1. Melting Capacity

1. Background to Application for Standard Variation to Permit

Since 2011 the Brock Metal zinc alloy manufacturing business has achieved sales growth of 50%. The increase in manufacturing capacity required to support this growth has been attained through continuous improvement – the cumulative effect of lots of small improvements in existing processes.

By 2016/17 it was evident that the limits of what could be achieved through such incremental improvement of existing processes were being approached, and that to grow capacity further, a more radical approach was needed involving investment in entirely new manufacturing processes. It was also clear that the high degree of manual handling inherent in the existing manual ingot stacking process was becoming increasingly undesirable as volumes increased.

Therefore, a major strategic investment programme was conceived which was designed to eliminate manual handling by automating the stacking process. To successfully automate the stacking process, it is essential to maintain control over both the position and orientation of the cast ingots once they are ejected from the moulds (something which the existing process could not do). This requirement meant that as part of the project to automate the stacking process it was also necessary to invest in a new casting process that maintained this control.

A technology survey was conducted and the best casting and stacking equipment for Brock Metal's needs was identified. Although driven by the desire to eliminate manual handling, the investment was justified financially through its ability to create additional production capacity. In the sequence of the main production processes involved in zinc alloy ingot production (melting – casting – stacking), casting had long been the rate determining step (bottleneck) at Brock Metal. The growth in casting capacity delivered by the investment was designed to be sufficient to handle all the available melting capacity. Indeed, with an eye on the future development of the business, it was designed to have considerably greater capacity even than this.

The investment was installed and commissioned in 2018. As intended, it successfully removed the casting process bottleneck, and increased production capacity. In doing so, and as expected, it meant that a new, higher limit on production capacity was then presented, not by the casting or stacking processes, but by the *melting process*.

It was always understood that this would be the case and the expectation was that the new higher limit on production capacity would be sufficient for a period whilst investment plans for addressing the new melting bottleneck were designed, justified and approved.

However, and unexpectedly, in mid-2018 the Brock Metal business was sold to a Belgian manufacturer of zinc alloys, 'NFM Alloyz'. NFM is a somewhat larger business than Brock Metal and has operated the same type of automated ingot casting and stacking equipment which Brock Metal installed in 2018 for the last 18 years. NFM has thus gained a great deal of knowledge and experience with the machinery and how to maximise its performance. This, and the market opportunities created by the joining of the two businesses, mean it is now wished to increase melting capacity even earlier than anticipated.

In an uncertain business environment (Brexit) increasing melting capacity will give the business options. The greater production capacity it opens to door to can be used in two possible ways:

1. To support further significant sales growth should this be available to Brock Metal in the future market.

2. To maintain current sales volumes but to produce them at lower cost by eliminating overtime and, potentially, producing them on just 2 shifts rather than the current 3.

We have been advised by the Environment Agency that the equipment it is proposed to install in order to increase melting capacity will require a Standard rather than a Significant Variation (see Section 4). In line with further advice from the Environment Agency, this application seeks to raise the limit on melting capacity such that it is adequate for and presents no restriction to, all defined future developments.

2. Description of Current Melting Processes at Brock Metal

Melting at Brock Metal has long been carried out using gas-fired furnaces. A large hemispherical cast iron crucible is supported around its flanged edge in a refractory-lined furnace well. A gas burner heats the air contained in the space so formed between the crucible and the refractory well. There are 14 such 'standard' furnaces at Brock Metal.

The crucible in each furnace can hold 5 tonnes of Super High Grade (SHG) zinc (99.995% pure) and alloying elements. The crucibles are loaded with solid metal in the form of blocks and slabs and this is melted down over the course of approximately 4 hours. In addition to these 'standard' furnaces, there is also one refractory-lined reverbatory furnace which can hold 6 tonnes of SHG zinc.

3. Treatment of Melting Capacity in the Brock Metal Environmental Permit

The Environmental Permit for The Brock Metal Company Ltd (EPR/MP3936UJ) includes a description of melting capacity within the Operational Techniques section. The description is framed in terms of *the total tonnage the site can melt at any one time* – something which is limited by the number and capacity of the furnaces on site. The total tonnage permitted can thus be thought of as the total tonnage of metal that can be held within all the furnaces on site at any one time. It is not a maximum daily production tonnage figure and has been worded as such to reflect this.

In the current Permit EPR/MP3936UJ, (Section S1.2 Operating techniques), Application for Variation EPR/MP3936UJ/V007 defines the melting capacity of the zinc alloy production process, as comprising:

- *Up to fourteen 5 tonne capacity furnaces, or a combination of 5 tonne to 7 tonne capacity furnaces, with a total maximum capacity of 74 tonnes (for zinc ingot production); and*
- *One 6 tonne capacity furnace (for zinc 'bullet' production)*

Total potential capacity of zinc alloy production of 80 tonnes

4. Proposed Increase in Melting Capacity

We propose to increase the total potential capacity of zinc alloy production (the maximum total tonnage the site can have in the melting processes) at any one time from 80 tonnes to 120 tonnes. The component parts of this increase are described below.

1. Replacement of 5 tonne capacity crucibles on the new ingot plant with 6 tonne crucibles

   This will involve the 9 furnaces which feed the new automated ingot casting and stacking plant. It increases the total melting capacity on site to 85 tonnes, and thus takes it above the

80 tonnes currently permitted, but because it is such a small change in total capacity our COMAH Officer has given permission for this to be done under the existing Permit.

2. Installation of an 18 tonne reservoir for holding molten zinc

   The reservoir is a steel tank insulated with a refractory lining on its floor and sides. Its holding space is a cube of side 1.5m which can contain 18 tonnes of molten zinc alloy. The operation of the reservoir would involve rapidly pumping into it the molten contents of 3 x 6 tonne crucibles which have been melted during the night shift. This molten metal can then be cast direct from the reservoir on the new plant whilst the three crucibles concerned can be re-charged and begin their next melting cycle.

   Although the level of insulation installed in the reservoir is high and sufficient to keep its contents molten for at least 3 hours, it is sensible to have the ability to put some heat into it to guard against its contents solidifying in the event that there is a lengthy breakdown on the casting and stacking line. It is also sensible to be able to pre-heat the reservoir before filling it with molten zinc alloy. Therefore, the reservoir will have 2 small burners attached to it, directed downwards into it. As advised in the recent Environmental Agency EPR Compliance Assessment Report (see accompanying document '*EPR CAR MP3936UJ 0322175_141218*') it is understood that this will mean the reservoir is classed as a furnace rather than a holding vessel.

3. Replacement of 5 tonne capacity crucibles on the block casting plant with 6.5 tonne crucibles

   This would involve the 5 standard furnaces which feed the block casting plant. It will be pursued according to market development and the future demand level of one significant UK-based customer.

The above developments thus represent an increase in total melting capacity of:

Ingot Plant:	9 crucibles x 6 tonnes =	54 tonnes
Reservoir:	New plant addition	18 tonnes
Block Plant:	5 crucibles x 6.5 tonnes =	32.5 tonnes
Bullet Plant:	Unchanged	6 tonnes
		———
TOTAL		110.5 tonnes

In future it may become possible to install 7 tonne crucibles on the Ingot Plant giving a melting capacity on this plant of 9 x 7 tonnes = 63 tonnes and a total plant melting capacity of 119.5 tonnes.

This application therefore seeks approval for a Standard Variation to increase the permitted total melting capacity on site to a figure of **120 tonnes**.