PLANT MANILA · MELTING AREA

Glass Furnace 1

Functional Description: SCADA, HMI and Historian (operations layer)

DOCUMENT	PM-MLT-F1-FDS-001
REVISION	A, issued for implementation
ATTACHMENT	IO-List.xlsx

1 Scope

This document describes what the operations layer for Glass Furnace 1 must do: the asset model, the alarms, the history and the operator screens. Closed-loop control stays in the furnace PLC. The signal list is the attached **IO-List.xlsx**.

2 Process

Glass Furnace 1 melts raw batch into molten glass at about 1550 °C. It is fired by **eight fuel oil burners**: four on the north side (North Burner 1 to 4) and four on the south side (South Burner 1 to 4). All burners take oil from one supply header. For each burner, a PID loop in the PLC holds the oil flow at the burner flow setpoint by moving the burner's control valve.

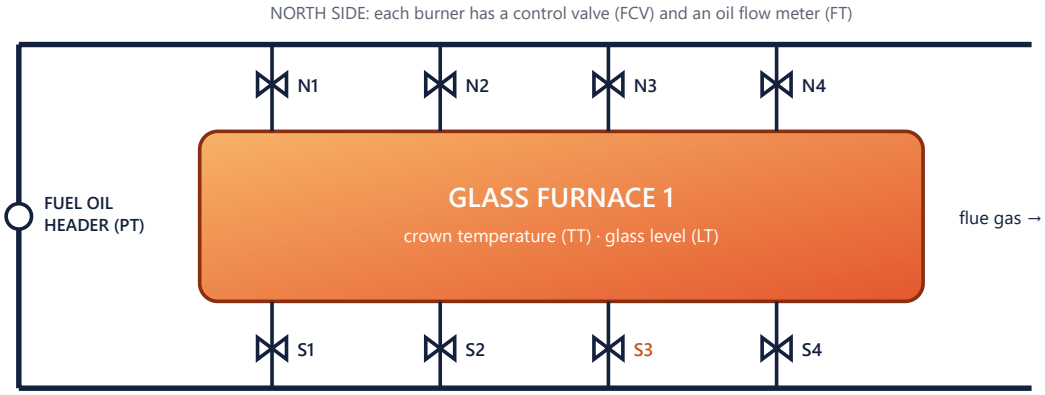


Figure 1. Glass Furnace 1, plan view (schematic, not to scale)

Signal	Meaning
Valve Opening (%)	Position of the burner's PID control valve, one per burner
Oil Flow (kg/h)	Measured fuel oil flow into the burner, one per burner
Burner Flow Setpoint (kg/h)	Target oil flow, the same for all eight burners, normally 220 kg/h
Crown Temperature (°C)	Temperature at the furnace crown
Glass Level (mm)	Molten glass level in the furnace
Oil Header Pressure (kPa)	Fuel oil supply pressure to the burners

3 Asset model

Organize the data by the ISA-95 hierarchy, exactly as the tag paths in the IO list:

`Plant_Manila / Melting_Area / Glass_Furnace_1 / North_Burners | South_Burners / <Burner>`

All eight burners are the same equipment, so they share **one Burner type** with Valve Opening, Oil Flow and Clogging (section 4). Each burner is one instance of that type. Furnace measurements and the burner flow setpoint sit at the furnace level, together with a calculated **Total Oil Flow** (sum of the eight burners).

4 Burner clogging

Carbon builds up on the burner nozzle tip and restricts the oil flow. The PID loop answers by opening the valve further. Neither signal is wrong on its own: the valve is doing its job, and a low flow alone could be a setpoint change. The combination identifies the fault:

> **Clogging = Valve Opening ≥ 90 % AND Oil Flow < 80 % of the Burner Flow Setpoint**

Each burner has a calculated **Clogging** flag with this rule.

5 Alarms

Alarm	Condition	Priority
Burner clogging: valve open, flow low	Clogging = 1, on each burner	Critical
Crown temperature high	Hi 1580 °C / HiHi 1600 °C	Warning / Critical
Glass level low	Lo 1180 mm	Warning
Oil header pressure low	Lo 700 kPa	Warning

Active alarms and alarm history must be visible to the operator.

6 History

Record on change every burner's Valve Opening and Oil Flow, the furnace measurements and Total Oil Flow. Operators use it to see a clog develop: the valve climbing while the flow falls away.

7 Operator screens

The screens serve the control room and live presentations. They must be **visually rich and modern**: a real process diagram, not tables of numbers.

- **Furnace Overview** (start screen). The furnace drawn as in Figure 1, with a molten-glass look in the center, the four north burners along the top, the four south burners along the bottom and the oil header with piping to every burner. Each burner shows its valve, a flame that is lit while it has oil flow, its Valve Opening, and its Oil Flow against the setpoint as a small bar. A burner in clogging alarm turns red and blinks. Around the furnace: crown temperature, glass level, header pressure and total oil flow. An active alarm strip along the bottom. **Clicking a burner opens its detail**, with a trend of Valve Opening against Oil Flow where a clog shows as the two lines moving apart.
- **Trends.** Oil flow of the eight burners on one chart, crown temperature on another.
- **Alarms.** Active alarms and alarm history.

Navigation between the three screens from a header. Dark, modern theme; strong color is kept for state (flame, alarm) so the burner in trouble is the first thing the eye finds.

8 Data source for this build: simulation

No PLC is connected for this build. The PLC addresses in the IO list (Modbus TCP, furnace PLC at 192.168.10.20) are for reference and are not configured now.

- Signals marked **Simulated** move smoothly (sine) between the Sim Min and Sim Max of the IO list. The limits are whole numbers on purpose.
- The Burner Flow Setpoint is an operator value that starts at 220 kg/h.

Demo clog test. A button on the Furnace Overview, labeled *Demo: clog South Burner 3*, switches a `Demo/ClogTest_SB3` flag. South Burner 3's simulated signals land in two raw tags, `Demo/SB3_ValveOpeningRaw` and `Demo/SB3_OilFlowRaw`, and the burner's values follow them while the test is off. With the test on, the burner shows the clogged values seen on site:

Clog test	South Burner 3 Valve Opening	South Burner 3 Oil Flow
Off	Demo/SB3_ValveOpeningRaw	Demo/SB3_OilFlowRaw
On	95 %	140.2 kg/h