Meridian Magnesium Products of America SF6 Conversion Path

EPA Round Table discussion May 18th Warsaw, Poland

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Presentation Index

- Meridian Overview
- Decision Making
- Finding a Solution
- Implementation
- Conclusion

Overview

Meridian is the Leading Full Service Supplier of Innovative Magnesium Diecasting Components and Assemblies in the Global Automotive Market

- **Worlds Largest Producer of Magnesium Components**
- **Die Casting Company Evolving into a Provider of Engineered Solutions**
- **Die Casting Magnesium since 1981**
- **Flexible Skilled Workforce**

- **Facilities**
- 3 North American Mfg. Facilities
- 2 European Mfg. Facilities
- 2 Asian Mfg. Facilities
- Global Technology Center

- Over 65 total DCM's from 280 to 3200 Tons
- Over 1200 dedicated employees
- Over 600,000 ft^2 of manufacturing space
- Over 40,000 Net Metric Tons of Product Shipped Annually
- Various secondary machining, coating, and assembly

- Meridian is committed to global growth as a leading automotive supplier

Meridian TECHNOLOGIES INC.

SUPERIOR MAGNESIUM DIECASTING BY DESIGN

Bus. Dev.,AE & Program Mgmt. Stuttgart, Germany

Bus. Dev. Bordeaux, France

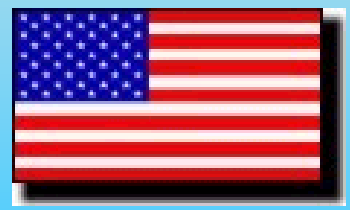
MPD Plant E Strathroy ON

Bus. Development AE & Program Mgmt. Plymouth, Michigan

Bus. Dev. Turin, Italy

Bus. Dev. & AE Tokyo, Hamamatsu Japan

Eaton Rapids, Michigan, USA



- Started production in 1994
- 360 employees
- 13,140 Net Metric Tons
- 208,000 ft^2 (13,800m^2) Plant Size
- 15 Die cast cells
  - 2 - 800 ton
  - 4 - 1200 ton
  - 1 – 2500 ton
  - 8 - 3000 ton
- Secondary Operations
  - 9 CNC machining centers
  - 2 Tri-Way machining centers
  - Special purpose drilling centers
  - Special purpose machining/assembly machines
  - Automated assembly equipment
  - Automated vision inspection stations for IP assembly and MRS programs
  - Leak Test equipment
  - Paint Line for MRS program

- ISO/TS 16949:2002 Registered
- ISO14001 Registered
- Q1 Certified Supplier to Ford

Strathroy, Ontario, Canada

- Started production in 1981
- 16,000 Net Metric Tons
- 408 employees
- 229,000 ft^2 (21274m^2) Plant Size
- 21 Die cast cells
  - 4 - 800 ton
  - 8 - 1200 ton
  - 7- 1600 ton
  - 2 - 2500 ton

- Secondary Operations
  - 12 dedicated machining and assembly operations
  - Automated Vision Inspection Station for IP's
  - In-House Recycling operation
- ISO/TS 16949:2002 Registered
- ISO14001 Registered

Strathroy, Ontario, Canada

- Started production in 2001
- 2,666 Net Metric Tons
- 72 employees
- 71,000 sq. ft (6,595 sq.m) Plant Size
- 4 Die cast cells
  - 2 - 1600 ton
  - 2- 3200 ton
- Secondary Operations
  - 3 dedicated machining and assembly operations
-

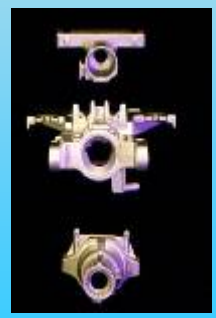
- ISO/TS 16949:2002 Registered
- ISO 14001 Registered

Product Applications

INTERIOR STRUCTURES

- *Instrument Panel*
- *Seat Frame*
- *Steering Column Components*





BODY & CHASSIS STRUCTURES

- *Radiator Support*
- *Front of Dash*
- *Door Closures*
- *Cross members*
- *Engine Cradles*




POWERTRAIN

- *Transfer Cases, Transmission Housings*
- *Intake Manifolds, Valve Covers, Oil Pans*
- *Engine Brackets, Engine Mounts*






Decision Making Process

- Original testing by Meridian takes place in 2001 at our recycling facility in Strathroy, Canada.
- Several gases were tested during this time to determine the cover gas properties and feasibilities.
- Health and Safety concerns were also a major area to test.

