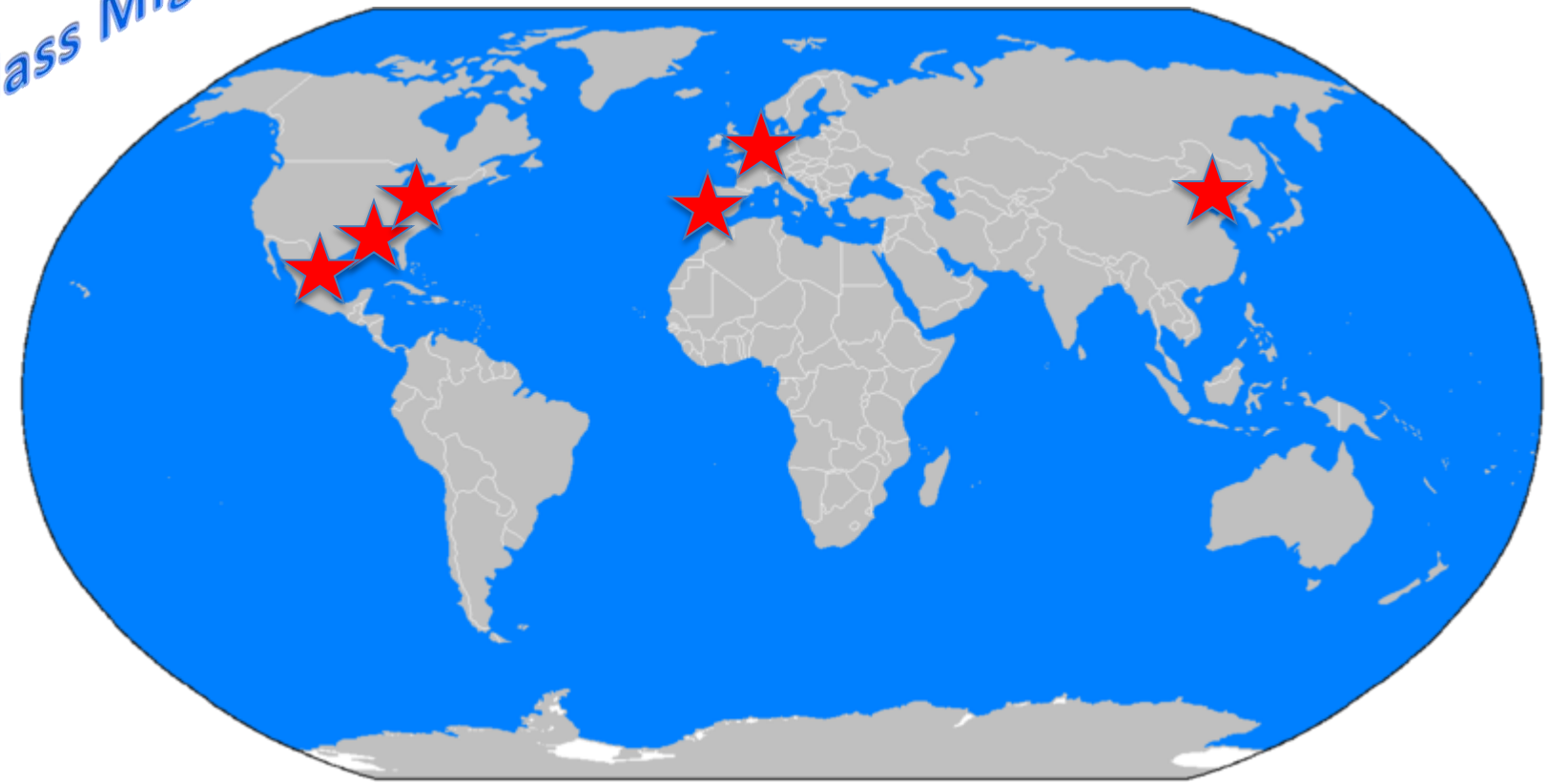
Libbey Glass TC-09 Participation

Libbey®

Libbey Global

Glass Mfg. Locations



Libbey Glass Introduction

- Products
  - Pressed
  - Pressed blown
  - Blow blow
  - Hand to fully automated
- Compositions
  - Soda Lime
  - Boro Silicate
  - Cullet Ratio 10 to 65% Internal cullet only
  - Quality variable to product requirement, 0.05 to .005 seeds per gram
  - Colored glasses – colorant forehearth and tank melts
  - Different fining systems and oxidation states
  - Iron content – 0.010% to 0.035%

Libbey Glass Introduction

- Furnaces – 21 furnaces
  - Air and O2 fired
  - Cold Top Electric
  - Air fired:
    - Regenerative cross fired
    - Regenerative U-flame
    - Recuperative
  - Size: small pot furnace to 260 tpd
  - Boosting or not
  - NG compositional differences
- Environmental constraints
  - Exist at all production locations
  - Dependent on local rules
  - Continuously increasing restrictions expected

Energy Usages at Libbey

- Energy Usage at Libbey
  - Less that 50% of the energy consumed in the factory is in the primary melting of glass.
  - Energy usage in the last 40years at Libbey has been reduced by at least 25 to 30% - efficiency gain and process evolution
  - The different forming processes for tableware have very different energy usages: Blow and Blow, Pressed, Tempered and Hand shop, and Boro Glass tempered
  - Primary melting energy improvements are constrained by high capital costs to modify existing equipment and in some locations environmental regulations that require larger capital cost to implement minor efficiency requirements.

Energy Usages at Libbey

- Energy Conservation Goal – 1% per year, every year
  - Have maintained energy conservation goal for past 5 years
  - Furnace Inspections – world wide - Yearly
  - Furnace Energy reductions as a result of improvement in designs and construction and controls at major and minor repairs
  - Regular plant and process energy audits – world wide program
  - Plant Leak detection surveys –world wide program
  - Compressed air energy reductions due to aggressive analysis and redesign of existing systems

What do we know?

Energy has always been one of the highest costs in glass making and energy consumption reduction technologies have always been evaluated based on cost to implement and payback as well as affect on process and quality.

What does Libbey want from TC-09 Participation?

- Developments:
  - Technical – To be on the front of new and evolving processes and technical developments that reduce energy consumptions in the glass industry.
  - Political – To have an impact on any political initiative in the EU on energy regulation and be aware of any possible changes in existing regulations.