





ADVANCED SOLUTIONS FOR
Glass Melting - Conditioning - Forming

PRESENTATION OF COMPANY PROFILE

PRODUCTS & SERVICES

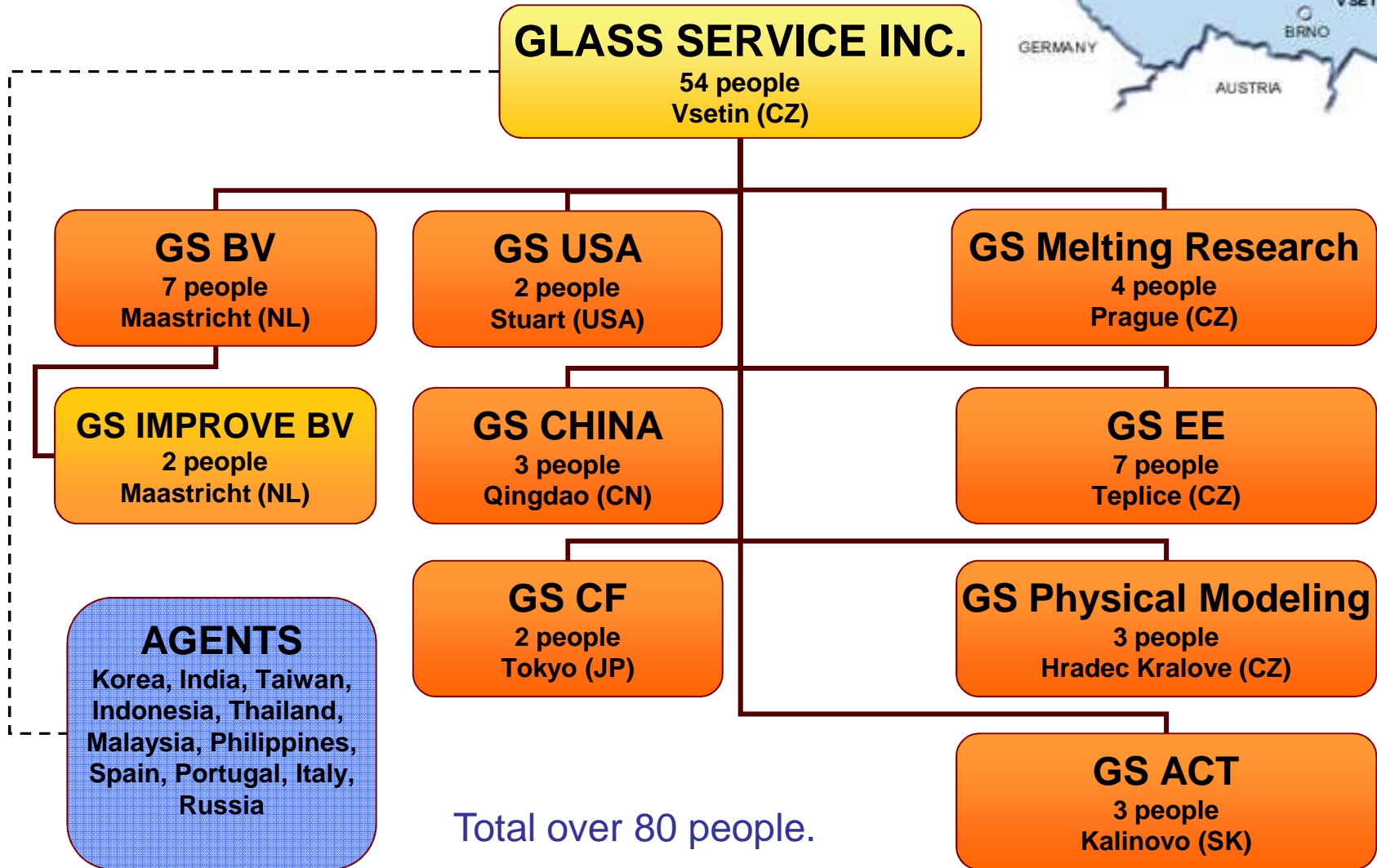


COMPANY PROFILE

- Started in March 1990 as a private company
- Consulting and development of „software tools“ to optimize the glass melting production process
- GS presently employs more than 80 people
(15 former managers from glass factories)
- GS conducts its own research
- GS can provide laboratory services
- Number of GS customers is over 200 in more than 40 countries



STRUCTURE



Total over 80 people.