Decision Making Process

- Further testing done by the EPA and IMA helped clarify the options.
- Testing revealed three gases that we felt could perform well protecting magnesium.
- A decision matrix was used to determine which gas would be most suitable for our processes.

Decision Making Process

Items considered in matrix

- Ability to protect
- Dross Production
- Health concerns normal and abnormal
- Operational costs
- Capitol required
- Global warming potential
- Affect on metal quality

Decision Making Process

In 2002 we purchased a SO2 mass flow controlled mixing station from Polycontrols in Brossard Quebec for our test site in Canada.

We wanted to collect further data on:

1. **Dross Production**
2. **Gas usage**
3. **Protection ability**
4. **Health & Safety measures taken were adequate**

We also continued to look at the other cover gases during this time.

Decision Making Process

- Problem
  - The capitol required to covert each site did not meet the return on investment required by our corporate standards.
  - While committed to eliminating the use of SF 6 Meridian needed to be able to pay for the implementation costs.
  - We were dedicated to meet the 2010 commitment we had made to the EPA.

We needed a solution to help with the implementation! The project was on hold!!!

Finding A Solution

- A session at the EPA sponsored 4th International Conference on SF6 and the Environment in San Antonio, TX dealt with the carbon credit market and its ability to generate funds for environmental projects.

- We contacted several companies and discussed the Carbon Credit possibilities.

Finding A Solution

- In January of 2007 we signed a contract with Quality Tonnes (CCC) to develop a UN approved Methodology that would enable us and others to sell carbon credits. These credits could generate funds to help off set capitol and operating costs.

- The Project is back on track!!!!

Implementation

- It was decided that we would run the Die Cast plants and all of recycling except the melt furnace on Novec™ 612 and the melt furnace in recycling would run on SO2.
- We obtained quotes from vendors for mixing stations and issued PO's to Polycontrols in late Sept of 2007. Lead time for the mixing stations was 90 days.

Implementation

- We installed 800’ of type K copper tubing the entire length of the Die cast facility to run the Novec™ 612 gas through. All joints were silver soldered and done under an argon purge to prevent flaking inside the pipe.

