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Technologies

4th Annual Global Magnesium Industry Climate Protection Workshop

Update on Advance Magnesium Melt Protection Technologies

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2008 World Magnesium Conference
May 18, 2008 – Warsaw, Poland

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Recent Market Trends

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Recent Market trends

- √ Carbon credits have become realty
  - Approbation of Methodology AM0065 by the UNFCCC on February 1st, 2008
  - All major processes (Dilute SO2, Novec 612tm and HFC-134a) are recognized by UNFCCC
- √ Timing for conversion project is getting critical in order to take advantage of carbon credits
  - Experiencing pressure from customers to execute ‘fast track projects’
  - Typical cycle time for plant wide conversion is 12 weeks upon budget approval



Recent Market trends

√ Plant wide conversions are more popular

- Most projects during last year were plant wide conversions and involved large capacity systems

√ Number of gas conversion projects has increased

- 10 major conversion projects occurred last year
- 4 Conversions with Novec612^{tm} and 6 with Dilute SO_2
- No information on conversions with with HFC-134a is available (HFC-134a was not present at the last EPA Trial and no new projects were inventoried by major actors of the industry)

Recent Market trends

√ Last year's types of projects:

- 4 Alloying systems (Dilute SO_2)
- 2 Recycling systems (Dilute SO_2 + Novec612^{tm})
- ~200 Die casting machines (Dilute SO2 and Novec 612^{tm})
  - All Chinese projects were Dilute SO_2
  - All North American projects were Novec612^{tm}
  - Die casters converted were any size, brands and models

General Conclusion on Market trends

- √ The Magnesium Industry can take advantage of carbon credits to offset conversion costs of replacing SF6 gas before the end of the Kyoto protocol.

- √ Major environmental improvement is achievable.

- √ Long term significant gains in operation costs are possible.

Concerns related to recognized alternatives

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Concerns related to Dilute SO_2

Dilute SO_2 is well know for its low cost of operation (approximately 1/5 to 1/10 the cost of the SF_6).

SO_2 is present and many industries such as preservative for beer and wine, bleaching agent of oils and foods, as refrigerant in the ice industry; in disinfecting, …

However, concerns related to the occupational exposure should be addressed

Concerns related to Dilute SO_2

Occupational exposure precautions:

√ Leak detection monitoring is built-in:

- 2 ppm: Warning signal
- 5 ppm: Threshold Limit Value reached. The system must be automatically switched off and the backup unit turn on

√ Operator protection during bottle changes:

- Forced ventilation (provided by the mixer)
- Gas Mask
- Gloves, boots and safety glasses

Concerns related to Dilute SO_2

Occupational exposure precautions:

√ Effective training including periodic update on:

- Safety procedure:
  - Detection of SO_2 leak
  - Emergency Response Plan
  - First Aid Treatment
  - Precaution in Handling and Storage
- Operation & trouble shooting of the system

√ Limit access to the equipment to qualified personnel

√ Annual maintenance & calibration program

Concerns related to Dilute SO_2

What is required by the UNFCCC ?:

- Well controlled SO_2 concentration (around 1%) with precise gas mixing and delivery system using MFCs (Mass Flow controller)
- Ensure that SO_2 emissions are in compliance with local regulations
- Heated SO_2 gas lines
- Gas cabinet or storage area with leak monitors and emergency ventilation system
- Redundant backup melt protection in case of mixer shut down
- Emergency response plan, training and personal safety equipments
- Maintenance plan for equipments and gas distribution system

Concerns related to Fluorinated cover gases such as Novec 612th and HFC-134a

Novec612^{tm} and HFC-134a are excellent alternatives where plant configuration does not suit the use of SO_2.

However, the following concerns should be addressed

Concerns related to Novec612^{tm}

Accuracy of the gas mixer is critical:

√ Prevent the formation of toxic volatiles

Used in excess, Novec612^{tm} produces toxic HF gas.

√ Optimize operation cost

Novec612^{tm} is effective at extremely low concentration (~0.00035%). An inaccurate system can easily overshoot the concentration and impact operation cost

Concerns related to HFC-134a

√ Potential of ban for HFC in many countries

√ Support

Once the license has been bought, the solution still needs to be deployed.

In small size applications, existing manual gas mixers can rarely be adjusted meet required mixing.

In large scale applications, HFC-134a needs to be carefully controlled to prevent liquefaction and other operation problems.

Conclusion

√ Time is of the essence in moving forward with conversions

√ The alternative replacement varies with each plant configuration and process.

√ It is false to think that a single solution will fit all the industry needs.

√ Each alternative has its best application.