

# Combining Competencies for Process Excellence

Comprehensive Platinum based solutions for the special glass industries

## Non-round shaped PGM refining chambers

Patented Innovation

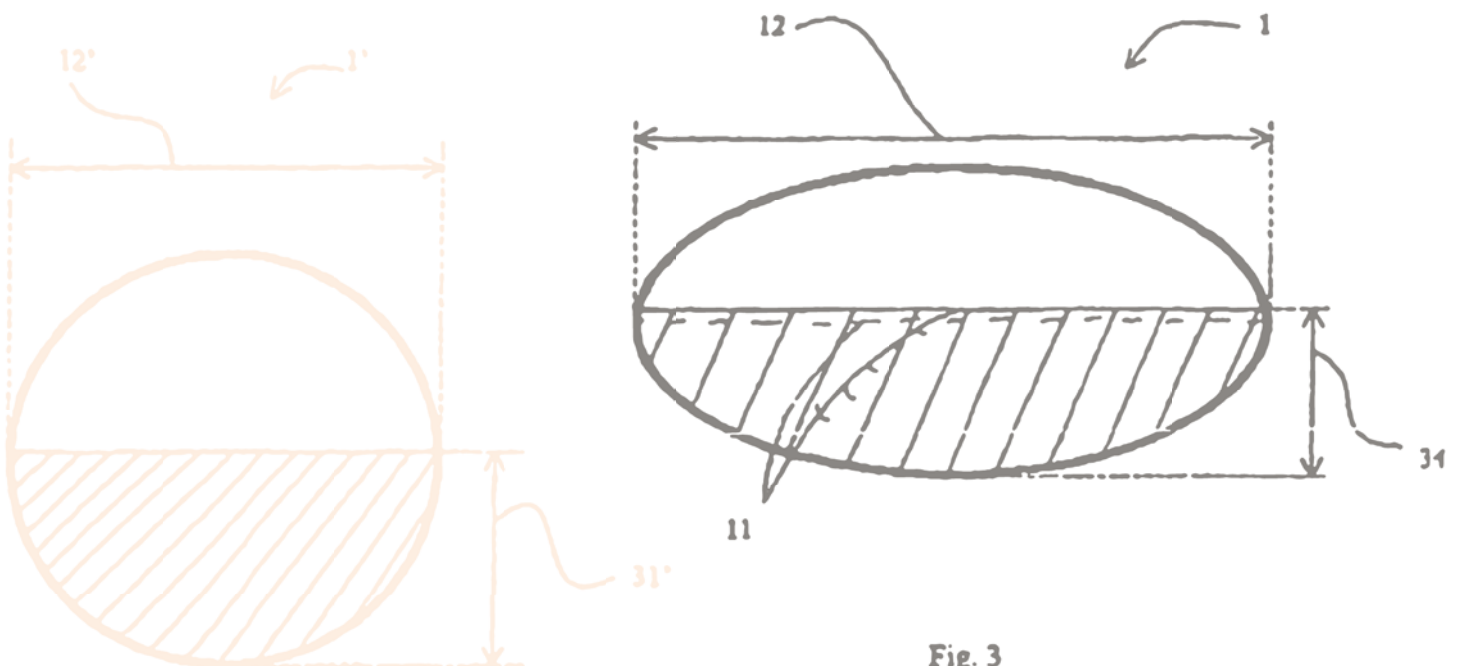
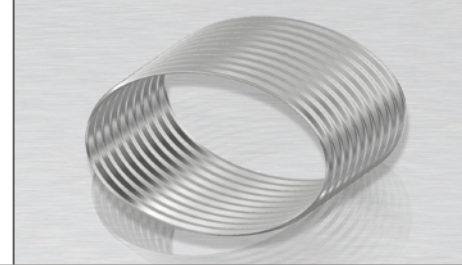


Fig. 3



Our mission is to provide Process Excellence to our customers: By applying an altered geometry of the cross section of PGM material based refining chambers for special glass purification, a substantially improved refining process can be achieved.

## Glass refining process

This process step of glass melting involves complete dissolution and homogeneous distribution of all individual ingredients of glass, particularly the elimination of streaks, and removal of gas bubbles from the melt.

For certain special glasses like optical or display glasses, refining is done in a tube made of PGM (Platinum group metals) with a round cross section. In operation, the tube lies essentially horizontally. The tube is filled half to two thirds full of glass so as to get the best use of the refining chamber.

Following points are critical for the glass refining process:

- › the size of the open surface of the glass has a substantial impact on the degassing efficiency
- › the maximum path of the rising gas bubbles affects the refining time
- › the mixing and throughput are determined by the flow profile and the velocity of the glass flow
- › the glass temperature and its distribution

As the refining is done at the highest temperature in the entire glass fusion process, heat is added directly or indirectly to the refining segment.

## Umicore's unique solution

Our innovative refining chamber designs do also comprise a refining process in which the molten glass flows through a tubular chamber. Allowing glass in the molten state at a temperature of 1,000 °C to 1,700 °C flow through the refining chamber, wherein its cross section is, in at least one segment, shaped so that in the operating position the length of a horizontal line (that divides the surface of the cross section into a lower and an upper section of the surface), is greater than twice the maximum vertical extent of the lower segment of the surface.

This means the level of the molten glass is adjusted so that the surface of the glass perpendicular to the direction of flow of the molten glass has a width which is more than twice as great as the maximum vertical extent of the molten glass in the refining chamber.

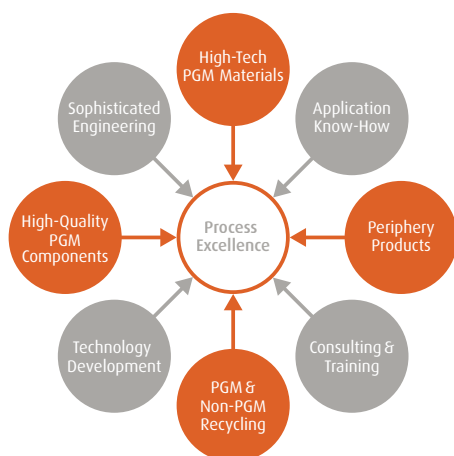
## Immense advantages

Special shaping of the refining chamber's cross section results in the following benefits and differences as compared with known conventional designs:

- › the free surface of the glass increases and hence enables better degassing of the glass melt
- › the longest path of gas bubbles from the bottom to the surface decreases and hence degassing requires less time. This enables either higher glass throughput, or shortened refining segments, or reduced cross section. In any case it leads to less PGM material requirement within this process and hence to substantial cost reduction
- › the reduced depth of the glass bath along with the altered flow cross section will result in a different flow profile which enables better mixing of the glass bath
- › as heat is added along the refining chamber a reduced depth of the glass bath leads to decreased temperature differences within the glass and quicker heating of the glass

## Note

The figure on the front page illustrates a comparison between a round and an elliptical cross section, each having the same circumference, with the same glass filling.



## Technology Development

We consider innovation to be the most important engine for progress. It will finally translate into Process Excellence for our customers and support them to manufacture products with tailor-made features for their target industries. Umicore is continuously striving for proprietary technologies that enable us to be a leader in our field and support our customers in the best possible way.

For inquiries and additional information please contact

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