

Star Energy Upgrade Flowcomp

Gas Metering System



System Description

Sales Gas Metering Skid

- Has **8" 900# header** (with 8" 900# tie in for customer) from which it is split into 2 x 100% configuration.
- Each stream comprises of (1) 8" USM, (1) pressure transmitter, (1) temperature transmitter, (1) hand operated Isolation Valves at Stream inlet and (1) hand operated Isolation Valves at Stream outlet

System Description

Analyzer Shelter

- The 3-sided analyzer rack comprises the following:
 - (2) Gas Chromatographs which analyzes hydrocarbons from C1 to C9+, N2 and CO2 and it provides all this gas composition data to flow computers for computing operating density, standard density, compressibility and calorific value. Its controller is in the metering panel with Serial port for diagnostics
 - (1) H2O Analyzer, which analyzes the H2O contents in the gas and provide the output in the form of 4-20mA signal and digital output for system/fault alarm (voltage free contact) to both flow computers..



System Description

Metering Control Panel

- A single section panel housing the following:
 - [2] Flow computers (Daniel/S600+)
 - [2] GC Controller (Daniel/2350)
 - 24VDC power supply unit – 300W
 - Ethernet switches
 - Surge Protector
 - Repeaters/Splitters
 - Serial port Converter
 - Serial port MGate

System Description

Metering Control Panel

- Loose-Supplied Equipment:
 - Operator Station (Dell)
 - Software package [installed in Supervisory Computer] (ww)
 - Monitor (Dell 17" LCD)
 - Laserjet Printer [Report Printer] (HP)
 - Dot matrix Printer [Alarm Printer] (Epson LQ310)

System Description

Metering Control Panel

- Operator Station is connected to Flow computer using Modbus TCP/IP Ethernet Link for data exchange
- Customer's RTU is interfaced with Flow computer using RS 485toRS232 Modbus for data exchange.
- Operator Station running Wonderware software is provided for operator's monitoring and for reports generation.

System Description

Metering Control Panel

- The metering panel is of Rittal make with front glazed door, lifting eye bolts and locks mounted inside Control Room. Panel has front operational & back Maintenance access provided with a forced draft system using a cooling fan and illumination lamps activated by door switches.

System Description

Metering Control Panel

- Two feeder of UPS power 110VAC 50 Hz 1 Ph to power the metering panel and internal equipments and external field instruments (using 24 V DC). The 24VDC is derived from the 110VAC using a redundant 24VDC power supply unit. 110VAC, 50Hz, 1Ph,

System Description

Metering Control Panel

- Any alarm that is available on the flow computers shall be printed out in the **alarm printer** (Dot matrix printer). This printer is connected to the flow computer's serial port via printer sharer. **Report printer** (LaserJet printer) is connected to operator station and shall be used for printing the reports.

Metering Philosophy

- The metering streams are designed as per **AGA9**. The flow metering system uses Gas Ultrasonic flow meters for Natural Gas measurement; beside GUSM, each meter stream is also equipped with the following instruments:
 - Static pressure transmitters for individual streams.
 - Line temperature sensor with transmitters for individual streams.
 - Pressure and temperature gauge for individual streams.
- Dual upstream and downstream isolation valve – Both inlet and both outlet valves are with limit switch

Metering Philosophy

- The metering skid is designed for **2 x 100% configuration**, normally one stream is in operation and other is standby. In case failure of active stream, operator will switch the flow to standby stream.
- The **Daniel SeniorSonic Ultrasonic flow meter Model 3400** is a four-path, in-line ultrasonic meter that measures transit times of ultrasonic pulses passing through the gas on four parallel planes.

Metering Philosophy

- Each of the four paths has two integrally mounted ultrasonic transducers. The pair of transducers acts alternately as transmitter and receiver. The difference in transit times of the downstream-directed pulses and the upstream directed pulses is directly proportional to the measured fluid velocity.

Metering Philosophy

- Flow computer gathers process data from the skid instruments (Uncorrected flow from GUSM through frequency signal, Pressure/ temperature 4-20mA signal from transmitters) performs corrections and calculations as per specification and report product throughput. Signal from USM, PT and TT of each stream are connected to both stream flow computer. Each flow computer will perform flow calculation for both Metering stream in redundant manner.

