Public/Private Partnerships Discover Environmental Solutions

3rd International Conference on SF_6 and the Environment

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Scott C. Bartos

U.S. Environmental Protection Agency

SF6 Emission Reduction Partnership for the Magnesium Industry

Outline

- Framework for Cooperation
  - How did we get here?
- Industry Trends
- ’03-’04 Partnership Highlights
- Partner Accomplishments
- Strategy – *Foster Technological Transition*
  - Upcoming activities
- Conclusion

Partnership Framework

- Understand the industry, emission sources, and environmental concern
- Open dialogue, seek common interests, draft agreement
  - Environmental stewardship
  - Improve product quality and cost
  - Conserve resources = save money
- Collect data, identify reduction opportunities, garner support
- Establish Climate Protection Goal
  - Send clear signal to industry suppliers, policy makers, and customers
- Support technical innovation and promote information sharing
- Monitor progress and reward achievements

Industry Trends / Emerging Opportunities

- China dominating world 1° production – 500,000 mt
  - If / when China uses SF_6 = 3.3 MMTCE in 2003
    - Inexpensive SF_6, domestic supply
    - Hydro Mg & Meridian operating in China
- US Magnesium poised for growth
  - new cell technology reduced Cl emissions and cut energy demand by 25%
  - expand to 55,000 metric tons – 2006
- Die casting to become largest market for Mg in 2005
  - 10% annual growth through 2008

’03-’04 Highlights: Support Technical Innovation

- Completed 1st independent production scale study of alternative cover gases
  - Intermet (Mg die caster)
    - Novec™ 612 (F-ketone)
    - AM-cover™ (HFC-134a)
    - SF_6
  - Both alternatives reduce GHG emissions by 99%
  - Support IPCC guidance for estimating cover gas emissions
- Concluded 3-year cooperative cover gas study with IMA and Canada
  - SINTEF – Norwegian Industrial Research Institute
  - Laboratory evaluation of non-optimized cover gases and protective mechanisms
    - SF_6
    - AM-cover™
    - Novec™ 612
    - HFE 7100
  - All three alternatives performed better than SF_6
  - Final report and metal samples available at IMA

’03-’04 Highlights: Promote Information Sharing

- TMS Annual Meeting
- IMA Annual Meeting
  - expert panel on SF_6 reduction strategies
- Launched partnership web site
  - www.epa.gov/magnesium-sf6
- Advise policy making and scientific community
  - Update IPCC emissions estimating guidance
    - 5-20% destruction of SF_6
    - GHG emissions from alternative technologies

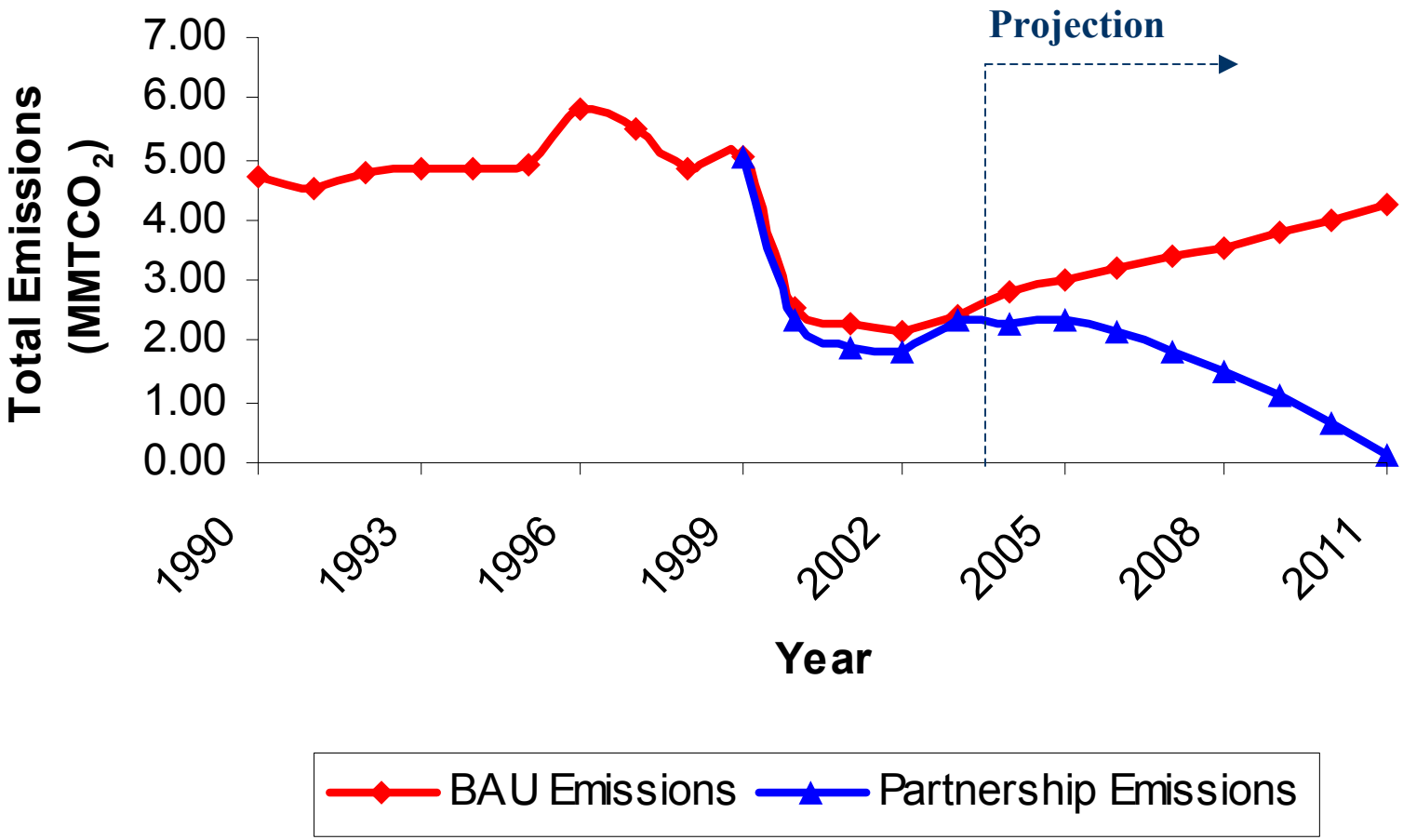
’03-’04 Highlights: Recognize & Reward Achievements

