ELECTROGLASS
England
The Specialists
in
Electric Glass Melting and Conditioning
Electrical Energy in Glass Melting and Conditioning
- Current Practice and Future Trends

Glassman South America
Buenos Aires, Argentina
29-30 March 2017

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Electroglass Ltd
Typical Gas and Electricity Costs per Kilowatt-Hour

- Gas cost US Cents per kWh
- Electricity cost US Cents per kWh

Countries: A, B, C, D, E, F, G, H, I, J
Gas?
Oil?
Electricity?
Electrical energy in glass melting and conditioning

All-Electric Melting

Electric Boosting in fuel-fired furnaces

Electric Distributors and Forehearths
Selection criteria for All-Electric Melting

Technical

Economic

Both
Selection criteria for All-Electric Melting

Technical
Economic
Both
The Batch Blanket of an All-Electric Furnace
ELECTROGLASS
ELECTROGLASS
The Batch Blanket of an All-Electric Furnace
Selection criteria for

**All-Electric Melting**

Technical

Economic

Both
Key economic factor –

Process energy efficiency
Furnace Size and Energy Efficiency

- Electric Furnace Energy Efficiency %
- Fuel-Fired Furnace Energy Efficiency %

Capacity Tonnes/Day

Electric
Fuel-Fired
Ratio of Gas Furnace to Electric Furnace Energy Consumption

Furnace Size Tonnes/Day

- 1.0
- 1.5
- 2.0
- 2.5
- 3.0
- 3.5
- 4.0
- 4.5
Where the cost of electricity per unit of energy is about 3 times the cost of the same amount of gas energy, or less, electric melting is likely to be the economic choice for furnaces up to about 40 tonnes/day.
Selection criteria for All-Electric Melting

Technical

Economic

Both
ELECTROGLASS
Selection criteria for Electric Boosting in Fuel-Fired Furnaces

Technical
Economic
Both
Selection criteria for Electric Boosting in Fuel-Fired Furnaces

Technical

Economic

Both
Key technical factor –

Achieving and maintaining glass quality, especially in dark coloured glasses
Boost System Redesign

End-Fired Regenerative Furnace
Selection criteria for Electric Boosting in Fuel-Fired Furnaces

- Technical
- Economic
- Both
ELECTROGLASS CCC BOOST SYSTEMS
Typical Performance Data: Boost KW per extra Tonne/Day

Furnace Reference and Glass Colour
20 kW of continuous boost power input per extra tonne/day is equivalent to 480 kW-hours of energy per tonne of glass, or 413 kCals per kg of glass.

Even if electricity is 3 times the cost of gas per unit of energy, and if your unboosted furnace is using more than 1240 kCals per kg of glass, the glass from the boost system is cheaper than the glass from gas.
**Electric Boost in Float Glass Furnaces**

- **700 Tonnes/Day Furnace**
  - Optimum thermal efficiency only at maximum pull rate.
  - Reduced efficiency at lower pull.
  - Reduced pull on tinted glass

- **600 Tonnes/Day Furnace with 100 Tonnes/Day Electric Boost**
  - Optimum thermal efficiency from 600 to 700 tonnes/day, with boost adjusted according to pull.
  - Tinted glass output increased to match downstream line capacity
Selection criteria for Electric Boosting in Fuel-Fired Furnaces

Technical
Economic
Both
Selection criteria for Electric Forehearths and Distributors

Technical

Economic

Both
Selection criteria for Electric Forehearths and Distributors

- Technical
- Economic
- Both
All-Electric Forehearths

Low Heat Losses

Centreline Radiation Cooling

Radiant Profile Volatilisation Control

Temptrim Electrode Heating

Minimum Glass: Refractory Contact
Selection criteria for Electric Forehearth and Distributors

Technical, Economic, Both
All-Electric Forehearths

- Low Heat Losses
- Centreline Radiation Cooling
- Radiant Profile Heating
- High Efficiency Insulation for Minimum Losses
<table>
<thead>
<tr>
<th></th>
<th>FOREHEARTH 1:2 36'' WIDE</th>
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<th>FOREHEARTH 1:1 48'' WIDE</th>
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<td>Middle Right</td>
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Conversion of 2 Forehearths from Gas Heating to Electric

- 1050 m³ per day at 0.464 US$ per m³
- 1535 kWh per day at 0.051 US$ per kWh
2nd Setpoint change 1100 degC to 1105 deg C.
Time 10 mins, 0.50 deg/min.
Power limited to 20 kW.
Max power used approx 15 kW.

1st Setpoint change 1090 degC to 1100 deg C.
Time 19 mins, 0.53 deg/min.
Power limited to 20 kW.

Zone Temperature

Zone Power
All-Electric Distributor
Electrical energy in glass melting and conditioning

All-Electric Melting
Highly Energy Efficient
Lower Melting Energy Costs in smaller furnaces
Technology of Choice for Volatile Glasses
Environmentally Friendly

Electric Boosting in fuel-fired furnaces
Highly Energy Efficient
Maintains Maximum Energy Efficiency at Reduced Pull
Reduces Total Energy Consumption per kg. of Glass
Can Reduce Total Energy Cost per kg. of Glass

Electric Distributors and Forehearths
Highly Energy Efficient
Can Reduce Gas Energy Costs by 60% to 90% in many cases
Excellent Temperature Control and Fast Response
Minimal Maintenance
Future Trends, - the key factors -

Gas and oil supplies and prices

Increasing electricity sources,
- solar, wind, hydro, etc

Increasing environmental awareness and concern

- all point to what we are seeing already, ever increasing interest and use of electrical energy in glass melting.
Thank You!

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England