Metering Philosophy

- Two Gas Chromatographs shall be operating as main or backup Gas Chromatographs, i.e. Main Two Gas Chromatograph shall be on duty at a time and its data shall be used for Calculation and other GC's data shall be used for display purpose only. On a critical failure of One Gas Chromatograph, the GC good condition shall be designated as Main and its data shall be used for Calculation. The operator can select the main/backup GC from operator station depending on the health status of the GC.

Metering Philosophy

- Flow computer will raise the Alarms in the event that process conditions fall outside the operator defined limits. A **system alarm** is raised if any of system components fails, all alarms will be printed out through alarm printer. Streams hourly and daily reports will be generated by Operator work station.

Redundancy

- Each flow meter provides dual pulse output to each of the flow computers. **Pulse signal** shall be used for flow calculation.
- Each USM flow meter is serially connected (over **RS 485 serial link**) to each of the flow computers. Serial link shall be used for diagnostic status of USM.
- Each USM flow meter is provided with RS232 link for basic diagnostic data.

Redundancy

- Each GC is connected to both the flow computers using **RS 485 port**.
- All other process signals from the metering skid which are required for flow computer calculations are duplicated by using splitters/Relays and connected to both flow computers.
- Each flow computer will have computation for stream #1 & Stream # 2 as two streams flow computer and will function in Duty-Standby mode.
- Each Flow computer is connected to Operator station over Ethernet Switch.

FloBoss S600+ Stream Flow Computer

- Housed in the metering panel, flow computers are monitoring two streams, **interfaced peer-to-peer communication**, operating in Duty-Standby mode.
- Generally, the duty flow computer (whichever startup 1st) shall be monitoring, computing and delivering both streams data to Operator Stations (Operator Station) for display & reports generation purpose.

FloBoss S600+ Stream Flow Computer

- However, in addition, the standby flow computer data is also displayed on Operator Station. Both flow computers receive data from both streams flow meters, PT & TT and analyzers (GC, and H2O Analyzers) at inlet header and perform the computing all the time.

FloBoss S600+ Stream Flow Computer

Summary of Function

- Obtain all field inputs of both streams and performs all functions for both streams.
- Obtain stream pressure & temperature values from the respective pressure & temperature transmitters located on the metering stream.
- Obtain pulse from ultrasonic meter through hard wire and calculate gross volumetric flow rate at line conditions in accordance with pulse calculation.
- Obtain average velocity of gas from the ultrasonic meter through serial communication and calculate gross volume.

FloBoss S600+ Stream Flow Computer

Summary of Function

- Calculate correction factors for the effects of temperature and pressure on the steel of the meter spool.
- Provide TCP/IP Ethernet link to Operator Station through Ethernet switches for transfer of all measured and calculated data (streams 1 & 2).
- Receive un-normalized gas composition from gas chromatograph 100%
- Calculate the compressibility factor and density at reference/operating conditions in accordance with **AGA8** (1994).

FloBoss S600+ Stream Flow Computer

Summary of Function

- Calculate superior Calorific value in accordance with **GPA 2172**.
- Calculate velocity of sound in accordance with **AGA10 (2003)**.
- Calculate the instantaneous volume flow rate at reference conditions and at line conditions, mass and energy flow rates.
- Calculate cumulative total for volume at reference conditions and at line conditions, mass and energy.
- Provide a maintenance mode facility.

FloBoss S600+ Stream Flow Computer

Summary of Function

- Provide an operator interface through which relevant data may be viewed and/or modified.
- Operate a security system.
- Calculate cumulative, daily, 3 hourly totals for mass, standard volume and energy.
- Print out alarms and events to a printer.
- Obtain gas compositions from GC through RS485 serial link.
- Data communication to RTU shall use Modbus RTU serial protocol .