- White House recognizes EPA’s Partners and the International Magnesium Association (IMA)
  - Climate VISION initiative
  - Committed to eliminate SF_6 emissions by 2010
- EPA’s 2004 Climate Protection Award
  - 16 partners and IMA
- Certificates of Recognition
  - Chicago White Metal Casting
  - 3M Electronic Markets and Materials Division
  - AMT / Cooperative Research Centre for Cast Metals Manufacturing

Partner Accomplishments

- > 50% reduction in emissions since inception in 1999
  - 5.0 MMTCO$_2$ in ’99 to 2.4 MMTCO$_2$ in ’03
  - NWA closed during this period
  - Avg. usage rate for die casting = 2.5 kg SF$_6$/mt Mg
- Aggressive focus on “good housekeeping”
- Identify and adopt viable alternative melt protection technologies
- High quality emissions data
  - All within +/- 20%, some +/- 5%

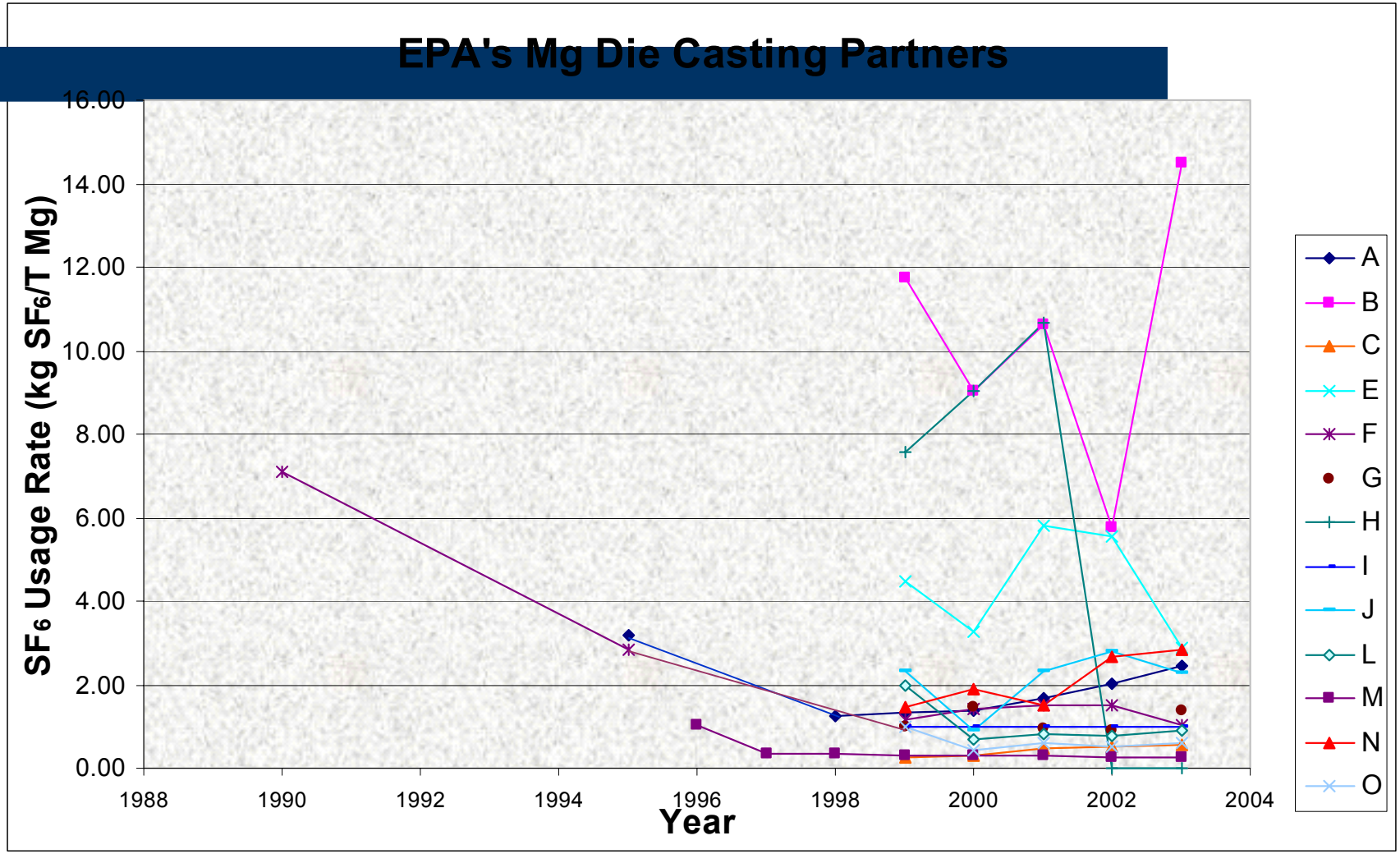
Magnesium Partnership vs BAU Emisisons



*1999 Dow ceases 1º Mg production

**2001 NWA ceases 1º Mg production

U.S. Die Casting SF_6 Usage Rates



Current Partners
16 Companies = 80% U.S. Emissions

- Acme Die Casting (Northbrook, IL)
- Advanced Magnesium Alloys Corporation (AMACOR) (Anderson, Indiana)
- Chicago White Metal Casting (Bensenville, IL)
- Consolidated Foundries (Pomona, CA)
- CONTECH Metal Forge Division of SPX Corporation (Alma, MI)
- Del Mar Die Casting (Gardena, CA)
- Diversified Diemakers (Palmyra, MO)
- Hyatt Die Cast & Engineering Corporation (Cypress, CA)
- Lunt Manufacturing (Schaumburg and Hampshire, IL)
- Magnesium Aluminum Corporation (Cleveland, OH)
- Magnesium Products of America (Eaton Rapids, MI)
- Northern Diecast (Harbor Springs, MI)
- Northwest Alloys (Addy, WA) - closed in October 2001
- Product Technologies (Maple Lake, MN)
- Spartan Light Metal Products (Sparta, IL)
- Twin City Die Castings (Monticello, Minnesota)
- U.S. Magnesium (Salt Lake City, UT)

Emission Reduction Strategies

- Prompt leak detection and repair
- Careful cover gas management
