Fig 1. The Trimax pump assembly as received at Huddersfield.

AxFlow restores obsolete Trimax pumps

An urgent call was received by Axflow from a customer with a breakdown of a fifty year old extruder pump, which made busbars. Busbars are essential components within power transmission systems and traditionally are made from copper because this material delivers high levels of conductivity. However, it is not the lightest of materials nor is it the cheapest. Where weight and cost are critical factors in applications such as electrical power distribution, renewable energy, electrical inverters and components for the aerospace, railway and marine industries, solid copper busbars are not the ideal solution.

One alternative that offers 60% lower weight, 40% cost reduction and 60% lower surface resistance compared to copper conductors is the copper-clad aluminium (CCA) electrical conductor, better known as the Cuponal™, manufactured by Bruker Hydrostatic Extrusions. The Cuponal™ consists of a solid core of electrical grade aluminium with a pressure bonded seamless outer layer of high conductivity copper. The manufacturing process involves hydrostatically extruding copper and aluminium billets from which the busbars are manufactured.

The process developed by Hydrostatic Extrusions at its UK plant in Perth, Scotland, is far from new, being several decades old. In spite of its long history, it remains the only method of delivering

Fig 2. The pump internals were badly worn.

Fig 3. A new pinwheel and worm had to be made.

performance parameters that cannot be attained by any other extrusion process. Hydrostatic extrusion uses oil at high pressure around the billet to effect the extrusion, this eliminates any friction between the billet and press container. In the case of Hydrostatic Extrusions, the oil used is vegetable oil and this is delivered by two high pressure reciprocating pumps. Their performance is absolutely critical to the entire process. The Holden & Brooke T50 Trimax pumps apply 1500 psi pressure to the main ram using the castor oil as the hydrostatic medium.

Problem

Just how critical the pump's performance is to the extrusion process became very clear when the No 1 pump suffered a catastrophic failure. This may have been caused by a closed discharge valve in the system (Fig. 1). Fortunately, the process system included a second pump, enabling production to continue. Replacing the damaged pump was deemed a priority as two pumps provide system resilience, but this was far from being straightforward. The Holden & Brooke Triplex pump was obsolete.

Stuart Elliott, Managing Director, Hydrostatic Extrusions takes up the story. "The press is basically a huge hydraulic ram which pressurises the extrusion container. Once the empty container is loaded with the working metal pieces for extrusion the hydrostatic fluid is pumped at high pressure into the closed container. The oil continues to be pumped into the container until the pre-determined pressure in the container is achieved. The extrusion ram is then applied and the pumps are taken off duty until the extrusion process is completed. In terms of operation, the two pumps are run all day, and over the five decades in which they have been in service they have proved to be very effective, requiring very little maintenance work."

Hydrostatic Extrusions' initial thought was to find an alternative manufacturer's pump, but finding a pump that delivered a low flow and high pressure that matched the performance of the original models specified proved too difficult and costly. The alternative was to look at the feasibility and costs of getting the pump repaired and this led to AxFlow's

Huddersfield Service Base being called in for advice. "We responded to Hydrostatic Extrusions' enquiry by despatching one of our Scottish-based sales engineers to take a look at the pump and prepare a report," explains Tom Cooper, AxFlow Service Base Manager. "It was in a very poor state of repair (Fig. 2) and needed some serious work if it was to re-enter service and perform to the customer's requirements. However, we considered that extensive repair work, which included making completely new components, was possible. We prepared a full report supported by extensive photographs, the associated costs and a timeframe in which the work would be carried out, and this was accepted by the customer."

The report identified many key failings, the crankshaft had sheared, causing excessive force on the bearing housing resulting in the casting cracking. Both items had to be completely replaced. In addition, the pinion wheel was damaged so the pinion wheel and worm shaft had to be replaced as a pair (Fig.3). The conrod bearings were badly worn and had to be replaced. One of the crankshaft bearings was seized on to the crankshaft meaning that both the crankshaft and the bearing had to be replaced. AxFlow's final recommendation was to replace all the seals, packings and gaskets as well as the taper roller timken bearings for the worm shaft.

The process developed by Hydrostatic Extrusions at its UK plant in Perth, Scotland, is far from new, being several decades old. In spite of its long history, it remains the only method of delivering performance parameters that cannot be attained by any other extrusion process. The functional principle of hydrostatic extrusion uses oil at high pressure around the billet to effect the extrusion, which eliminates any friction between the billet and press container.

"We estimated that the pump could be rebuilt to the original operating specification, pressure tested before spray painting and dispatched for refitting and commissioning in eight weeks, comments Tom Cooper. "The repair and rebuild was completed within eight weeks and since commisioning, the pump has run perfectly. The customer was so satisfied with the job that we have now taken delivery of the second pump for repair and maintenance." ■