Reference Conditions

- Reference conditions for **Volumetric and Mass flow rates** shall be the following:
 - Temperature: 60°F
 - Pressure: 14.73 Psia
- Reference conditions for **Energy flow rate** shall be the following:
 - Temperature: 60°F
 - Pressure: 14.73 Psia

FloBoss S600+ Stream Flow Computer

Modes Of Operation

- ON-LINE:** On-line is when **gross observed flow rate** value is above low flow cut-off and maintenance flag is clear.
- OFF-LINE:** Off-line is when **gross observed flow rate** is below the low flow cut-off.
- MAINTENANCE:** Maintenance mode is typically used when calculation checks or associated calibration tests are required to be carried out.

FloBoss S600+ Stream Flow Computer

Input / Output Summary

Variables	Signal
Stream pressure input	4-20mA
Stream temperature input	4-20mA
Stream flow input	Pulse
USM velocity of gas	RS485 Serial
Gas composition from GC	RS485 Serial
H2O content from H2O analyzer	4-20mA

Stream Instrument Interface

Active Mode Parameter	Mode Type	Default
Stream Temperature	Analog Input	Measured
Stream Pressure	Analog Input	Measured
H2O	Analog Input	Measured

Active Mode: Object is under control of Flow Computer; it will change depending on alarm condition. (e.g. Keypad-Fault)

Stream Instrument Interface

Passive Mode Parameter	Mode Type	Default
Gas Composition	Gas Composition	Chromat
Meter Density	Calculation	Calculated
Meter Compressibility	Calculation	Calculated
Standard Density	Calculation	Calculated
Standard Compressibility	Calculation	Calculated

Passive Mode:
Object is under control of operator or engineer; changing this from a default setting may have an adverse effect on Flow Computer calculations.

Stream Instrument Interface

Passive Mode:

Object is under control of operator or engineer; changing this from a default setting may have an adverse effect on Flow Computer calculations.

Passive Mode Parameter	Mode Type	Default
Calorific Value	Calculation	Calculated
Meter Factor	Calculation	Keypad
CTSM	Calculation	Calculated
CPSM	Calculation	Calculated

Ultrasonic Flow Meter Measurement

- The ultrasonic flow meter measures the flow rate, which is dependent on the **average fluid velocity and the cross-sectional area of the meter**. The average fluid velocity along the acoustic path is determined from the **transit time difference** of two ultrasonic signals, one traveling upstream and one traveling downstream, over the same distance in the flowing fluid, that sound traveling with fluid flow will travel faster than sound traveling against the flow. This time difference is a **function of fluid velocity**. The USM operates on 24 VDC power supply from the metering panel.

Temperature Measurement

The S600+ is configured to accept a 4-20mA signal for the temperature in **Degrees F**.

- **MEASURED**: The in-use value is derived from calculated value incoming analogue signal, selected from front panel.
- **KEYPAD**: The in-use value is an operator-entered value.
- **KEYPAD-F**: If MEASURED mode fails, the KEYPAD value will be used automatically. If the input signal returns to a non-failed state, the measured value is used & the relevant mode shows MEASURED.

If KEYPAD mode is manually selected the mode remains in KEYPAD until MEASURED mode is manually selected.

Temperature Measurement

- The following alarms and events are typically raised on this input.

Alarms	Value High
	Value Low
Events	Each mode change e.g. Measured to Keypad-F, etc.

Pressure Measurement

The S600+ is configured to accept a 4-20mA signal for the pressure in **Psig**.

- **MEASURED**: The in-use value is derived from calculated value incoming analogue signal, selected from front panel.
- **KEYPAD**: The in-use value is an operator-entered value.
- **KEYPAD-F**: If MEASURED mode fails, the KEYPAD value will be used automatically. If the input signal returns to a non-failed state, the measured value is used & the relevant mode shows MEASURED.

If KEYPAD mode is manually selected the mode remains in KEYPAD until MEASURED mode is manually selected.

Pressure Measurement

- The following alarms and events are typically raised on this input.

Alarms	Value High
	Value Low
Events	Each mode change e.g. Measured to Keypad-F, etc.

H2O Content Measurement

The S600+ is configured to accept a 4-20mA signal for the H2O content in **PPMV**.

- **MEASURED**: The in-use value is derived from calculated value incoming analogue signal, selected from front panel.
- **KEYPAD**: The in-use value is an operator-entered value.
- **KEYPAD-F**: If MEASURED mode fails, the KEYPAD value will be used automatically. If the input signal returns to a non-failed state, the measured value is used & the relevant mode shows MEASURED.