  - Dedicated staff or “Champion”
  - Pulsed cover gas delivery
- Alternative cover gas technologies
  - AM-cover, Novec 612, SO_2, CO_2 “snow”
- SF_6 capture and reuse
  - Successful trial at US Magnesium

Partnership Strategy / Next Steps: *Foster Technological Transition*

- Support technical innovation and facilitate adoption of alternative melt protection
  - Cover gas emissions study
    - First two studies very successful!
      - Verified FTIR method
      - 5-20% destruction of SF_6
    - Coordinate with Australia, AMT, 3M, and others (SO_2, CO_2 "snow"?)
    - Primary or secondary producer
    - Improve IPCC inventory guidance
    - Assess workplace health and safety concerns
- Assist China's industry to "leapfrog" SF_6 technology

Next Steps: Outreach & Information Sharing

- SF_6 Conference Internet Proceedings
- Publish technical papers
  - *Environmental Science & Policy* - 1st study of alternative cover gases
  - Automotive Light Metal
  - IMA Annual Conference
- Technical brochure on alternative cover gases with IMA and CMA
  - English and Chinese

Next Steps: Seek Recognition & Reward Opportunities

- High quality emissions data
  - Revise GHG emissions tracking and reporting tool
    - Report via web site
    - Quality assurance checklist
- Credit for emission reductions
  - Track and advise DOE's 1605b update
  - Chicago Climate Exchange
- Fulfill Climate VISION obligations

Conclusions

- Continue seeking reductions via cover gas management
  - Reduce leaks
  - Assure effective delivery and proper concentration
    - Avoid “over protection”
  - Tighten systems
  - ALL important first steps towards elimination
- Study and consider alternative melt protection
  - Need industry leaders to share experiences
- EPA’s Partners are making very good progress
  - Thanks to:
    - Effective leadership at partner companies and the IMA
    - Strong support from material and equipment suppliers