Session Three:

Continuous Casting of Silver Bars

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I. Who is Allgemeine?

1. Overview
Thank you for the invitation to be here to speak on such a new technology. I am proud to introduce you to, in our terminology, continuous casted silver bars.

Allgemeine Gold- und Silberscheideanstalt AG was founded in 1891: we have more than 120 years’ history behind us. We are located in the south of Germany in Pforzheim. This is also the headquarters of the Allgemeine Group. Allgemeine is part of Umicore Group, with more than 90% of the shares for Umicore. Allgemeine was LBMA accredited in 2008.

2. Our Activities
Firstly, we were founded as a recycling company, and we recycle precious metals: gold, silver and the platinum metals. From these metals we produce precious metal products for jewellery, for investment products and also for industrial applications. We are very experienced in precious metal analytics and are proud to be involved in new developments in precious metal assaying and analytics. To round off our business, we also provide precious metal trading.

3. Core Business
Our core business is what we call ‘The Cycle of Precious Metal’: our refining department gets material from grams to amounts in tons, and we recycle the precious metals. We are focused on materials containing a high proportion of precious metals. From the recycled precious metals we produce products: we now have more than 400 different alloys in our programme and we deliver these in all forms, in line with our customers’ needs. We have a lot of special requests from all the fields and niches, as well as the main applications.
Besides the headquarters of Allgemeine in Pforzheim we have some affiliates: Markham (Toronto, Canada) – by your it is maybe known as Imperial, since last year it’s renamed in Umicore Precious Metal Canada, Amsterdam, better known as SchöneEdelmetaal, Vienna, known as Ögussa, Bangkok, Umicore Precious Metals Thailand and we are involved in the Umicore production in Brazil.

II. History of Continuous Casting

I come now to the history of the new technology for our bar. What was the situation in 2011-12? The silver price had risen, and we had a dramatically drop from the silver demand in production, particularly due to the decision of the German Government to switch from a silver alloy for the €10 coin to the copper-nickel alloy. On the other side, the demand for the refining service, especially for silver, was very high at this time, so we increased the refining capacity and increased the production of fine silver. In 2012 we had a gap between the refined silver and the demand in the production of about 300 tons – a real silver hill – and we had to find a solution to bring this back in the market. Together with Umicore, which is also active the market as a big precious metal refiner, there was a big capacity to produces granules. But the demand for this kind of products was lower than the amount of silver. And in our group we missed the capacities to produce LBMA-bars. However, the dropping demand for silver products meant we had free capacity and a team who could process silver. Since some years from time time poped up the Question: ‘Is it possible to change the LBMA rules? Can we produce bars with the continuous casting technology against the open-mold-rule?’ Sometimes it can be difficult to change rules worldwide, but in 2012 was the right time, after a initial discussion and the first precise request and we got the green light to try this, to provide the drawings and to find a solution in this technology. And then we were very fast: we provided the drawings in April, we provided the first sample and the bars were accepted by the Physical Committee in June 2012.

III. The Process

1. Pre-melting, Assaying and Casting

We had the continuous casting unit for years, with a yearly capacity for over 1,500 tons per year. We want and we could use this furnace, and the unit is a line of pre-melting furnace, casting furnace, and drawing unit. We use the pre-melting furnace for all kinds of silver–granules, crystals and other forms of material; I will come back later to the chips that we produce during milling. The capacity is 500kg per batch.

After melting and homogenisation we take a sample, we assess this sample in our laboratory with the spark analyser, and 8 ... 10 minutes later we get the analysis of such 500kg batch. All possible impurities and the oxygen content is analysed quantitatively. After analysis we approve the furnace or we have to stop them, in principle we have the possibility and time during the process to treat the melt and to analyse the furnace again. After final approval we transfer the silver in the second, the casting furnace.

On the slides on the left you see on the top the pre-melting furnace and on the right side you see the transfer of 500kg in the casting furnace.

2. Casting

The casting furnace has a capacity for a volume of approximately 1,000kg, which we use with the casting speed from 550kg per hour. We cast the bar form and, for those, who are not familiar with the continuous casting technology, we use carbon dies, covered by a copper
cooler, the liquid material goes in, solidified and cools down during the time in the die. Behind, the solid material moves out of the die.

After each new batch comes from the pre-melting furnace, we make a final analysis of this furnace, this material batch. We use this analysis as process control – and it is the final analysis – again with the spark analyser. The material which comes out, goes through a secondary cooling unit.

3. Cutting

Directly in line, we cut the material into 300mm pieces. This is the raw bar, which we then process in our CNC area. All the bars from one batch are packed in 500kg on a pallet corresponding with the pre-melting furnace and the final analyse after putting the material in the casting furnace. Then we move this material to the CNC department. In principle, we could directly mill this bar in line or in place, and we could very easily automate this process, but due to the historical role of our company we have not enough space in this area, so we have to move the bars into another area and proceed the bars further.

4. Milling

Why we have to do this? For the right bar form and safer handling we have to mill the undercut and round the edges. This is, in principle, a disadvantage of this technology and an additional step: the normal casted bars are ready after casting, so we have here an additional step. The milling process is dry, without lubricant. After some improvements, we mill in a cycle two bars in five minutes. The amount of chips we get is 7%, through our dry milling process without any contamination we can easily return this material directly in the melting process.

5. Weighing, Marking and Packaging

Weighing, marking and packaging is not so different from the normal casted bars: an electronic scale, directly connected with the computer and the marking station programming a dot matrix engraving, we engrave our sign, the weight, and the bar number, in the face of the bar. We get the weighing list and we pack the material for transport. Because the extremely flat surfaces, we have to secure the material a little bit differently from the normal bars. After the first deliveries of such bars to London we received the information that not all the bars are accurate on the pallet. We changed the packaging system and we deliver these kinds of bars special packed with foam panels; we remove the panels in the London Vaults and return this packaging material to Pforzheim. And then we have the normal packaging according to the LBMA requirements.

IV. Conclusion

If you have a continuous caster of the right size and milling capacities it is easy to produce such bars. If you have experience in continuous casting it is not a big deal. We needed only three months from the idea to accreditation, but we could use our production capabilities and our well-trained staff. We are able to produce bars in different qualities with different weights: most of our bars are produced in a three-nine quality, but we are also able to produce this in four-nine quality, depending only on the pre-material and customer requests. We could use our equipment for different kinds of material: we can use it for grains, which are common in the market, and we could also use washed silver crystals, directly from the electrolysis.

From this type of bar production we get a high visible quality of bars and a very unique form. Each bar comes out the same as the others, free from marks or bubbles on the bar surface. We
guarantee and all bars are proved the finess of silver, and there aren’t any problems through oxygen in the process.

For Allgemeine in 2012, this was a very efficient alternative to push the refined material back into the market. In December 2012, we celebrated 10,000 bars. All the bars were shipped to London, and now we could celebrate reaching 500 tons of such kind of bars.

This was a short introduction into the new technology. For us, this technology is not really new: we have been producing continuous cast products for, I believe, more than 30 years, but it is relatively new to use the technology for bar production. We are very proud to be the first company to get accreditation for such types of bars from the LBMA. For this, I have to say thanks to the LBMA; to the Physical Committee and to the Chief Executive of the LBMA, Stewart Murray, who forced us to try it and to provide such a bar in the market. In the future I am sure we will see other producers who will provide such bars, free from all the defects that we know can exist in silver. As those who produce silver bars know, it is not so easy to make unique bars all of the time.