If KEYPAD mode is manually selected the mode remains in KEYPAD until MEASURED mode is manually selected.

H2O Content Measurement

- The following alarms and events are typically raised on this input.

Alarms	Value High
Events	Each mode change e.g. Measured to Keypad-F, etc.

Chromatograph Data

- The system consists of two C9+ GCs and operates as duty and standby. Generally, duty GC data will be used for **Calorific value** and **density calculation**. An **auto switchover** to standby will be performed in stream flow computer when duty GC is detected **critical, communication failed, mole hi or mole lo alarm**.
- A **manual switchover** provision is available on Operator Station graphic to allow operator to manual select the duty GC.

Chromatograph Data

- If auto/manual calibration is performed, the flow computer will use the **last good value** for computation
- GC provides gas composition data to all stream flow computers via **RS485 serial** links.
- This Chromatograph data is normalized in the flow computer without H₂O & H₂S data.

Calculations - Gas Density

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED - AGA8**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Calculations - Gas Compressibility

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED - AGA8**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Calculations - Standard Density

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED - AGA8**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Calculations - Standard Compressibility

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED - AGA8**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Calculations - Calorific Value

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED – GPA2172 1996**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Calculations - CTSM

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Calculations - CPSM

- There are two modes available for the In-use gas density:
 - **KEYPAD**: Uses a value entered on the keypad or HMI or web access server interface or fallback value for the selected item
 - **CALCULATED**: Uses the calculated value obtained from the relevant calculation for the selected item
- If CALCULATED mode is manually selected the mode remains in CALCULATED until KEYPAD mode is manually selected.
- If KEYPAD mode is manually selected the mode remains in KEYPAD until CALCULATED mode is manually selected.

Units of Measurement

Masurement	Unit	Rollover no.	Decimal point
Static pressure	Psig	n/a	2
Temperature	Deg F	n/a	2
Density	lb/ft3	n/a	5
Gross Volume Flow Rate	MMCF/d	n/a	4
Standard Volume Flow Rate	MMSCF/d	n/a	4
Energy Flow Rate	BBTU/d	n/a	4
Mass Flow Rate	lbs/d	n/a	4
Calorific Value	BTU/SCF	n/a	3
Gross Volume Total	MMCF	n/a	4
Standard Volume Total	MMSCF	n/a	4

Units of Measurement

Masurement	Unit	Rollover no.	Decimal point
Energy Total	BBTU	8	4
Mass	MIbs	8	4

- For conversion between imperial units and SI (Metric) units, the following conversion factors shall be used:
 - 1 m³ = 35.3147 SCF
 - 1 MJ/M³ = 26.83956 BTU/SCF
 - 1 ton (1000 Kg) = 2204.62 lb

Totalization

- **Cumulative Total** represents the quantity of the relevant parameter that has been registered the flow computer since its totals were last reset, excluding any amount, which has passed whilst the flow computer has been put in maintenance mode.
- **Hourly Total** represents the quantity of the relevant parameter that has been registered by the flow computer since the last hour end occurred, excluding any amount, which has passed whilst the flow computer has been put in maintenance mode.

Totalization

- **Previous Hourly Total** represents the quantity of the relevant parameter that has been registered the flow computer until the next hour end is passed, excluding any amount, which has passed whilst the flow computer has been put in maintenance mode.
- **Daily Total** represents the quantity of the relevant parameter that has been registered by the flow computer since the last day end occurred, excluding any amount, which has passed whilst the flow computer has been put in maintenance mode.

Totalization

- **Previous Daily Total** represents the quantity of the relevant parameter that has been registered the flow computer between the last day end and the last but one day end, excluding any amount, which has passed whilst the flow computer has been put in maintenance mode.
- **Weekly Total** represents the quantity of the relevant parameter that has been registered by the computer since the last week end occurred, excluding any amount which has passed whilst the flow computer has been put in maintenance mode.

