Producing Brass Rod by the Conform Process

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There is a strong possibility that the Conform continuous extrusion process is capable of producing small diameter brass rod at a cost saving of more than 25% compared with the traditional production route.

The current method of producing brasses in wire and small section form is by cold working down to finished size from either continuously cast or hot extruded feedstock. In order to keep the extrusion ratio to an acceptable figure, even when using a multihole die, the minimum diameter is usually set by the output rate from the caster. This fixes the diameter at a figure in the range 17-20mm.

Cold working from these sizes, particularly for those alloys with a duplex microstructure, involves a considerable number of individual reductions, either by rolling or drawing, with intermediate annealing and surface cleaning operations.

In principle, the Conform process is ideally suited to performing these heavy reductions on either extruded or continuously cast feedstock. Such an operation, performed on a Conform machine, is capable of giving a reduction, in a single pass, equivalent to up to ten drawing or cold rolling passes. Due to the heat generated in the product during the heavy working operation, the product normally emerges in the annealed condition.

The process makes use of a rotating wheel to provide the extrusion force. Feedstock is fed into a groove around the wheel circumference and friction ensures that the work material moves forward with the wheel as it rotates. A stationary close fitting shoe encloses the groove over a short length of the wheel circumference to prevent escape of the feedstock. The continued forward movement of the feedstock is prevented by an abutment which forms part of the shoe and which extends to the bottom of the groove. A die is placed adjacent to the abutment allowing extrusion of the product in a radial direction. The process work normally provides sufficient heat to ensure that the product is extruded in an annealed condition, equivalent of a hot extruded product.

By developments involving die design to minimize stress as well as improved cooling and improved die materials, extrusions of copper strip have been made which indicated ultimate die lives considerably in excess of the break-even amount.

As the forces developed in extruding brasses in the Conform machine are likely to be significantly greater than occur in extruding copper, great care and attention is needed in the design of tooling to minimize stress, provide sufficient cooling to protect the tooling without chilling the feedstock, and minimize the escape of flash from the gaps between stationary and rotating tooling parts.

An alternative technique is to use feedstock in the form of a powder rather than solid. This can be consolidated and extruded by Conform at lower pressures than for solid feed. There is also the possibility of blending different powders to make composite or reinforced materials.

Conform extrusion of copper and brass was first demonstrated at The U.K. Atomic Energy Authority Springfield Laboratories in the mid-seventies. Since then, considerable advances have been made, although initially, inadequate tool life hampered progress. However, at Springfield Laboratories, improvements have been made in the life of Conform wheels such that a wheel life of 50 tons of copper can now be expected. At BNF, further advances have been made in the application of the machine for extruding copper strip. Comparison with the traditional roll-draw process indicates that Conform becomes economically attractive with die/abutment lives greater than about two tons.

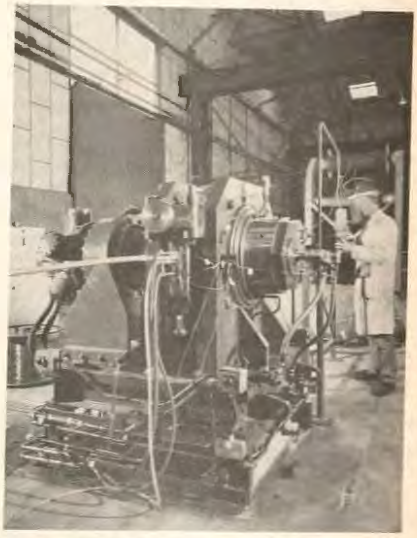

Figure 1. BNF's Conform machine. The major advantages of the process include an ability to impart a very heavy reduction to the input material in a single operation, continuous operation, and an emerging product which is fully annealed.

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Software for Metallurgical Calculations—Part II

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The following is the second installment of an eight-part series which examines some of the programs featured at the Computer Software for Metallurgical Calculations Conference, which took place late in 1985 at the University of Missouri-Rolla.

PC SOFTWARE: FLEXMET

FLEXMET (FLEXible METallurgical Evaluation Technique) is one of several general-purpose computer packages for calculating steady-state material balances for use in design process flowsheets and is written in FORTRAN IV. It is marketed by FLUOR Corp. A library of standard unit operation models may be combined with specific user-developed modules. This increases the flexibility of the flowsheets solved. Calculation techniques, unit operation models, and engineering assumptions used within the package are the same as those an engineer would use to arrive at a solution manually. A report generator allows the user to build custom reports of process unit operations and streams. The interactive package can handle 15 components and 100 to 150 streams. The conference attendees preferred that the package provide graphic output of the flowsheet and calculate heat balances. In the version demonstrated, these functions were not available.

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