Sigmfaine System Integration at Hunt Refining

... when Data Quality matters in Process & Manufacturing

Kenny Harbison, Yield & Loss Control Database Administrator, Hunt Refining Company
Hunt Refining Company's original refinery was built in 1946 to refine crude oil in the Alabama area primarily into asphalt products. Since then, the company has grown significantly in breadth and capability and is now a much more complex refinery. A major expansion in 2010 marked the addition of a Hydrocracker and CCR unit, along with upgrading the technology infrastructure to enhance data reconciliation and refinery balancing.
THE APPS

1. LIMS
   - Lab integration providing current data on product tanks and streams.

2. Gasoline Blending
   - Use analyzer with components to optimize blending.
THE APPS

1. LIMS
   - Lab integration providing current data on product tanks and streams.

2. Gasoline Blending
   - Use analyzer with components to optimize blending.

3. Tank Information
   - Providing current tank gauges, volumes
1. LIMS
   - Lab integration providing current data on product tanks and streams.

2. Gasoline Blending
   - Use analyzer with components to optimize blending.

3. Tank Information
   - Providing current tank gauges, volumes

4. Movement tracking
   - Capture all transfers within refinery
FORMULA FOR SUCCESS

1 – LIMS

+ 

2 – Gasoline Blending

+ 

3 – Tank Information

+ 

4 – Movement Tracking

= ?
THE SOLUTION = SIGMAFINE
PLANT PRODUCTION & YIELD PERFORMANCE ACCOUNTING = “INVENTORY BALANCING” WITH THE SIGMAFINE/PI SYSTEM INFRASTRUCTURE.
THE SOLUTION – SIGMAFINE

Sigmafine Architecture

- Data & System Integration between servers
  1. Romss (3 Apps)
     - (Gasoline blender, Tank information system, and movement management system)
  2. LIMS (Lab data)
  3. Aspen Historian

- PI

- PS Data Import
  1. Diamond (system for scaled truck ticketing)
  2. Allegro (sales / invoicing)
     - Use VBA to import data
PS DATA IMPORT - STEP 1

**Diamond**

```
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>

```

**Allegro**

```

```

BEFORE

```

<table>
<thead>
<tr>
<th>RAW DATA</th>
<th>RAW DATA</th>
</tr>
</thead>
</table>

AFTER

```

<table>
<thead>
<tr>
<th>Refined Data</th>
<th>Refined Data</th>
</tr>
</thead>
</table>

Select (x) Name | z_Sale Site | i4_meas_volume_metered |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x pm_BIOFUEL</td>
<td>101</td>
<td>51380</td>
</tr>
<tr>
<td>2 x pm_ETHANOL</td>
<td>101</td>
<td>102320</td>
</tr>
<tr>
<td>3 x pm_ETHANOL</td>
<td>101</td>
<td>102320</td>
</tr>
<tr>
<td>4 x pm_ETHANOL</td>
<td>101</td>
<td>102320</td>
</tr>
<tr>
<td>5 x pm_ETHANOL</td>
<td>101</td>
<td>102320</td>
</tr>
</tbody>
</table>
PS DATA IMPORT - STEP 2

Diamond

- IMPORT_10052014.csv_processed
  10/6/2014 6:58 AM
- YIELD_REPORT_10022014.csv_processed
  10/3/2014 11:00 AM

Allegro

- PROCESSED File

- PROCESSED File
INTEGRATION FRAMEWORK

CONNECTION TO HRC054

Configuration using SQL Native client provider
INTEGRATION FRAMEWORK

CONNECTION TO LIMS

Configuration using Oracle Provider for OLE DB
INTEGRATION FRAMEWORK

DTN & ALLEGRO TRANSFERS

The DTN transfers are imported by reading a text file.

- Virtual Dataset includes parameters and code for the configuration.
MODEL DEVELOPMENT

Build database from template
database with predefined element
templates and example elements

Standardize element naming to simplify
modeling and troubleshooting

Utilize Excel workbook with the add-ins
for PI AF and Sigmafine to
import/export data
BENEFITS

• Accurate information about how the refinery is performing.
• Monitor meters, units, processes & overall refinery performance on a daily basis.
• Reporting
• Review, analyze and report reconciliation results
EXCEL ADD-IN
Configuration (AF Builder)

- View and edit element configuration
AREAS WHERE SIGMAFINE IS USED

- Inventory balancing
- Production accounting
- Refinery material balances
- Individual process units material balances
- Detection of measurement errors
- Non-measured flows calculation
- Material losses accounting
Thank you!