

ARC ENERGY APPLIES UNDERSEA OIL & GAS TECHNIQUES TO HELP PROTECT UNDERGROUND MINING OPERATIONS

Gloucestershire-based weld overlay cladding specialist [Arc Energy Resources](#) has completed a critical cladding operation for mining equipment manufacturer Joy Global that is destined to protect coal mining installations underground rather than in Arc Energy's usual environment – oil & gas operations undersea.

Joy Global is a leader in the development and manufacture of surface and underground mining machinery. Its Worcester-based facility manufactures a wide range of heavy duty equipment for use in longwall mining operations, including shearers, roof supports and armoured face conveyors for the extraction of coal and other bedded materials.

The critical cladding operation recently undertaken by Arc Energy Resources helps to protect the vulnerable sprocket units fitted to Joy Global's range of heavy duty armoured face conveyors, which are installed with a shearer to extract the coal from the face. The sprockets drive Joy Global's heavy duty BROADBAND long life chains, which operate continuously, moving coal from the coalface. The underground environment is extremely aggressive, consisting of erosive coal, dust, dirt and rock – as well as water, which contains a cocktail of corrosive elements. This combination of corrosion and erosion was proving to be a serious threat to the operational life of the Joy Mining systems, due to build-up on the 'dirty side' of the mechanical face-seals used to protect the sprocket's bearings and shaft. It was so severe that it was displacing the seals' internal nitrile rings. The company's welding team investigated welding a ring of stainless steel to the seal housing end of the low alloy sprocket barrel. However, a colleague suggested contacting Arc Energy Resources for a more robust solution.

Initial conversations and subsequent meetings with Arc Energy at its Gloucestershire facility were focused on protecting the sprocket assembly from the build-up of corrosion, and preventing the subsequent pressure losses and oil leaks that were seriously affecting the operational life of the machine. The result, based on Arc Energy's wealth of experience in applying corrosion resistant alloys (CRA) such as Inconels, stainless steels and nickel and copper alloys, was a proposal to weld a corrosion resistant layer of stainless steel alloy to a pre-machined sprocket in the seal seating area. Following final machine finishing, this would give the sprocket housing an area of stainless to support the seal, protecting it from corrosion and thereby improving the reliability of its armoured face conveyors.



[Joy Mining](#) has since applied this enhanced protection system to a number of its machines and a spokesman says technical reports confirm the sprockets have performed successfully in extreme coal mining environments in the UK and Australia. He adds that any build-up of dirt and fines no longer causes the corrosion that had been undermining the performance of the seals. Joy Global's largest UK customer, UK Coal, which had been experiencing the problem, is also convinced. Typically, its sprocket seals had been failing after six to nine months and are now achieving a service life of 18 months, which means the equipment remains underground for longer and therefore achieves a significantly extended and more profitable operational life.

The enhanced sprocket protection on the armoured face conveyor, made possible by Arc Energy's [weld overlay cladding](#), has also opened the minds of the Joy Global design department to the potential in other areas of the business, and could soon be introduced on a new range of advanced, long-life coal face machines being developed by the Worcester design team. The potential for customers around the world is a range of Joy Global mining equipment that will combine very high production rates with an expected service life of 18 months. The same welding technology will also be adopted for other sprocket driven machines, and in particular a range of very large armoured face conveyors systems with motor ratings up to 1600kW. And while the sprocket remains a very small, but absolutely crucial component, the protection provided by Arc Energy Resources' weld overlay cladding will ensure that sprocket failure is unlikely to interrupt coal production.

Reporting on the management of the project, Joy Global welding engineer Ian Scott says: "The working relationship went very smoothly and the Arc Energy team demonstrated a very good understanding of our technical requirements from the start. The company's in-depth knowledge of CRAs and its existing approvals for a vast range of welding procedures opened our minds to other areas where we could improve the life of our equipment with the selective use of weld overlay cladding."

Commenting for Arc Energy Resources, managing director Alan Robinson – one of very few UK registered European Welding Engineers and a senior member of the Welding Institute – says: "We have assembled a skilled team capable of delivering a high quality, multi-disciplined service from initial enquiry through to delivery, so we are ideally placed to respond to the most complex challenges and provide highly effective engineering solutions. We are delighted to have provided a solution for Joy Global.

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