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## Oxygen Free Copper Wire Casting Technology

Rautomead breaks the mould

### CONTENTS

**STOP PRESS...PAGE 7**

**PAGE 2 & 3**

**Pure and Simple**

*Rautomead breaks the mould in casting technology for "oxygen free" copper wire rod.*

**Total Control Refinery to Special Cable**

*A growing concept in the copper industry*

**PAGE 4**

**Vertically Challenging**

*The unbeatable Rautomead RS upwards-vertical casting machine*

**PAGE 5**

**Never Before.....**

*Advances in the casting industry*

**All Part of the Service**

*Rautomead's approach to Installation, Commissioning Training and Support*

**PAGE 6**

**Precious Metals mean Golden Opportunities**

*The jewel in the crown of casting technology*

**Going for Gold**

*Olympic gold in the Sydney Olympics*

**Manufacture in Algeria**

**PAGE 7**

**The only way is Up**

*A major breakthrough for the non-ferrous foundry industry*

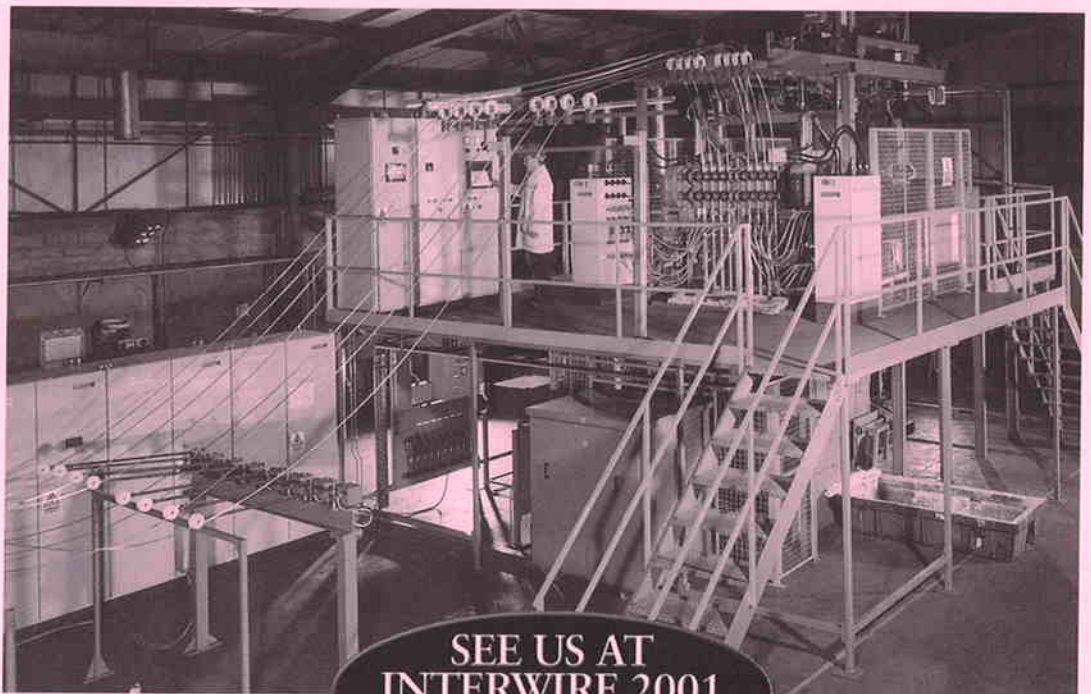
**Stop Press...**

**PAGE 8**

**Continuous Casting**

**Since 1978**

*The Rautomead Story*



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*Throughout the copper wire industry, the trend is for higher quality 8.0mm diameter feedstock rod for the drawing process. Over recent years,*

*Rautomead International Limited has become a world leader in continuous casting technology with innovative solutions that truly break the mould.*

From its headquarters in Dundee, Rautomead specialises in the design and manufacture of continuous casting equipment for processing non-ferrous metals. The company's vast expertise in Graphite Crucible and Electrical Resistance Heating is being found to offer significant quality benefits and major cost savings to cable and wire producers.

#### WIRE BREAKS MINIMISED

By applying graphite-casting technology to the production of fine and superfine copper wires, Rautomead can ensure that costly wire breaks are minimised in the multi-strand drawing process.

#### THE OXYGEN-FREE SOLUTION

Residual oxides frequently provide the potential for wire breaks during drawing. Rautomead's

integral graphite filter technology, however, overcomes this problem by providing a naturally reducing environment in which the oxygen reacts with the graphite containment system to result in the production of oxygen-free quality copper wire rod.

Non-metallic inclusions - another potential cause of wire breaks - are also minimised in the Rautomead process.

*For full details, turn over now...*

# It's *Pure and Simple*

## Rautomead breaks the mould in casting technology for "Oxygen Free" Copper Wire Rod.

Since its formation in 1978, Rautomead International Limited has become a leading specialist in the design and manufacture of continuous casting equipment for processing non-ferrous metals.

In fact, today, its Dundee headquarters is recognised as the world-centre for continuous casting technology.

The company's wide-ranging expertise in Graphite Crucible and Electrical Resistance Heating Technology is being found to offer significant quality benefits and major cost savings to the international wire and cable industry.

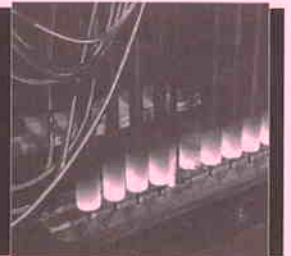
Rautomead's unrivalled expertise in this area is perhaps nowhere better illustrated than by the application of its graphite casting solutions to copper wire production.