Totalization

- **Previous Weekly Total** represents the quantity of the relevant parameter that was registered by the computer between the last week end and the last but one week end, excluding any amount which has passed whilst the flow computer has been put in maintenance mode.
- **Monthly Total** represents the quantity of the relevant parameter that has been registered by the computer since the last month end occurred, excluding any amount which has passed whilst the flow computer has been put in maintenance mode.

Totalization

- **Previous Monthly Total** represents the quantity of the relevant parameter that was registered by the computer between the last month end and the last but one month end, excluding any amount which has passed whilst the flow computer has been put in maintenance mode.

Totalization

End of Day

- A day is deemed to have ended when the flow computer time clock passes the associated base time, where the base time is the hour allocated (0 - 23) to determine when, for metering purposes, one day finishes and the next day commences.
- This system will be configured for **Base time 1** end of day at **24:00 hrs.**

Totalization

End of Day

- At day end the **current daily displayed total** is copied into the **previous day displayed total** and the **current daily displayed total** is reset to **zero**. It should be noted that the associated current daily remainder (which is not displayed) would remain unchanged.

Totalization

Totals Reset

- A **Totals Reset** will reset all totals and therefore this function should be treated with extreme caution. The totals may be reset by selecting 'totals reset' from the **front panel**, or when initiating a '**cold start**'. However, 'totals reset' and 'cold start' require the **user to enter a password** with the proper security level to execute. Thus accidental reset is not possible.

Security

- Each object is allocated an associated level of security.
- Access to Security levels 1 and 2 require the **security bit link** not to be fitted on the P152 **CPU Board** of the Flow Computer.
- Default setting for accessing to Flow Computer are as follows:

Displays	-	level 1, 2, 3
Reports	-	level 1, 2, 3
Alarm Accept	-	level 1, 2, 3
Ident (Change)	-	level 1
Diagnostics	-	level 1
Remote Access	-	level 1

level 1:	Engineer
level 2:	Technician
level 3:	Operator

In order to change data when utilising the front panel display, the user must enter a password of the required security level, or higher.

Alarms

By default, the alarms are categorized into 3 alarm groups shown below:

Computer Alarms: related to alarms connected only to Flow computer

NO.	Alarm	Description
	COLD START	The S600+ has performed a cold start.
	WARM START	The S600+ has performed a warm start.
	RAM FAIL	The CRC of a data module in RAM is incorrect.
	ROM FAIL	The CRC of a data module in ROM is incorrect.
	RESET REQUIRED	An error has occurred which requires the flow computer totals to be reset.
	TOTS ROLLOVER	A totals rollover has occurred.

Alarms

System Alarms: related to I/O failures of devices

Alarms	Description
TEMP UNDERRANGE / OVERRANGE	Input signal has fallen below 3.5mA or exceeded 20.5mA
PRESS UNDERRANGE / OVERRANGE	Input signal has fallen below 3.5mA or exceeded 20.5mA
H2O/H2S UNDERRANGE / OVERRANGE	Input signal has fallen below 3.5mA or exceeded 20.5mA

Alarms

Process Alarm: related to high and low alarm on devices

Alarms	Description
TEMP LOW	The in-use value of downstream temperature has fallen below the keypad entered low limit.
TEMP HIGH	The in-use value of downstream temperature has exceeded the keypad entered high limit.
PRESS LOW	The in-use value of upstream pressure has fallen below the keypad entered low limit.
PRESS HIGH	The in-use value of upstream pressure has exceeded the keypad entered high limit.
H2O/H2S HIGH	The in-use value of H2O/H2S has exceeded the keypad entered high limit.

Peer to Peer Communication

- The peer to peer communications link is used to **synchronize operator constants/commands** issued via the front panel or web browser. It also used **for redundant purpose**, duty and standby.
- The following parameters shall be synchronized:
 - All analog keypad data
 - All analog high/low limit data
 - All analog mode
 - GC keypad data & High/Low limit
 - GC mode
 - USM parameters such as internal/external diameter, young modulus, calibration press/temp.

Peer to Peer Communication

- It should be noted that all the **calculated data** will NOT be synchronized such as totalizer, flow rate, CV, density.
- Duty and standby flow computers are receiving the same field instruments inputs and performance the same calculations. In case of failure of duty flow computer, standby flow computer will take over immediately.

