Glass Fibre Production in Eastern Europe

DEVELOPMENTS IN MANUFACTURING METHODS

As in the western world, the rapid growth in the uses of glass fibre has led to a considerable expansion of production in the Soviet Union and its satellite countries. A forecast of the extent of this growth was in fact given by Mr Khrushchev in outlining the present Seven Year Plan to the Supreme Soviet in 1959, and it is clear both from this statement and from other sources that production of this type of material is scheduled to increase by some twenty to twenty-five times by 1965. Huge quantities of heat and acoustic insulating materials based upon glass fibre are needed for the construction of houses, in shipbuilding, in rail and road transport vehicles and in the chemical and other industries, and great efforts have been made to achieve large-scale production of relatively cheap staple glass yarn of high quality.

Some account of these developments has recently been given in two papers (1, 2) published in Russia, one dealing with the expansion of production in the U.S.S.R. itself and the other with similar developments in the German People's Republic, while some further interesting information has come from Czechoslovakia (3).

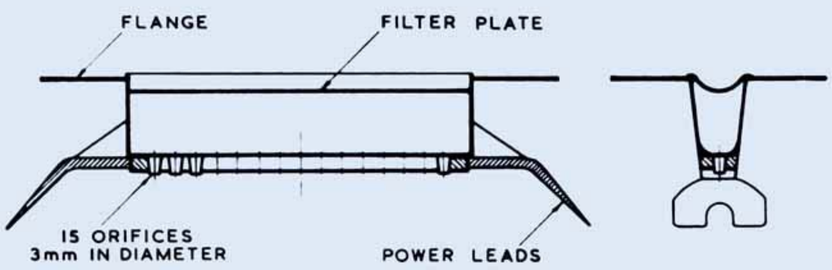
Automatic Production of Glass Yarn in the U.S.S.R.

In the first paper Shkol'rikov and Kocharov describe an automatic production line set up at the Merefyanski Glass Plant for the production of glass yarn by vertical steam blowing and for the processing of this yarn to yield heat and acoustic insulating materials. Glass is melted in a conventional end-fired recuperative furnace supplying one or more feeders each containing a rhodium-platinum alloy bushing having fifteen orifices. The bushings are heated in the normal way by low-voltage current, and from the orifices the glass threads emerge at 1350 to 1400°C, to be drawn out by jets of superheated steam into a collecting chamber where they are sprayed with a binder, a solution of a synthetic resin.

The usual technique of collecting on a conveyor and drying the blanket then follows, the thickness and density of the blanket being controlled by the belt speed, variable between 0.3 and 1.2 metres per minute. No output figures are given for this plant, but from the length of the conveyor belt, 20 metres, and the fact that each feeder unit produces up to 1700 metres of blanket per day, it would appear that an output of the order of one ton per day per feeder unit is achieved.

Design of Rhodium-Platinum Bushing

One interesting feature of this plant concerns the design of the rhodium-platinum bushings. Experimental work carried out at the Glass Fibre Institute has led to the conclusion that certain advantages can be gained in converting the mass of molten glass to threads if, instead of a flat bushing, a boat-shaped design is used with the power leads connected to its bottom. In this way the molten glass is said to be more uniformly heated, and higher temperatures can be attained in the fibres emerging from the orifices. As a result, thinner staple yarn can be produced at a lower pressure of steam. A



The Russian design of rhodium-platinum alloy bushing for the production of glass yarn

diagram of this design of bushing, having fifteen orifices each 3 mm in diameter, is reproduced here.

Developments in East Germany

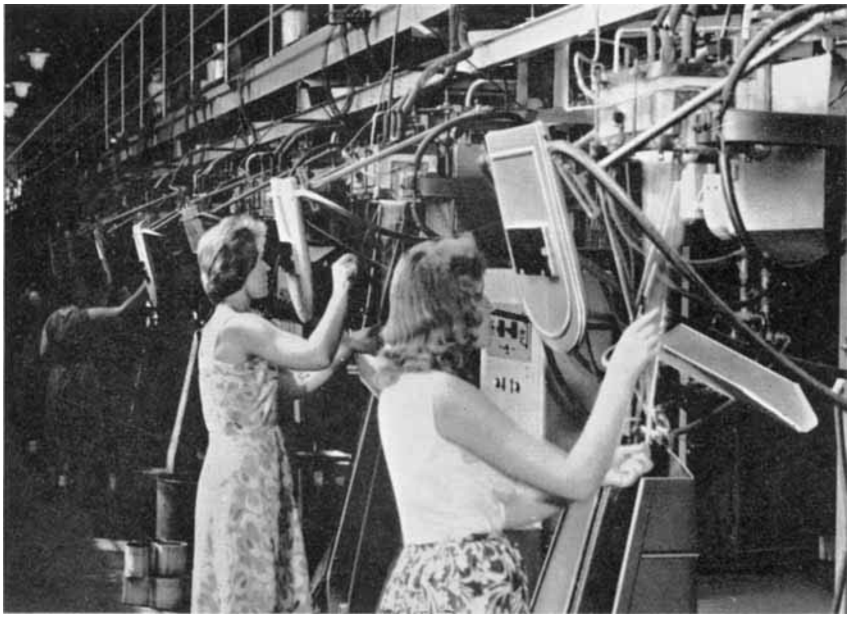
In the second paper Kocharov gives a comprehensive survey of developments in the production of a number of types of glass fibre products in East Germany. The account includes the production of glass fibre reinforced plastic, of roof sheeting materials, of glass yarn by a combined drawing-spinning method, of textile yarn starting from glass rods, of textile fibre by drawing through spinnerets and of staple fibre by steam blowing. The details given are naturally somewhat condensed, but they indicate that the industry in Eastern Europe has made considerable advances.