With an industry wide trend towards higher quality 8.0mm diameter wire rod for feedstock to the drawing process, Rautomead's know-how facilitates the production of fine and superfine wires whilst minimising the frequency of wire breaks in multistrand drawing machines.



### A naturally reducing environment

One of the potential causes of breaks in copper wire during drawing can be residual oxides present in the molten metal during the casting process. Rautomead's unique integrated melting and casting graphite crucible (incorporating a graphite filter) overcomes this problem by providing a naturally reducing environment in which the oxygen reacts with the graphite containment system to produce oxygen free copper wire rod.

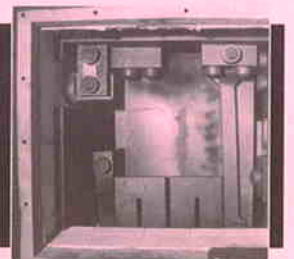


### Eliminating breaks through non-metallic inclusion

Non-metallic inclusions in the rod, resulting from the use of refractory lined crucible and launders in induction systems, is also a cause of wire breaks. Rautomead eliminates this problem with the use of a graphite crucible combined with an electric resistance heating and integrated melting & casting system.

### Heating technology leads the way

The Rautomead furnace's high intensity - low voltage electrical resistance heating is safe to use and provides a high degree of power and temperature control. In combination with the graphite crucible, it provides a large 'heat sink', generating highly accurate and very stable melt temperatures.



### 24 applications worldwide

Rautomead have already introduced 24 Upward Vertical continuous casting machines in 11 different countries around the world. Consequently, the Rautomead range of machines is becoming a by-word for reliable, economic and efficient production of high quality copper rod. Machines are available for the production of between 2,000 and 20,000 tonnes per year.

### A test of excellence

All Rautomead machines are fully installed, tested and operated, casting metal, prior to packing and shipping. Customers' engineers are invited to attend to receive initial "hands on" training and to witness pre-shipment casting demonstrations. An extensive and worldwide customer care programme also comprehensively supports Rautomead products.



# A Total Control Refinery to Special Cable

## A Growing Concept in the Copper Industry

*The meteoric development of the information technology industry - with servers, LANs, PCs, laptops, palm-tops, printers, scanners and the accompanying miniaturisation of so many electronic components-is creating a rapidly increasing demand for finer and finer wires.*

*Yet while building wires are conventionally used at gauges of 0.5mm to 0.20mm, these new products call for wire gauges in the range 0.05mm to 0.02mm - 1/10th of the diameter, but only 1/100th of the surface area.*

### OXIDE INCLUSIONS

As a consequence, fine and superfine multi-wire drawing equipment has been developed to process 16 to 32 strands simultaneously. However, brittle copper oxides - resulting from impurities in the matrix - can result in both cup and cone wire-breaks. And conventional CCR rod, often made from cathode from a variety of sources, frequently fails to meet the exacting performance requirements.

### A NEW APPLICATION, A NEW LEVEL OF QUALITY

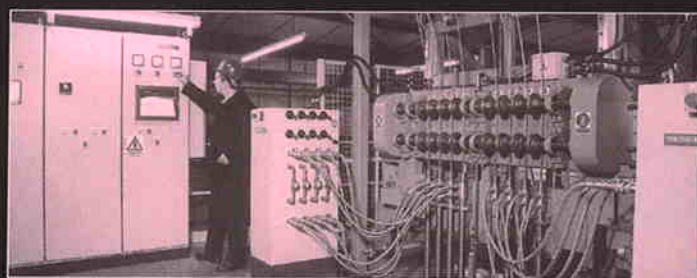
For these new high-tech applications, the normally accepted Grade A classification is not sufficient to ensure acceptable performance and economic production.

An impurity level (excluding silver) of 7 parts/million is equivalent to a purity of 99.9993% - and this is the area of quality essential to achieve a wire-break performance in drawing at 0.050mm (50 microns) of better than 200 kg per break.

Such applications of refined copper call for a radical re-appraisal of relationships within the copper industry to achieve a position where, for example, the



manufacturer of special cables has full control over purity of the cathode used and control over the whole rod casting and wire drawing sequence.



### A FINE SOLUTION FROM RAUTOMEAD

Rautomead specialises in the design and construction of continuous casting machines of small to medium capacity for the conversion of high quality cathode into copper re-draw rod with typical annual output capabilities from

2,000 tonnes to 18,000 tonnes.

Rautomead machines are compact and designed to be installed in wire and cable factories where the redraw rod

can be fed straight to the rod breakdown machine.

### ELECTRICAL RESISTANCE HEATING - VERTICAL CASTING

The Rautomead proprietary process is designed to melt, hold and cast the cathode copper in a

single graphite furnace. The furnace is heated by electrical resistance and is protected in an inert nitrogen gas atmosphere; the rods are cast vertically upwards from the machine to form coils of 4-5 tonnes weight.

The graphite furnace represents probably the most metallurgically clean environment in which to handle copper in the molten state, it also serves to reduce oxygen from 80-100 parts/million common in good quality cathode to less than 5 parts/million in the cast rod.

### WORLDWIDE ACCLAIM

Already 27 systems have been sold in 12 countries around the world. Whilst the production of 8mm re-draw rod is the main application of this equipment, it has also found applications in the production of special conductor alloys, such as CuAg, CuSn, CuMg and CuCd.