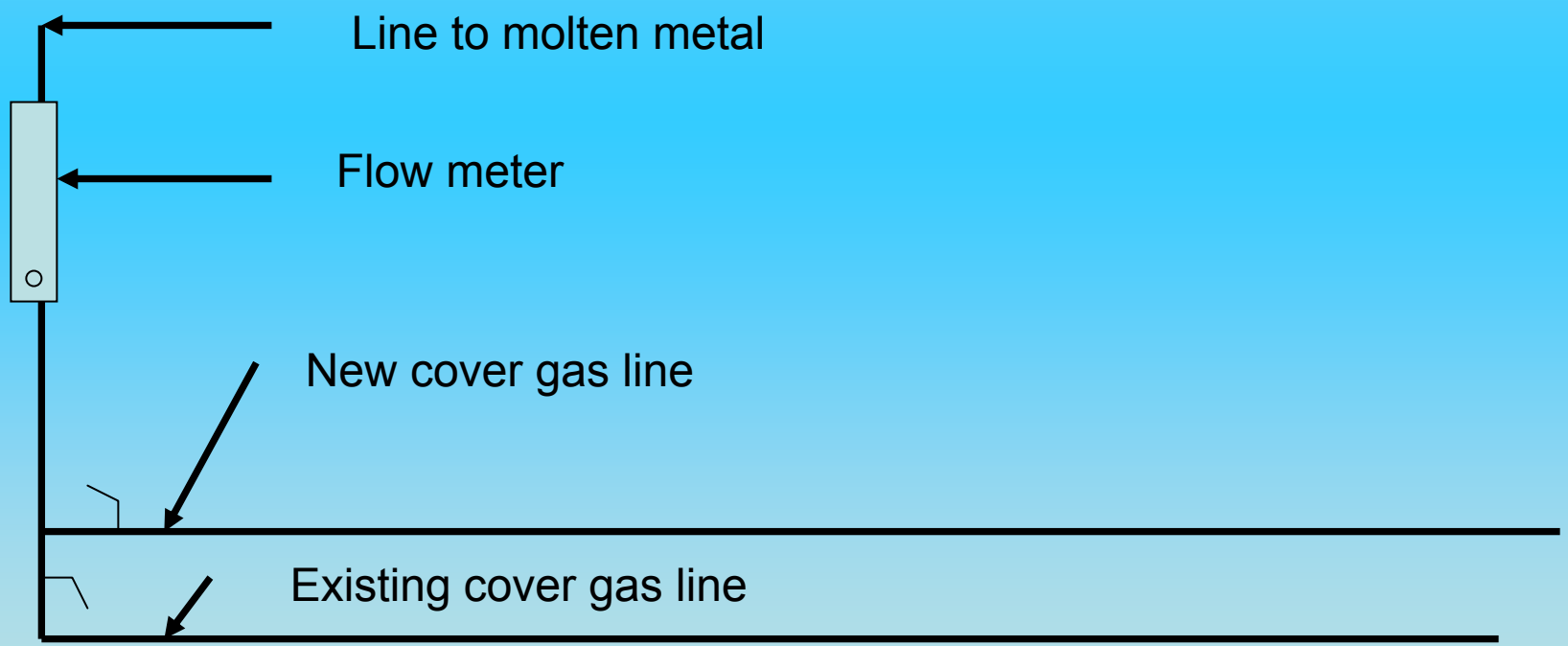
Implementation

This was done to enable us to do the conversion one cell at a time. By doing this it helped with operator buy in to the project

- We tied into our existing cover gas line during our Dec shut down and utilized the existing flow meters.

Implementation

