4th Annual Global Magnesium Industry Climate Protection Workshop

2008 Annual World Magnesium Conference

Warsaw

18 May 2008

Experimentation for SF6 Destruction in Magnesium industry: Uncertainty assessment from CDM point of view

Kishor Rajhansa

Programme Officer – Methodologies

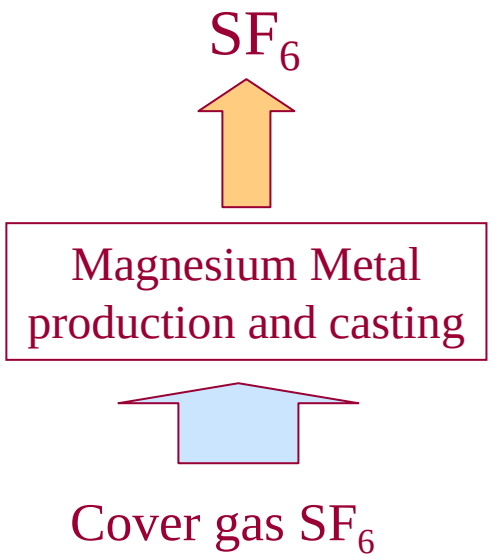
UNFCCC

UNFCCC

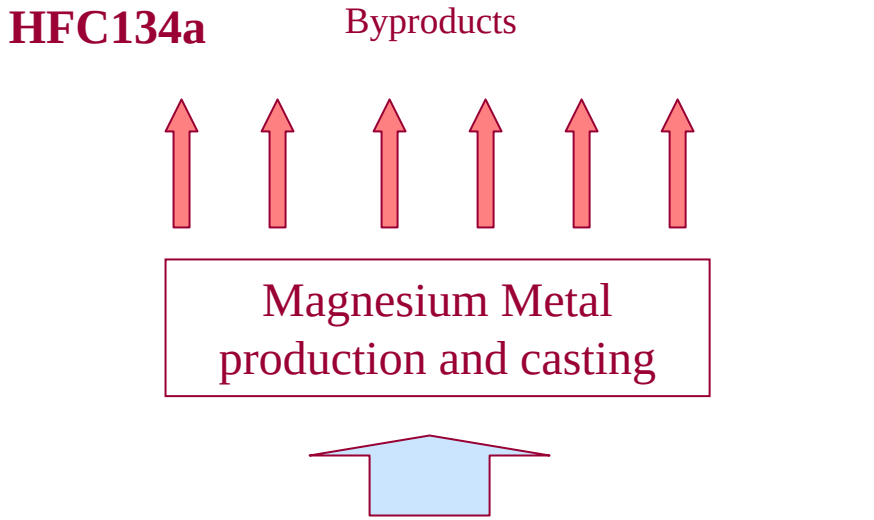
http://cdm.unfccc.int/

Approved CDM Methodology AM0065
(Replacement of SF_6 with alternate cover gas in the magnesium industry)

Baseline scenario



Project scenario



- The baseline is = 0.5 * SF6 consumption; where 0.5 is default destruction of SF6. Methodology suggests using the lower of two values as baseline SF6 consumption: the historical value or IPCC default of 1kg per tonne Mg.
- Experiments for estimation of baseline destruction factor proposed, but procedure could lead to high level of uncertainty
- Limited studies available on SF6 destruction; IPCC states 30% destroyed.

Issue related to uncertainty of baseline destruction factor of SF6

The existing experimental procedures, (used by EPA and proposed by new methodology NM0252), are based on ;

- Measurement of concentration in input feed and comparison with concentrations at specific points above the surface of molten metal.
- The experiments makes two assumptions:

