Coke Site - Data Integrator Notes

Two PureCell 400 fuel cell is installed behind the bottling plant. The UTC Power PureCell™ Model 400 fuel cell provides clean and efficient electric power and thermal output to the facility. Each fuel cell is expected to supply a portion of the facility's electricity requirements in addition to partial standby power in the event of a power grid failure. The plant will also recover heat from the fuel cell to use for space and Domestic Hot Water (DHW) heating . The PureCell® Model 400 is installed along the side of the plant. The fuel cell (FC) has separate electrical feeds for parallel operation with the utility or to provide backup power when isolated from the grid. The fuel cell is able to provide 400 kW of electrical power and up to 1.7 million Btu/h of heat. If fully utilized, the fuel cell can obtain a thermal efficiency near 90%. If fully utilized, the fuel cell can obtain a thermal efficiency near 90%.

Data Point Details

The monitoring system is based around the Obvius AcquiSuite data logger. The layout of the EMS and the connections with other network components of the Fuel Cell system are shown in the Addendum to the monitoring plan. A Babel Buster gateway device reads MODBUS data from the PPC and Shark power meters and makes that data available to the Obvius data logger. All data is collected as 1 minute data and converted to hourly data.

All data on the website is presented in Eastern Standard Time.

DG/CHP Generator Output (total kWh)
The Generator Output comes from the data channel called WFCCUM1 and WFCCUM2. These are accumulators for generator output. The difference between consecutive intervals is used to determine the output for each hour.

DG/CHP Generator Output Demand (peak kW)
The Generator Output Demand comes from the data channel called WFC1 and WFC2. These channels are averaged across each 15-minute period to determine the demand. The maximum value for each hour is then taken.

DG/CHP Generator Gas Input (cubic feet)
The data for Generator Gas input comes from the data channel labeled FG1 and FG2. These channels provide the fuel flow rate in kg/hour, are converted into standard cubic feet, and averaged to determine the quantity of fuel used for each hour.

Total Facility Purchased Energy (total kWh)
No data

Total Facility Purchased Demand (peak kW)
No data

Other Facility Gas Use (cubic feet)
No data

Unused Heat Recovery (total MBtu/h)
The flow rate, supply temperature, and return temperature of the cooling water loops, (FCW1,TCWS1,TCWR1, FCW2,TCWS2,TCWR2), are used to determine the amount of heat which is rejected from the system. This is determined as a rate which is averaged across the hour.

Useful Heat Recovery (total MBtu/h)
The flow rate, supply temperature, and return temperature of the high and low grade water loops, (FH1,THS1,THR1, FL1,TLS1,TLR1, FH2,THS2,THR2 and FL2,TLS2,TLR2), are used to determine the amount of heat which is recovered from the system. This is determined as a rate which is averaged across the hour.

Status/Runtime of DG/CHP Generator (hrs)
The channels labeled as RTIME1 and RTIME2 provide the generator status. This is an accumulator for the generator status. The difference between consecutive intervals is used to determine the status for each hour.

Ambient Temperature (avg °F)
The Ambient temperature comes from the Weather Underground using the ALB airport as a reference location. The 15-minute data is averaged into hourly data.

Electrical Efficiency (%)
The Electrical Efficiency is calculated by dividing Generator Output (WG) in BTU's by Generator Gas Input (FGE) in BTU's. The lower heating value of natural gas used is 930 btu/cf. The expected efficiency should range from 30%-40%.

Total CHP Efficiency (%)
The Total CHP Efficiency is calculated by dividing the Generator Output and Useful Heat Recovery by the Generator Gas Input. The lower heating value of natural gas used is 930 btu/cf and the expected efficiency should range 75-90%

Data Quality Checks

The Data Quality Checks consist of three levels of verification:

- the data exist (flag=1),
- the data pass range checks (flag=2)
- the data pass relational checks (flag=3).

The methodology for applying the data quality begins by creating a contiguous database. We initially assume all data are good (flag=3) and then work backwards to identify data that does not meet Relational and/or Range Checking.

The next step is to apply the relational checks. Relational checks attempt to identify data values which conflict with other data in the data set. For instance, data received indicating a DG/CHP Generator output when the gas use is zero is suspect. For data failing a relational check, the data quality level is set to 2 for "Data Passes Range Checks".

The last step is evaluating the range checks. The range checks consist of reasonable high and low values based on facility and DG/CHP Generator information. Data that falls outside the defined range for the database value has its data quality level set to 1 for "Data Exists."

It is necessary to work backwards when applying data quality checks to insure that data gets set to the lowest applicable data quality level. It is possible for data to pass the relational check and fail the range check and such data will be set to a data quality level of 1 for "Data Exists."

Table 1. Data Quality Definitions

Data Quality Levels	Description	Definition
3	Passes Relational Checking	This data passes Range Checks and Relational Checks. This is the highest quality data in the data set.
2	Passes Range Checks	This data passes the Range Checks but is uncorroborated by Relational Checks with other values.
1	Data Exists	This data does not pass Range Checks. This data is found to be suspect based on the facility and/or CHP equipment sizing.
0	Data Does Not Exist	This data is a placeholder for maintaining a contiguous database only.

Details on the Range and Relational Checks are found below.

Relational Checks

These checks are applied to the interval data before it is converted to hourly data. If any of the interval data points fails the relational check, the data for the entire hour is marked as failed.

Table 2. Relational Checks

Evaluated Point	Criteria	Result
FG	WG > 25 and FGE<=0	DQ Level for FG set to 2

Notes: FG – DG/CHP Generator Gas Use
WG – DG/CHP Generator Output

Range Checks

These checks are applied to the 15-minute data before it is converted to hourly data. If any of the 15-minute data points fails the range check, the data for the entire hour is marked as failed.

Table 3. Range Checks

Data Point	Hourly Data Method	Upper Range Check	Lower Range Check
DG/CHP Generator Output	Sum	250 kWh	-1 kWh
DG/CHP Generator Output Demand	Maximum	1000 kW	-5 kW
DG/CHP Generator Gas Use	Sum	2500 cf	0 cf
Total Facility Purchased Energy	Sum	-	-
Total Facility Purchased Demand	Maximum	-	-
Other Facility Gas Use	Sum	-	-
Unused Heat Recovery	Average	4000 Mbtu	-50 MBtu
Useful Heat Recovery	Average	4000 MBtu	-50 MBtu
Ambient Temperature	Average	130°F	-30°F

Notes: Data failing the Range Check has the data quality level set to 1 for “Data Exists”

Coke

Site Notes:

10/3/10:
The data has been posted on the website.