Peer to Peer Communication

- Under normal operation, the **Operator Station** should obtain the data from duty flow computer for **reports generation** purpose. A status will be given to determine duty/standby through modbus communication.
- **Manual switchover** duty/standby mode only can be done in **flow computer** or **Operator Station**. Please note that all constants/commands must enter in to duty flow computer and the duty flow computer will **auto synchronize the updated data** to standby flow computer through peer to peer link.

Time Synchronization

- Integrity of time in Daniel metering system has been maintained by implementing the time synchronization between HMI to all Flow Computers.
- At **3:30 am** each day, HMI will send a time synchronization bit via **modbus (pulse ON for 2 to 3 seconds)** to Flow Computer and Flow Computer will perform time synchronize to pre-defined time at **3:30 am**.

Reports

- The following reports can be configured in the S600+:
 - Current Report
 - 3 Hourly Report
 - Daily Report
 - Weekly Report
 - Monthly Report

Reports

- **Report Base Time:** The Flow Computer will consider the following times as a base time for various reports
 - **3 Hourly report:** Starts from the **each 3 hour**
 - **Daily report** (0:00 am to 0:00 am): Start of the day = **00:00 am**
 - **Weekly report:** Every Week **Sunday, 00:00 am**
 - **Monthly report:** Start of the day – Every Month **First day, 00:00 am**

Gas Chromatograph

- Two Gas Chromatographs (C9+) are installed within the analyzer shelter in a duty & standby configuration. This Gas Chromatograph is a single stream Daniel Analyzer that has a panel mounted controller. The analyzer is provided with two carrier gas and one calibration gas cylinders installed along at the rear side of the shelter along its periphery. A **pressure switch** is provided for detecting carrier gas cylinder low pressure to alarm at the controller for operator to switch onto the standby carrier gas cylinder.

Gas Chromatograph

- The Gas Chromatograph performs analysis of the gas composition for following components:
- C9+ GC with Hydrocarbon dew point calculation

Methane (C_1), Ethane (C_2), Propane (C_3), n-Butane (nC_4), i-Butane (iC_4), n-Pentane (nC_5), i-Pentane (iC_5), Hexane+ (C_6), Heptane (C_7), Octane (C_8), Nonane (C_{9+}), Carbon Dioxide (CO_2), and Nitrogen (N_2).

Operator Station

- Operator Station is desktop mounted inside the metering panel. Intellution™ database is installed in operator station, which is updated on a regular basis with received and calculated data. The Intellution™ package is Wonderware HMI Server Software version 11.1. The Operator Station receives data from stream flow computers through **Ethernet switches**.

Operator Station

- Operator Station obtains data from the stream flow computers including duty/standby and generates reports on time or event basis, prints the report to a laser jet printer and provides a central archiving facility. I should be noted that all reports shall be printed on demand.
- The LaserJet printers communicate with Operator Station through **Ethernet Link using TCP/IP protocol.**

Data Storage

- As standard the system provides long term historical archiving as follows:
 - As each alarm is raised and cleared, the alarm is added to an Alarm historian.
 - Events are also archived & get saved in a file. It should be noted that all alarms & events are print on demand.
 - The Operator Station system also stores all automatic reports (Current, 3 Hourly, Daily and Verification reports) on the hard disk. These reports format archived as binary files for security purpose. It should be noted that all reports only could view and manual print out on Operator Station.

Data Storage

- The Operator Station system provides a facility to access the reports from flow computer through **web browser** with entering appropriate user level such as administrator. From web browser, administrator/engineer able to save the report in **CSV format**.

Alarm / Event Handling

- Alarms (both GAS) shall be logged on Operator Station. Typically; alarms shall be imposed on flow rates, temperatures, pressures, equipment status and data communication status. Alarms will be prioritized according to the criticality of the event. Critical alarms will produce invalid fiscal data.
- Alarms will be logged and displayed on to a visible **'alarm summary' window** of the Operator Station.