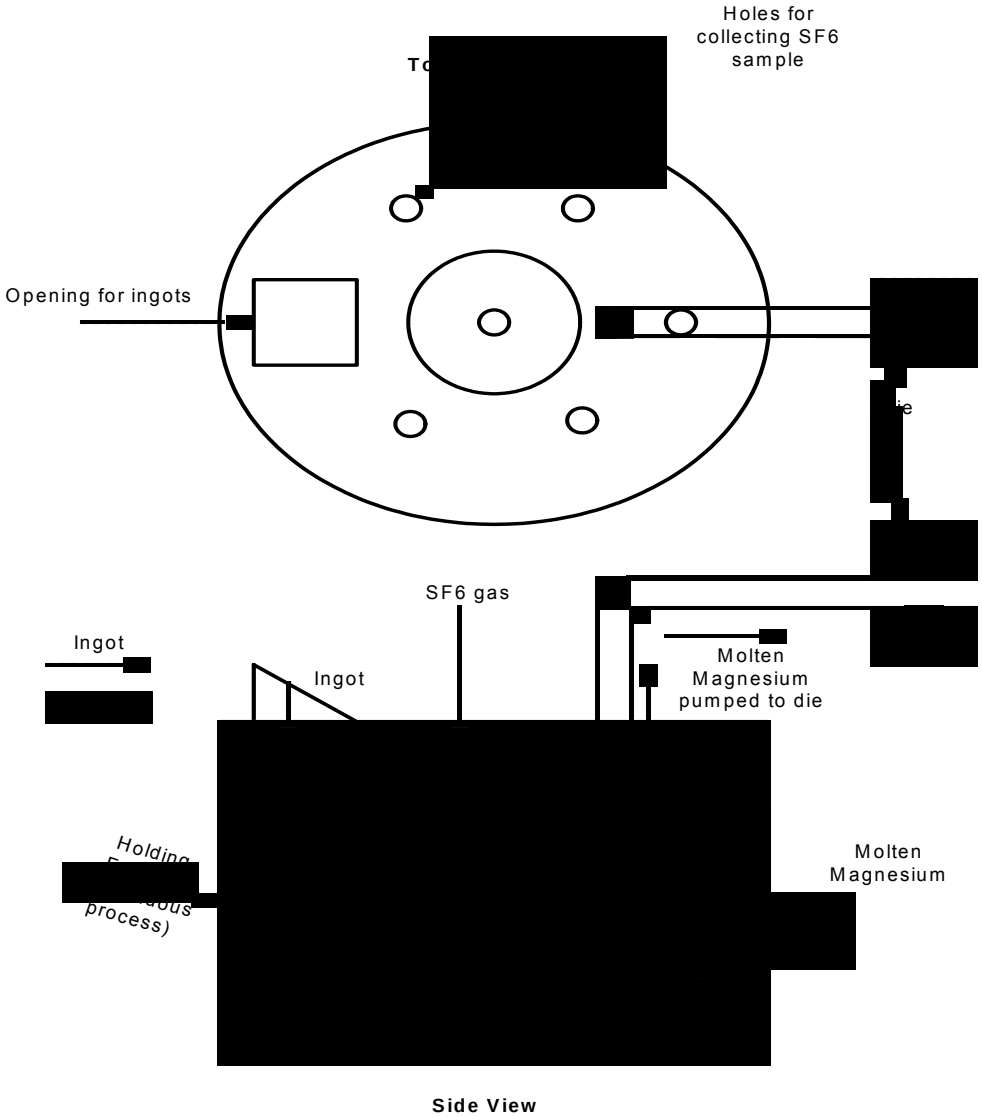
(i) a few sample points would give a representative picture of the whole cross-section; and

(ii) the samples are taken from the place where destruction is occurring (close to melt surface)

Other issues with existing experimentation

- The process is variable: Operating conditions and use of SF6 can vary from machine to machine and over time.
- The variability in result is large as the sampling process to measure concentration may require additional rigor and duration.
- No standardization for the use of SF6 to ensure that baseline is not deliberately inflated.
- The number of existing experiments is limited : Do not cover all variations to be able to represent industry practices as a whole.

Example of issues for experiments in Die Casting



SF6 measurement in holding furnace used for die casting

Example Experiment conducted by EPA

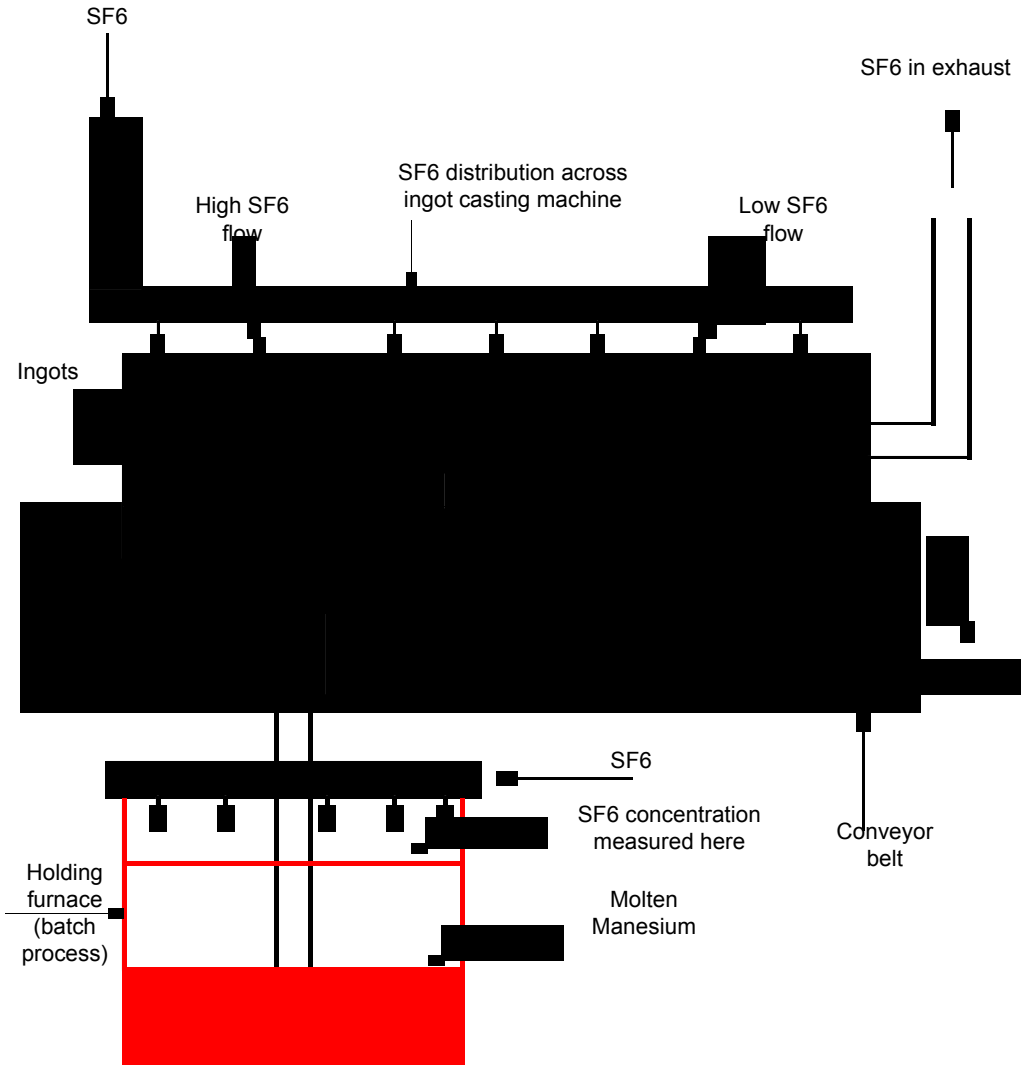
- Extracted sample of cover gas (SF6) from several points in the gap between the molten metal and the lid.
- All emissions take place in holding furnace and not mould.
- The collected samples were mixed and average concentration of SF6 in mixed sample was measured