- Typical installation



Implementation

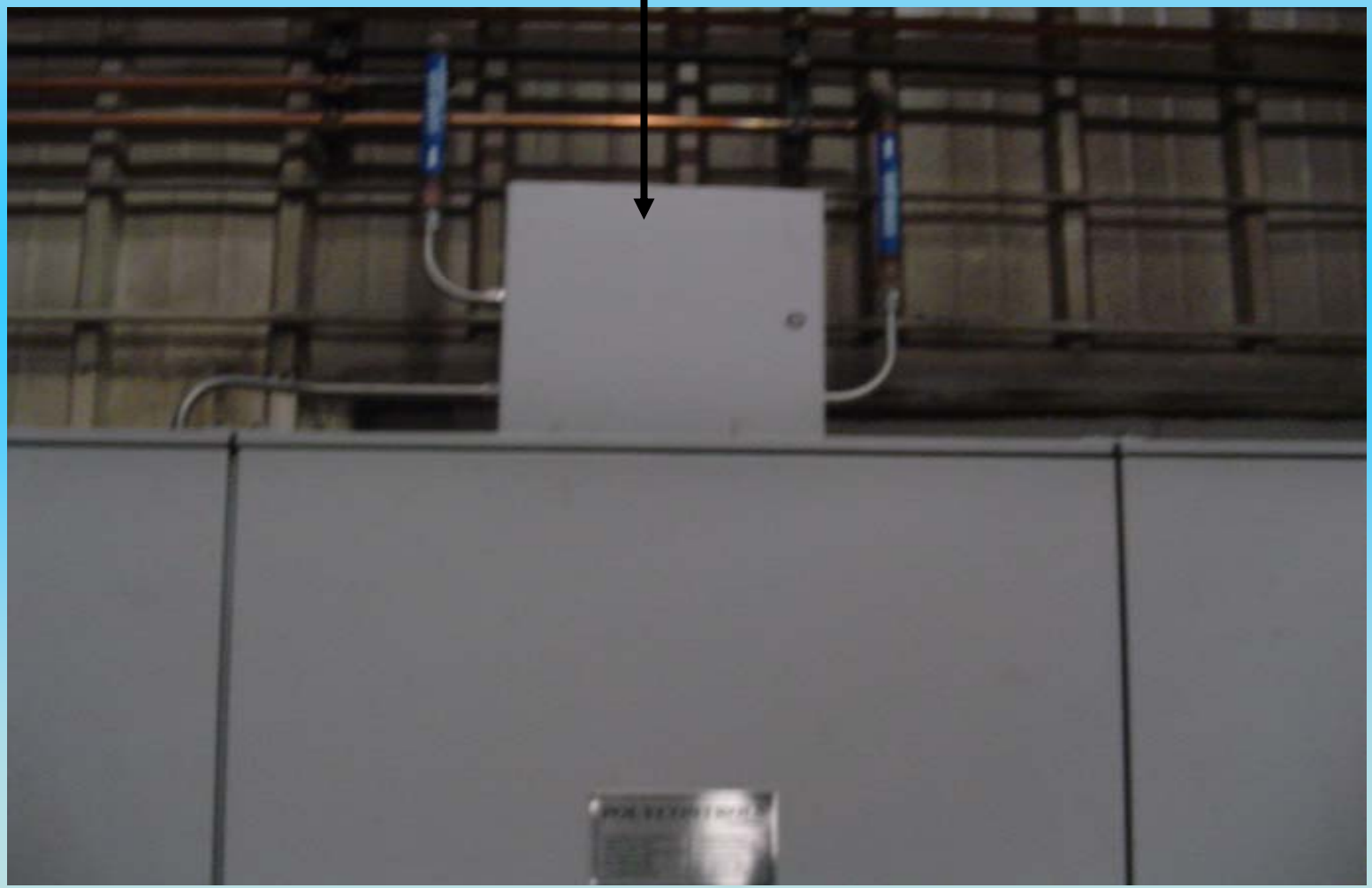
- The die cast plant panel arrived in late Jan and took 2 weeks to install.
- Once ready the conversion was done over a period of two days in the die cast plant.
- By the 14th of Feb the entire die cast facility was running the Novec gas.