The first experimental plant for the manufacture of textile fibre by drawing employed a rhodium-platinum trough with 101 orifices, each 1.6 mm in diameter, which was charged with the usual glass marbles. In later processes the marbles were replaced by cut lengths of glass rod, 100 mm long, fed by a serrated drum (a technique familiar in the glass rod and tubing industry) into the platinum alloy troughs having 100, 200 or 250 orifices. The intermediate processes of drum collection and spraying with an epoxy resin dissolved in carbon tetrachloride are familiar, and give a yarn with about 1 per cent of sizing material.

The plant for the production of yarn for thermal insulation employs a conventional glass melting furnace supplying glass to a feeder or feeders in each of which a rhodium-platinum alloy bushing is mounted. Each bushing, weighing 1.7 kg, has a line of 42 cylindrical orifices 2 mm long and 1.4 mm in diameter. The usual steam blowing technique then follows. In another installation the platinum alloy bushing has two lines of 56 orifices 5 mm long and 2.7 mm in diameter, the spacing between the lines and between the holes both being 6 mm. These bushings are 60 mm high and their overall dimensions 250 by 300 mm. A filter plate having 702 holes 1.4 mm in diameter is placed in the upper part of the bushing. In addition to the thermal insulation yarn, 14 to 15 microns in diameter, it is proposed to produce in this plant 10 micron yarn to be used in the manufacture of thermal and acoustic insulation for aircraft.

It is also proposed to investigate the use of a double bushing with 80 orifices for the manufacture of textile yarn. These orifices are 1.7 mm in diameter, spaced 5 mm apart, and yield yarn 5 to 7 microns in diameter.

A development that is not mentioned in either of these papers is the use of long lengths of glass rod fed mechanically into the conically-shaped orifices of a rhodium-platinum bushing. It is known that this process is practicable, the heated platinum trough causing the ends of the glass rods to



A battery of rhodium-platinum alloy bushings producing glass fibre in the Vertex National Corporation factory in Czechoslovakia

fuse in the individual orifices so that the glass issues from the orifices and is drawn off as threads in the usual way.

Expansion in Czechoslovakia

Similar expansion of production is taking place in Czechoslovakia, and the paper by Müller and Arje refers to the installation of new manufacturing equipment by the largest producer, the Vertex National Corporation. The paper is more concerned, however, with the achievement of high productivity and of high quality in the drawn fibre. Outputs from the plant are not quoted but it is clear that it is operated on the battery system, there being several of the platinum drawing troughs in line stated to produce fibre for textiles down to the finest diameters of a few microns.

Of particular interest, however, is a novel method of operating a platinum-clad probe for controlling the glass level within the furnace. Instead of the usual purely mechanical action of raising and lowering the probe, it is allowed to descend by gravity acting against a braking mechanism. When contact is made with the glass surface electronic relays operate, and the upward motion of the probe from the glass is brought about by the action of a solenoid on the base metal constituting the other end of the probe. It descends again when the current is broken through the solenoid winding. This device is then coupled back to the feeding mechanism.

It is clear that this metal level device can be used in a conventional tank furnace as well as in the platinum bushing for which it was devised. Due to the rapid upward motion, the cycle of probing the glass level is much more frequent than with the purely mechanical device and is adjustable within the time limits of 8 to 18 seconds, permitting very accurate control of glass level.

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References

1 Ya. A. Shkol'rikov and E. P. Kocharov — *Steklo i Keramika*, 1960, 17, (9), 1–5

2 E. P. Kocharov .. .. — *Steklo i Keramika*, 1960, 17, (8), 40–44

3 K. Müller and K. Arje .. .. — *Czechoslovak Heavy Industry*, 1960, (12), 25–30