Example of issues for experiments in Die Casting

Issues identified

- The SF6 destruction depends on: 1) the **alloy** and 2) the **rate of feed of the ingots** (as this will impact the turbulence) 3) individual operator's rate of feeding of SF6 to the process, as it is controlled manually in some instances.
- Instrument Calibration: Necessary particularly for those measuring the flow of SF6 in furnace. This is not necessarily happening in the industry.
- Large variability within process itself: The highest fluctuations take place when ingot is introduced in the holding furnace because the disturbance of protective layer takes place at that time exposing molten metal to SF6.
- Variation in operating conditions: Can be different within the same company or from site to site, so standardization is not possible.
- The studies done are not sufficiently large: To analyze the impact on placement of sample collector on destruction estimation.
- No common exhaust provided to collect sample: But it is argued that if such exhaust is used in actual practice, it will increase the SF6 supply to the process, resulting into less overall destruction for a given amount of magnesium production.

Example of issues for experiments in Ingot Casting



SF6 measurement in ingot casting

Experimental considerations

- SF6 concentration would be measured at several points in the gap between the molten metal and the lid of holding furnace and in ingot casting hood.
- Casting hood would likely have lower destruction relative to the holding furnace.
- The distribution systems of SF6 cover gas to the melting pot and to the ingot production can be separate.
- Casting hood exhaust capture is typically not used due to interference with the protective cover gas environment – would likely require higher flows and concentrations to maintain protection.
- Cover gas can be a mixture of SF6 and SO2

Example of issues for experiments in Ingot Casting

Issues identified

- Ingot casting is part of primary or secondary magnesium manufacturing industry and will require different measurement procedures relative to holding furnaces.
- Key factor for use of gas: Amount of SF6 used in this process depends upon the **alloy** that is being produced, in some cases the amount of SF6 used can double between different alloys.
- Since the destruction in holding furnace and ingot casting machine are different, the use of a common destruction factor for overall use of SF6 may be over estimation of destruction.
- Instrument Calibration is an important issue in this case also.
- Large variability within process itself: The flow of SF6 is constant in furnace but since furnace operates under batches, the fluctuations in SF6 destruction is likely when one batch is transferred and new one is filled, due to exposure of SF6 to more or less hot areas of molten magnesium and crucible surfce.
- The SF6 flow is typically higher in the beginning where hot metal is poured into ingot mould and it is less as the ingot moves through the casting hood.
- The operating conditions can vary within same company from site to site, so standardization is not possible.

Jeremy Scharfenberg of ICF International contributed to the information contained in this presentation.

Conclusion

- It is proven that CDM credits generate large incentives for magnesium industry, which will encourage them to take up projects of alternative cover gases other than SF6. CDM generates approximately 10 CER per tonne of Magnesium produced which values approx. 10% of sale price of Magnesium
- The existing experiments conducted by EPA do not capture all the real-time production variations such as those related to quantity of production, alloy types, operator practices and SF6 flow; due to practical difficulties, whereas for developing baseline destruction factor for SF6 methodologies this would be needed.
- If alternative for default baseline SF6 destruction factor of 0.5 (as per approved methodology AM0065) is to be derived, a more rigorous experimentation procedure is needed, taking into account the real-time issues of industry.

Thank you

krajhansa@unfccc.int