Implementation

- The existing SF6 cover gas is plumbed into the new cover gas panel to provide a back up system in case of electrical outage, or other panel malfunction.

Implementation

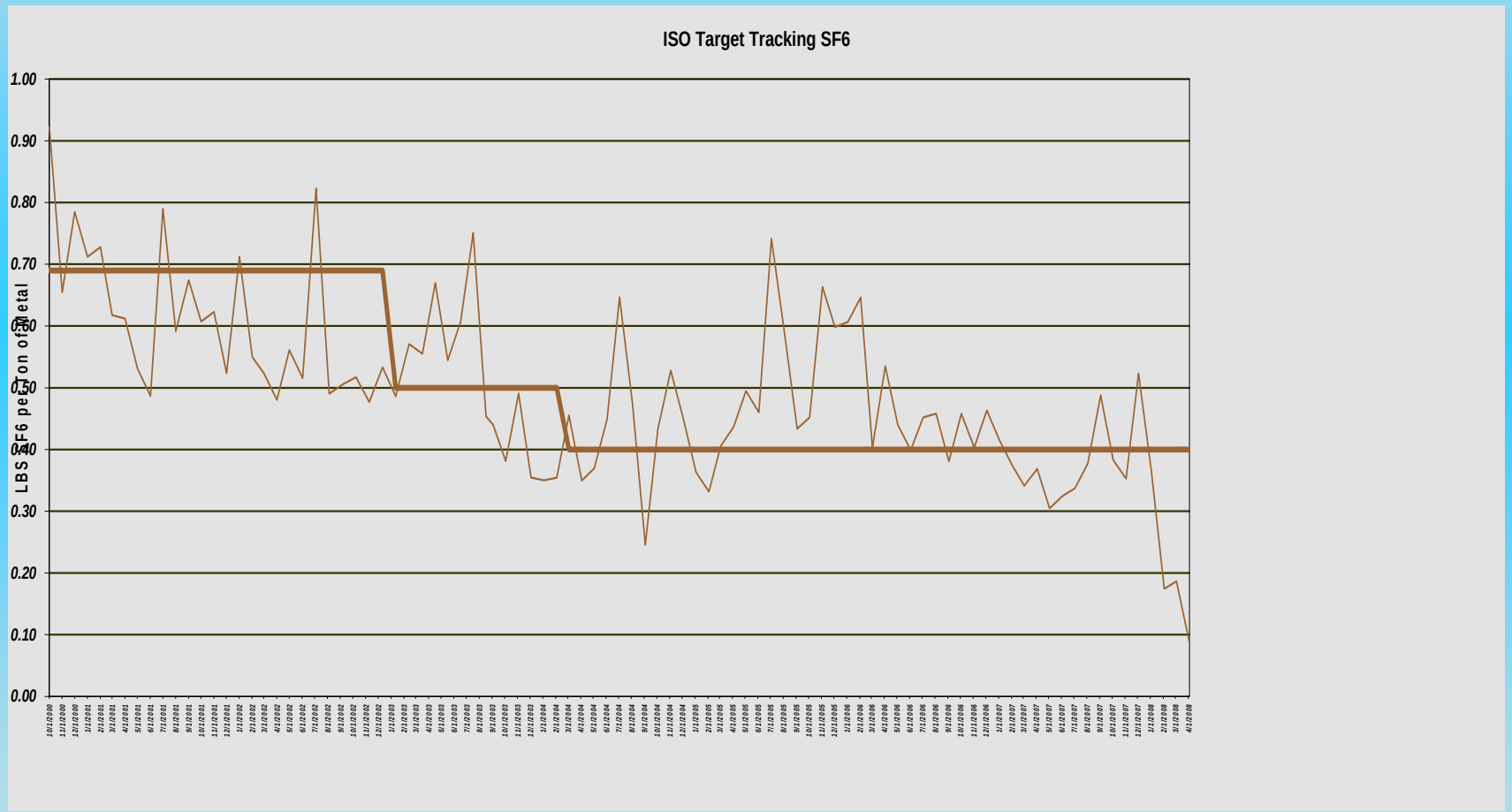
Change over Station



Implementation

- Air monitoring for HF and other off gases was done to ensure employee health.
- The die cast conversion was extremely smooth. There was no impact to production during the conversion.
- Monitoring of dross production, air quality and gas consumption continues.

Implementation



Implementation

- The SO2 installation in Recycling required additional monitoring to ensure employee health and safety. Detectors are set to alarm at .5PPM. If this detection level is reached the SO2 is shut down and SF6 is energized.
- Employees in recycling are required to wear respirators in areas where SO2 is used.
- Detectors are required to check for leaks.

Implementation

Personal detector worn by employees where SO2 is used

Fixed detectors located in 7 locations in building to detect excess So2 levels

Implementation

- Leak detector

Conclusion

- Approximate capitol costs
- Mixing station range $5,000 - $15,000 Per Die cast machine depending upon what type of unit is used.
- Installation costs were approximately $50,000 for each plant.
- Capitol costs can vary depending upon type of mixing station installed.

Conclusion

- Additional injection ports may be needed depending on lid arrangement. Currently we are using about 1.5 LPM per sq ft (.09 m^2) of surface area that is protected.

Conclusion

Typical cover gas distribution

Conclusion

- Involve employees in implementation.
- Dross levels have increased about .1%
- If using So2 additional ventilation may be needed.
- Temperature can affect the quality of the gas protection. Temperature levels above 680 C show signs of deterioration.

Conclusion

- For additional information on cover gas review the EPA test results located at:

http://epa.gov/magnesium-sf6/resources.html#paper

- Carbon Credits may help fund the conversion to an alternate cover gas.

Conclusion

- Both Novec™ 612 and SO2 work well for protection.
- If you have trouble with melt protection using SF6 you will also have trouble with the alternate gases.
- Novec levels of 250 PPM and 20% appear to work the best.

Conclusion

- Control of gas levels must be maintained to prevent generation of HF (Novec) and high SO2 levels that may impact employee health.
- If existing SF6 station is kept as a back up. Establish a PM to ensure periodic use to ensure readiness when needed.

Conclusion

- Questions?