

# Feeder@Max

IPCOS has developed Feeder@MAX to help glass manufacturers tightly control the conditioning of glass in forehearths. It helps maintain critical process conditions at specifications both during normal production and during load and product changes, and rapidly brings back the process within defined operating conditions after process upsets.

## THE BENEFITS ARE OBVIOUS:

**Improved temperature stability** at the exit of the forehearth.

**Tight control of gradients** at the exit of the forehearth.

**Compensates for known disturbances** originating from other forehearths and the melter.

**Reduced sensitivity to load changes.**

**Minimized energy consumption.** The INCA MPC controller has a prioritized optimization scheme that can be configured to minimize energy consumption if all other targets are met.

**Increased throughput and line efficiency** due to tight control of critical operating conditions and reduced time to recover from process disturbances.

**Well defined forehearth operation:** reduced operator interventions and one strategy for all shifts.

**Reduced training time for novice operators.** Controller performance and process operation can be simulated offline for operator training.

Local engineering staff can perform configuration and installation.

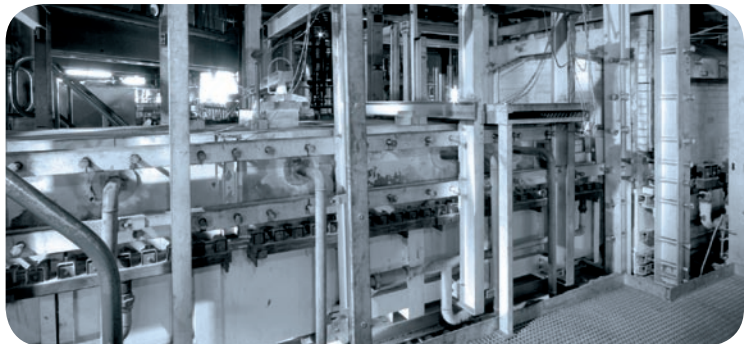
**Robust control engine** suitable for other applications inside and outside the glass manufacturing industry.

## SUPERIOR CONTROL OF FOREHEARTH

Feeder@MAX leads to accurately controlled glass conditions both at the exit of the feeder and along the feeder. This results in reduced glass defects, improved gob-weight stability and significantly improved efficiency in downstream processing by reducing variability.

Feeder@MAX is a general-purpose solution applicable to a wide range of forehearth designs and configurable for various forehearth actuator and sensor configurations: air/fuel, oxy/fuel, with or without controlled cooling airflows, electrical boosting, multi-level glass thermocouples, pyrometers, etc.

Feeder@MAX can be combined with other products from the IPCOS Glass@MAX family.



### Tuned to fulfill your control requirements

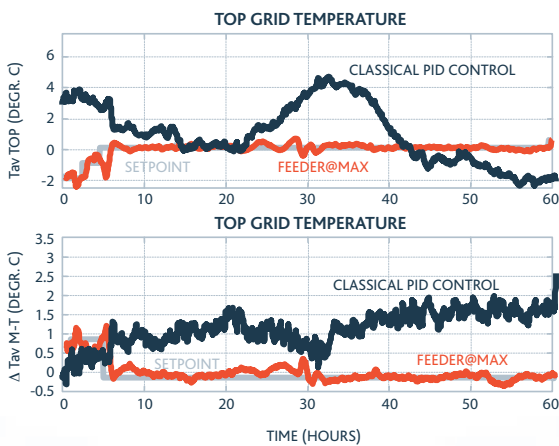
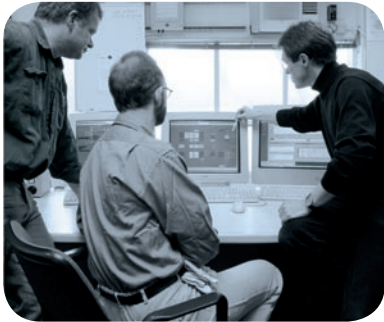
Feeder@MAX is a scalable and configurable solution to solve your process operation problems and may be extended with the following **optional modules**:

- **Multi-model:** Guarantees that your forehearth runs at optimal performance under widely varying loads and glass properties.
- **Selectable control strategies:** Guarantees optimal performance during exceptional circumstances like start-up, shutdown and tool changes.
- **Soft sensor for non-linear product property estimation:** An IPCOS product based on non-linear modeling techniques, INCA Sensor, estimates product properties or process conditions that are impossible or difficult to measure online (e.g. predicting gob-weight in between samples taken from a production line).

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GLASS SOLUTIONS

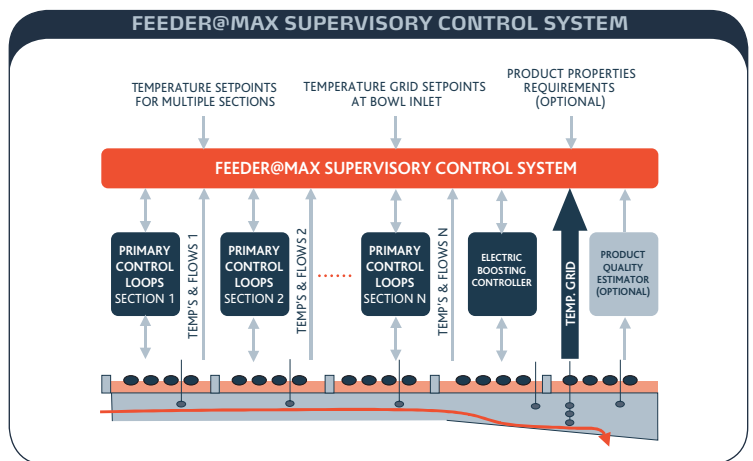


# FEEDER@MAX AT WORK



Feeder@MAX is implemented as a supervisory control package; it is built on top of the existing control system. It monitors the process and supplies setpoints to the primary control loops, if necessary. As a result the process is operated within tight specifications despite disturbances. The models applied within Feeder@MAX enable accurate prediction of process responses during transitions, enabling fully reproducible, rapid transitions of the process to the desired operating conditions.

The core of Feeder@MAX consists of INCA MPC, a state-of-the-art model-based predictive controller developed by IPCOS. INCA MPC simultaneously manipulates all available actuators on all ports to maintain the temperature profile both along the forehearth and at the exit.



The package is a standard off-the-shelf solution for forehearths. Feeder@MAX will be preconfigured to the specific forehearth configuration before it is shipped to site (interfacing to the existing primary control loops, number of sections, fuel gas flows, cooling air flows, boosting electrodes, thermocouples, pyrometers, other sensors etc.).

Feeder@MAX runs on a Windows 2000/XP/VISTA based PC platform. This approach makes the system open for offline analysis tools (e.g. Excel) and allows straightforward interfacing to other process control applications.

# Feeder@Max

## OUR REPRESENTATIVE

IPCOS is represented by TNO in glass industry. The in-depth knowledge and superior process simulation tools of TNO on glass melting processes in combination with the process knowledge, APC technology and APC implementation experience of IPCOS guarantees best performance APC solutions resulting in sustainable benefits for our customers for many years.

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