Sandy Cochrane and Geoff Yeoman, directors of conticast Ltd. UK, describe a process that has an almost indefinite number of applications from jewellery to high volume conductor copper wire production.

A horizontal continuous casting machine in operation producing twin strands

An economic case for a new future

Modern continuous casting machines as manufactured by the UK company conticast® provide opportunities for companies, not only in the general foundry industry but also non-ferrous machinists and hot forgers, to enter the semis manufacture business and/or achieve significant savings in material costs by recycling their own scrap and swarf.

Continuous casting machines suited to these types of installations are now available with processing capabilities from 10 to 1,000 tonnes per month. A wide range of materials can be readily processed including pure copper, copper alloys such as the bronzes (silicon and tin), brasses, gun metals, nickel brasses, silver, gold and alloys, zinc and some aluminium alloys.

Equipment from conticast can be operated on feedstock comprising a high percentage of scrap and swarf to produce high quality round bars and other semi-manufactures (plates, tubes/hollow sections, hexagons etc). Continuously cast produced rod has years of successful track record usage behind it which attest to the metallurgical structure and material integrity of the products.

The capital expenditure of getting into small to medium scale conticasting within a company with existing premises and basic infrastructure could be of the order of £100,000 to £200,000.

Multi-directional casting

Conticast produce continuous casting machines which operate horizontally, vertically upwards or vertically downwards according to the product range and mix to be produced. The system is based on graphite melt containment that represents the best metallurgical regime for the processing of non-ferrous alloys and precious metals.

Strand extraction is by means of PC controlled advanced technology AC servo-drive systems, with plant process recording and quality records executed by PC downloading all recorded information to Excel spread sheet.

The casting furnaces manufactured by conticast have high intensity, low voltage graphite heating elements and graphite crucibles protected by an inert gas (pure nitrogen) which fills the furnace case, thus excluding the outside atmosphere. The conticast processing technique has been developed without any compromise of product quality.

Operating cost will vary according to specifics of the operation, but some indications received from customers are listed below.

If more output can be achieved for

Variable costs (per 1,000kg output):	**£**
Power @ £0.07/kwhr x 450Kwhr/tonne	32
Nitrogen	9
Melting loss	5
Cooling water	2
Spares/maintenance consumable	20
Total	68 per 1000kg

Annual overhead costs (24h/day x 3 shifts)	**£**
Labour	120,000
Rent, rates insurance etc (~100m²)	30,000
Interest on capex, (say £400,000 @ 6.5% apr)	26,000
Depreciation on £400,000 over five years	80,000
Total overhead costs/12 months	256,000

Annual production output

Basis: 6,000 production hours per year, excluding maintenance and at a net output of 300 kg per hour (brass or bronze).

Annual output	1,800 tonnes/year

Total operating cost per tonne	**£**
Variable costs	68
Overhead 256,000/1800	142
Total operating costs	210/tonne
Total operating costs for 1,800 tonnes	£ 378,000/year

the same overall input costs, then this will represent a positive deviation to the above number by reducing the total overall operating cost per tonne.

Selling prices

Naturally, the selling price of semi-manufacture products varies according to the product, processing complexity and magnitude of any given order. However, if a 25mm diameter x 3 metre length of leaded gun metal round bar (UK spec BS1400: LG2, CDA/UNS spec C83600), supplied as tonne lots of as-cast, reeled (straightened) and bundled/packed product is taken as typical, then a margin of £400.00 ex-works may conservatively be expected above the basic raw commodity metals prices.

This means that a total plant income which can be expected from 1,800 tonne/year = £720,000.

Scrap can be purchased from the market at various levels below that of the basic commodity prices, which can give significant further financial savings benefit to the overall operation of a plant. If a company can also recycle its own in-house scrap as part of the production strategy, then this gives added advantages of partial self-sufficiency, plus a flexibility to outsource the balance of top-up raw materials.

Often selling semi-manufactures, bar, tube and plate products to a user means that a strategic partnership is formed with that customer as a total service can be given. The customer's scrap can be returned for reprocessing which then develops as both a materials and relationship cycle. Non-ferrous scrap arisings can be re-processed almost indefinitely, with the proper controls and procedures set in place.

The economic case

The simple 1,800 tonnes/year case is based on selling prices - variable and overhead costs to manufacture. In the case above this represents £720,000 minus £378,000, or £342,000.

The authors believe the above possibly represents some interesting opportunities for companies who wish to move away from conventional casting processes and into the world of continuous casting. Equally with companies wishing to involve materials recycling into their operations, conticast would be happy to confidentially examine the prospects further, according to specific circumstances.

Further information relating to conticasting, including a full list of conticastable alloys (available as a pdf file download) can be found at http://www.conticast.com

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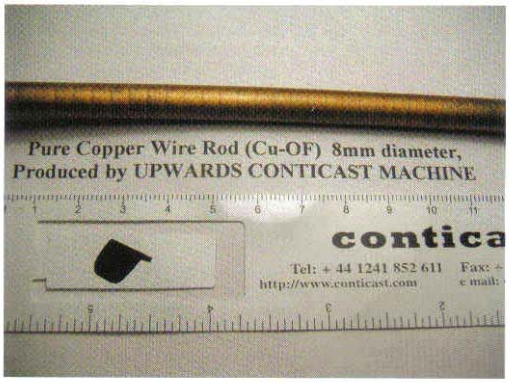
An LPG valve produced by forging and machining. The conticast brass bar is the raw feedstock



8mm diameter Cu-OF wire rod is ideal for the production of high quality fine copper magnet wire