PLANT**	**29.05.07**	**01.10.07**	**52%**
202	**CHLORINE DIOXIDE PLANT; ClO2**	**09.07.07**	**15.08.07**	**78%**
203	Checkout and commissioning	09.07.07	03.08.07	78%
204	Start chemical run	04.08.07	04.08.07	0%
205	Start commercial production	15.08.07	15.08.07	0%
206	**SODIUM CHLORATE PLANT; NaClO3**	**04.06.07**	**01.10.07**	**45%**
207	Checkout and commissioning	03.09.07	16.09.07	0%
208	Importation of sodium chlorate, NaClO3	04.06.07	20.09.07	50%
209	Start commercial production	01.10.07	01.10.07	0%
210	**HYDROGEN PEROXIDE PLANT, H2O2**	**29.05.07**	**26.09.07**	**45%**
211	Checkout and commissioning	18.07.07	24.09.07	0%
212	Storage area commissioning	29.05.07	03.07.07	100%
213	Start commercial production	25.09.07	25.09.07	0%
214	Importation of H2O2	07.07.07	03.08.07	100%
215	H2O2, Filling of the tanks	19.07.07	26.09.07	35%
216	**OXYGEN PLANT**	**21.06.07**	**01.09.07**	**64%**
217	Checkout and commissioning,Driox N2	21.06.07	01.07.07	100%
218	Start-up Driox N2	02.07.07	02.07.07	0%
219	Checkout and commissioning,Driox O2	10.07.07	14.08.07	80%
220	Start-up Driox O2	15.08.07	15.08.07	0%
221	Checkout and commissioning,O2 plant	10.07.07	31.08.07	45%
222	Start-up O2 palnt	01.09.07	01.09.07	0%
223	Plant ready for commercial production	01.09.07	01.09.07	0%
224	Importation of N2	01.07.07	01.07.07	0%
225	Importation of O2	15.08.07	15.08.07	0%
226	**CHEMICAL STORAGE AREA, NaOH & H2SO4**	**25.06.07**	**27.07.07**	**99%**
227	Checkout and commissioning	25.06.07	10.07.07	99%
228	Importation of NaOH	25.07.07	25.07.07	100%
229	Importation of H2SO4	27.07.07	27.07.07	100%
230	**SALT STORAGE AND DISSOLVING**	**09.07.07**	**11.08.07**	**0%**