Alarm / Event Handling

- Following an alarm, if the alarm is acknowledged then, it stops blinking but remains there in Alarm summary list until alarm conditions are normalized; once any alarm acknowledged & normalized it is cleared from the Alarm summary list. All events are also archived & saved in hard disk.
- On the process graphic screens of the Operator Station, alarms shall be displayed in dynamic animated form. For example, the pressure transmitter indication will blink in red if the in-use pressure exceeds the pre-defined limit.

Alarm / Event Handling

- Operator Station shall provide following alarms for Diagnostics for USM, GC Analyzer:
- USM (GAS only)
 - Chord-A Warning Alarm
 - Chord-B Warning Alarm
 - Chord-C Warning Alarm
 - Chord-D Warning Alarm
 - Chord-A Failed Alarm
 - Chord-B Failed Alarm
 - Chord-C Failed Alarm
 - Chord-D Failed Alarm

Alarm / Event Handling

- Operator Station shall provide following alarms for Diagnostics for USM, GC Analyzer:
- USM (GAS only)
 - Fixed Velocity Alarm
 - Fatal Chord Alarm
 - Data Timeout Alarm
 - Fail Warning Alarm
 - Hardware Fail Alarm
 - SOS deviation
 - USM Performance (Signal Quality)
 - Flow Velocity Ratio
 - Gain

Alarm / Event Handling

- Operator Station shall provide following alarms for Diagnostics for USM, GC Analyzer:
- Gas Chromatograph (GAS only)
 - Mole High Alarm
 - Mole Lo Alarm
 - Critical Alarm
 - Received Failed Alarm
- For further diagnostics, operator shall connect the Laptop (loaded with Diagnostic Software) to the Diagnostic Port (of the respective equipment) provided on the panel front.

Operator Station: System Alarm (Critical)

Alarm	Description
Stream flow computers Communication Failure Alarm	Operator Station cannot read/write data to the S600+ flow computer
Meter Temperature Transmitter Failure Alarm	Analog signal is less than 3.5mA or greater than 20.5mA
Meter Pressure Transmitter Failure Alarm	Analog signal is less than 3.5mA or greater than 20.5mA
H2O Failure Alarm (GAS only)	Analog signal is less than 3.5mA or greater than 20.5mA
Prover flow computers Communication Failure Alarm (Condensate only)	Operator Station cannot read/write data to the S600+ flow computer

Operator Station: Process Alarm

Alarm	Description
Low Pressure Alarm	Current live pressure is below low alarm limit defined in S600+ or Operator Station
High Pressure Alarm	Current live pressure is above high alarm limit defined in S600+ or Operator Station
Low Temperature Alarm	Current live temperature is below low alarm limit defined in S600+ or Operator Station
High Temperature Alarm	Current live temperature is above high alarm limit defined in S600+ or Operator Station

Alarm Acknowledgment

- The operator should acknowledge all alarms, which are raised. As alarms are raised they appear in active alarm list and appear on the 'Current Alarm' display in unacknowledged state. An alarm must always be acknowledged and normalized before it can be removed from the current alarm list.
- Operator can use the current alarm display screen for acknowledgement of alarms.

Trending

- Real-time as well as historical trending of the process parameters is configured & made available in Operator Station. This trending can be viewed against a time axis on a Operator Station & data can be analyzed.
- The Operator Station samples the following process parameters at **every 1 second** for real-time trending in order to provide the facility to display associated trending graphs.
 - Gross volume flowrate (MMCF/d)
 - Pressure (Psig)
 - Temperature (°F)

Trending

- The Operator Station also samples & stores data of above process parameters at every **15 seconds** & stores it in hard disk for **at least 365 days** for historical trending in order to provide the facility to display associated trending graphs.
- Each parameter that is trended can be displayed against a time axis, which is configurable. The user can also choose to display historical trends of each parameter.

Security Levels

- **Level 0 – Guest (Default)**
 - View all data
 - Print the reports
- **Level 1 – Operator**
 - All functions associated with Level 0
 - Alarm acknowledgement
 - Data modification. i.e. High/Low Limit, Keypad, Mode etc.
 - HOV operation (Open/Close)

Security Levels

- **Level 2 – Engineer**
 - All functions associated with Level 1
 - Shut down Operator Station
- **Level 3 – Administrator**
 - All functions associated with Level 2
 - Modification of passwords

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