PRODUCTS & SERVICES

1. Modeling Services
(melter, refiner, working end, forehearths, canals etc.)
2. Glass Furnace Models
3. Glass Furnace Simulators
4. Advanced Control Systems – **ES III™**
5. Glass Defect Analyses
6. High Temperature Observation Comparative Furnace Examinations
7. GS RAPIDOX II™ Furnace Measurements
8. Furnace Audits
9. Physical Modeling
10. Complex System Solutions
11. Hardware



1. MODELING SERVICES

- Air/Fuel, Oxy/Fuel and Electric Furnaces
- Melters, Refiners, Working Ends, Canals and Forehearths
- Furnace Design Enhancements
- Furnace Troubleshooting Tools
- Optimization of Furnace Operation
- Forming Modeling
- Furnace Modeling Software Licences
- Electro Boosting



2. FURNACE MODELS

- User friendly, fast, Utilizing PC Windows

Combustion space

- Air/Fuel – Gas or Oil
- Oxy/Fuel – Gas or Oil
- Volatilization from Glass Melt
- Complex Geometries
- Flame Chemistries, CO, H₂, NO_x, CH₄, H₂O, N₂, O₂
- Staged Burning
- Position of Burners, Flues
- Detailed Burner Geometry i.e. Flat Flame
- Coupling to Glass Melt

Glass melt

- Glass Flow and Temperature
- Batch Melting
- Foam
- Electric Boosting
- Forced Bubbling and Stirrers
- Flow Barriers
- Redox and (Re) fining
- Bubble/Seed (Defect) Concentrations
- Dissolving of Sand Grains or Stones
- Minimum Residence Time
- Glass Quality Indices



3. FURNACE SIMULATORS

- Prediction of Furnace Operational Changes
- Variable Manager / Operator Furnace Control
- Fast Model Predictive Analysis



4. ADVANCED CONTROL SYSTEMS – *ES III*TM

- Supervisory Advanced Control System for Furnace, Refiner, Working End, Canal, Forehearth etc.
- Multi-Input and Multi-Output Control Scheme
- Improved Furnace Operation
- Stabilization of Process (temperature variations etc.)
- Optimization of Energy Consumption



5. GLASS DEFECT ANALYSES

- Seeds, Bubbles, Blisters
- Stones, Cords, Viscous Knots
- On-site Inspection Services
- Many Types of Glass Property Analyses
- Mass Spectrometer
- EDX Micro-analyzer



6. HIGH TEMPERATURE OBSERVATION (HTO) FURNACE COMPARATIVE EXAMINATIONS

- Video Camera Observations
- Refractory Selection Determination
- Batch Formula Optimization
- Refining Processes and Bubble Quantification
- Comparative Furnace Atmospheric Conditions
- Potential Glass Reboil Issues
- Foaming Issues



7. GS RAPIDOX II™ FURNACE MEASUREMENTS

- Measurement of Glass Redox Value
- Quantification of Cullet Changes
- Batch Formula Changes
- Impact to Glass Color
- Simple Rapidox Furnace Operation



8. FURNACE AUDITS

- Visual Record of Furnace History
- Heat Balance
- Infrared Image Analysis
- Emissions Analysis
- Periscope Inspection
- Regenerator Inspection
- Tracer Analysis



9. PHYSICAL MODELING

- Glass Homogeneity Issues
- Complex Glass Circulation Patterns
- Stirrers
- Addition of Frits



10. COMPLEX SYSTEM SOLUTIONS

- Manufacturing Execution Systems – **GS I2C™**
- Special R&D Projects
- Forming Modeling
- Energy Environment
- Productivity Improvemens



11.HARDWARE

- Primary Instrumentation Control Systems
- Electric Pot Furnaces for Hand Made Production
- Small Capacity High Quality Glass Furnaces
- Specialized Laboratory Furnace (HTO) for Melting Analyses
- Mass Spectrometer for Bubble Analyses
- **GS RAPIDOX II™** for Quick Glass Redox Measurements
- Combustion Solutions