231	Checkout and commissioning	09.07.07	15.07.07	0%
232	Start filling salt storage	11.08.07	11.08.07	0%



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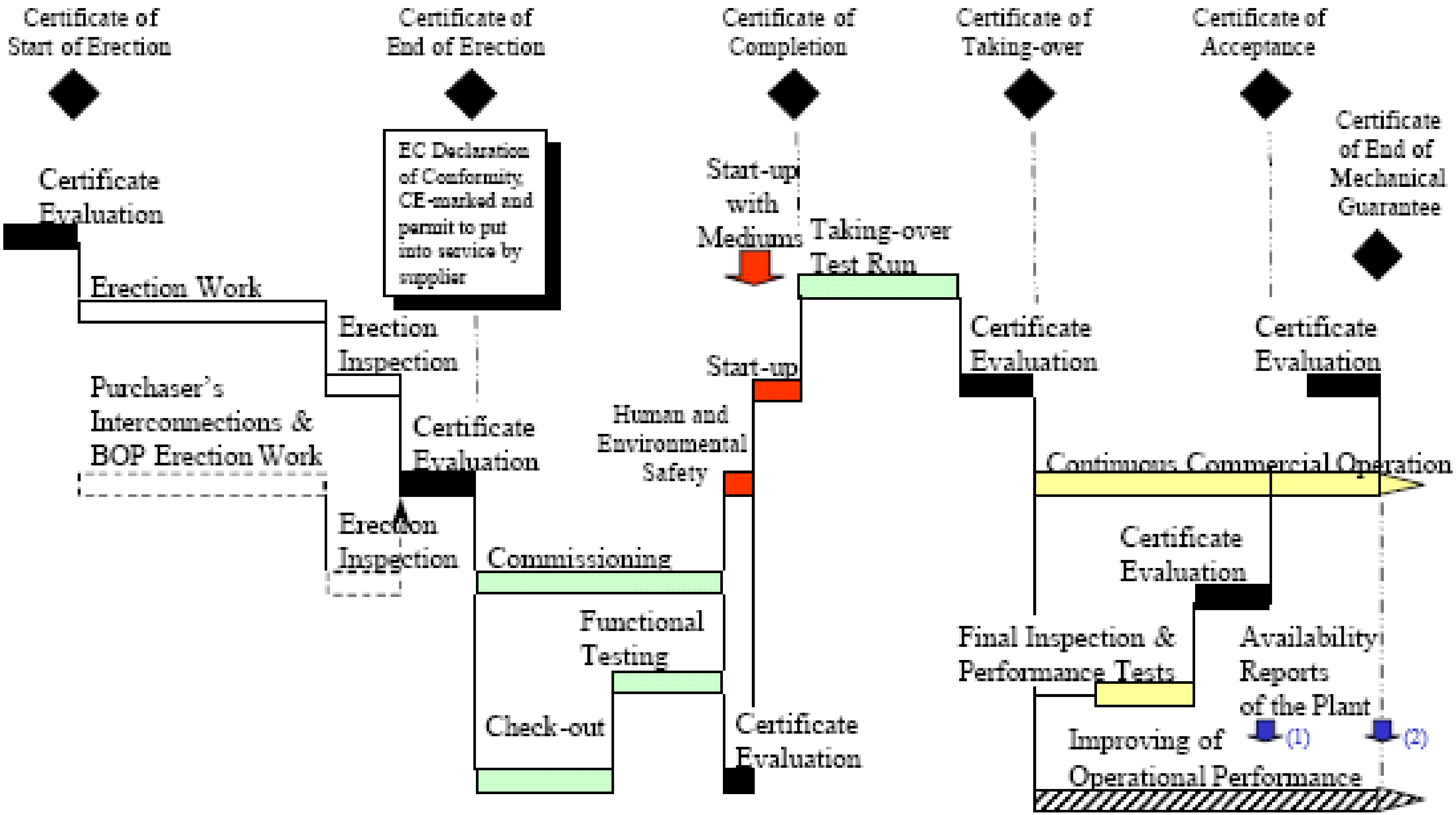
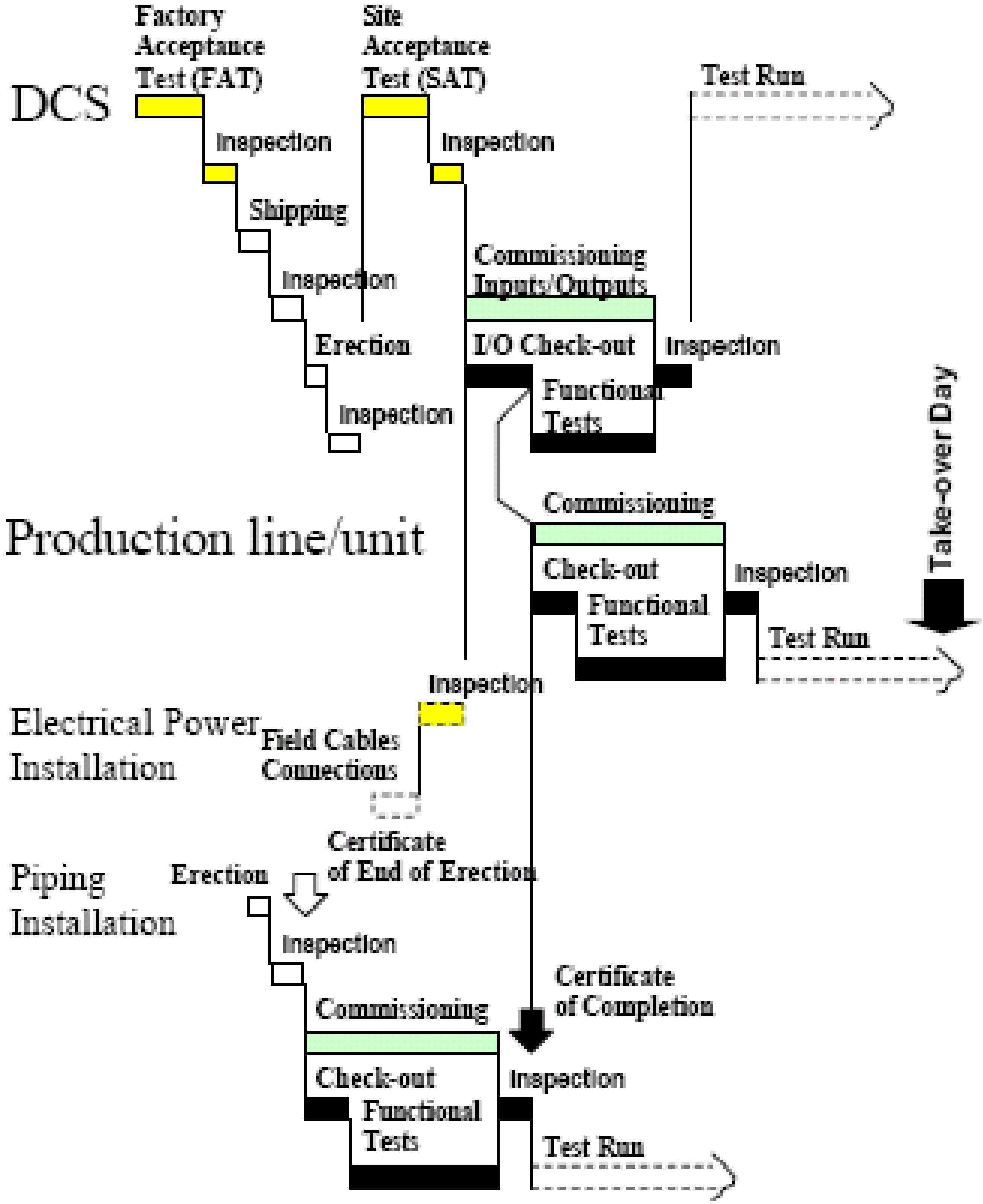
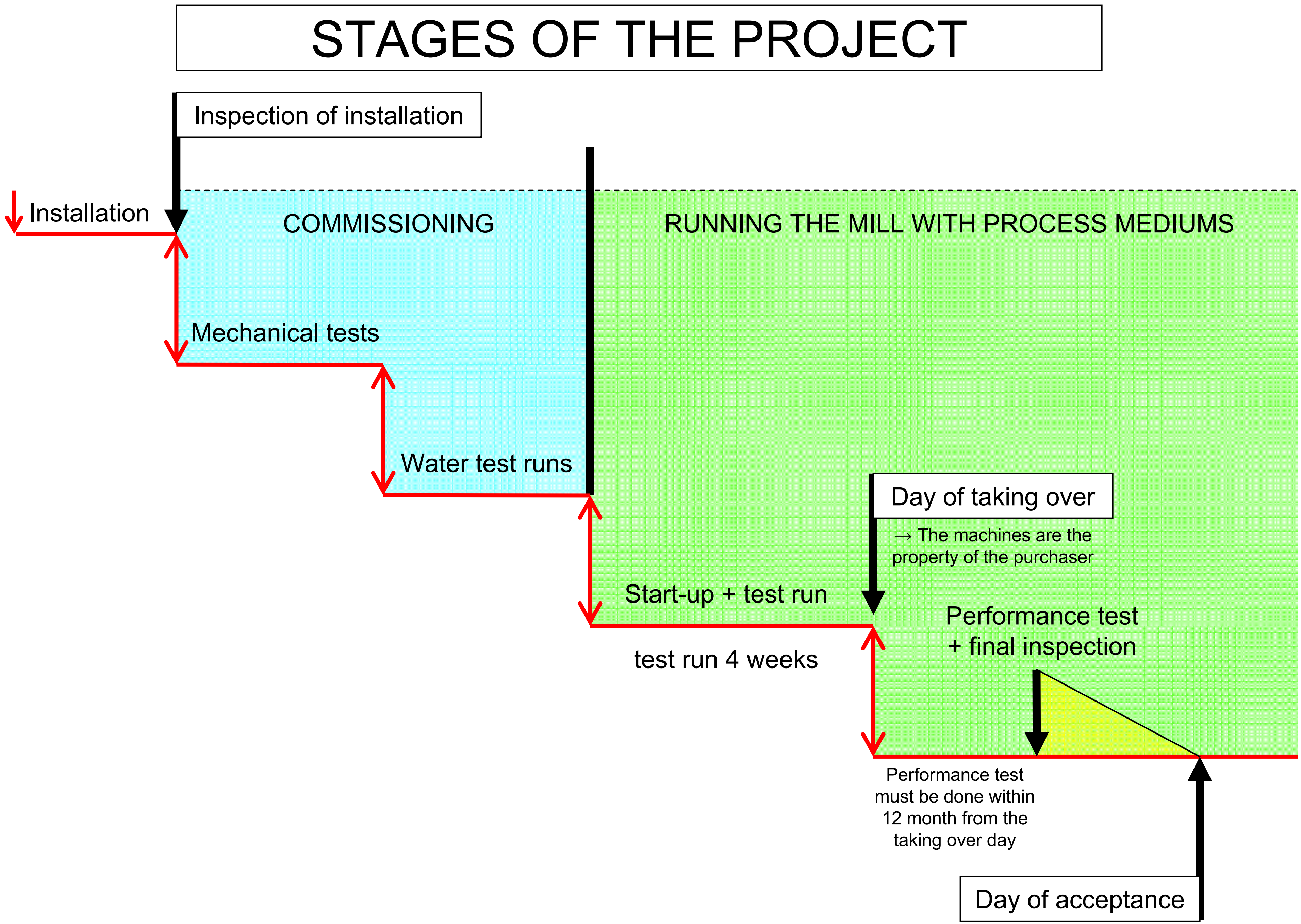
Stages of the project

For whole mill, from start of erection to end of mechanical warranty:



For each production line or unit, stages to be completed for the test run:




STAGES OF THE PROJECT
Inspection of installation
Installation
COMMISSIONING
RUNNING THE MILL WITH PROCESS MEDIUMS
Mechanical tests
Water test runs
Day of taking over
→ The machines are the property of the purchaser
Start-up + test run
test run 4 weeks
Performance test + final inspection
Performance test must be done within 12 month from the taking over day
Day of acceptance