Digital Transformation in Water Accounting

Gary Winkler Cal Water
Greg Dumas DST Controls
California Water Service

- Largest regulated water utility west of the Mississippi
- Founded in 1926
- Grew to serve 484,900 residences and businesses throughout the state.

Most Outstanding Water Project of 2018

Award from American Society of Civil Engineers
Keeping track of 10+ billion gallons per year!

*We keep the pumps running just fine...*

The problem ...

- Tracking flows and power for 1000+ pumps
- Rolling up this physical data into economic costs and total production value
- Publishing a report of only 10 numbers!

High horsepower pumps pump water from aquifers, lakes and rivers to distribution stations.
Former Data Flow

1. Drive to stations to take readings on paper.
2. Compile handwritten readings into a Microsoft Excel spreadsheet.
3. Enter the Excel data into a Microsoft Access Form.
4. Generate Access report, print it, and submit to District Manager for approval.
5. Upon approval data is manually transcribed from the report into another Excel spreadsheet for use by finance and corporate.
Biggest Issue:
Computerized, but still intensely manual

• Involves many hours of travel and manual record keeping.

• Prone to transcription errors.

• The access database is flat, lacking meaningful organization.

• The Access database does not lend itself to calculations, aggregations, or trending.

• Data is stored in many different tables and formats.
Opportunity:
Organize data for Accounting

Accounting needs only 10 numbers per month!

- Accounting can’t handle the individual metrics (flow, power, run hours) for each of 2000 operating end devices.
- **Accounting wants total amounts, costs for all districts.**

<table>
<thead>
<tr>
<th>Water Production Summary</th>
<th>Daily Sum</th>
<th>Month to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWS Wells:</td>
<td>16,996</td>
<td>471,775</td>
</tr>
<tr>
<td>Leased Water:</td>
<td>Null</td>
<td>Null</td>
</tr>
<tr>
<td>Purchased Water:</td>
<td>14,546</td>
<td>354,131</td>
</tr>
<tr>
<td>Purchased Water - Other:</td>
<td>1,995</td>
<td>48,889</td>
</tr>
<tr>
<td>Surface Water:</td>
<td>278</td>
<td>143,392</td>
</tr>
<tr>
<td>Desalted Water:</td>
<td>Null</td>
<td>Null</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>53,367</td>
<td>1,380,312</td>
</tr>
<tr>
<td>Wheeled Water:</td>
<td>3,623</td>
<td>97,052</td>
</tr>
<tr>
<td>Total Production:</td>
<td>53,367</td>
<td>1,380,312</td>
</tr>
<tr>
<td>Other Water:</td>
<td>Null</td>
<td>Null</td>
</tr>
<tr>
<td>Backwash:</td>
<td>Null</td>
<td>Null</td>
</tr>
<tr>
<td>Reclaimed Water:</td>
<td>Null</td>
<td>Null</td>
</tr>
</tbody>
</table>
Decision: PI AF is the only choice to produce business metrics

• Traditional historians restrict calculations to physical assets, not business concerns.

• PI AF provides calculations traceable to the underlying physical mechanism

• PI AF rolls up and aggregates data across all enterprise data sources
PI AF at Cal Water
Many departments use their own AF Server

• A dedicated AF Structure
  For each enterprise issue

• Admins of one AF structure
  needn’t worry about other structures
Rollups: AF Converts Hundreds of Values to 10!

For reporting, data is organized into a hierarchy that can handle both physical and logical needs.

Maintains physical location of each asset while allowing logical separation by water type.

Rollup calculations consolidate data from all lower levels, gives district level production data from meter data.

With this hierarchy, we can generate customized reports for several enterprise departments.
Each hierarchy member is based on a template.

With 30 templates, we can generate customized reports for many enterprise departments.

Element templates contain all relevant attributes and analyses.

Most element configurations are automatic based on hierarchy location and attribute IDs.

If the district structure is known, it can be built in AF in a matter of minutes!
Analyses are Performed at Each Level

- Flow totals are calculated from flow rate data & manual data.
- Run hours are calculated based on the device state tags
- Kilowatt hours are manually entered.
- From there, month to date and previous day rollup calculations are performed
- Different types of flow, such as transfer and production, are calculated separately.
- The end result is calculated district level calculations based on data from all member pumps and meters.
Dealing with Equipment not in SCADA

- **PI Manual Logger (PIML)** allows operators to enter data from non-SCADA equipment into PI
- 1500+ manual entry points, scattered across the entire state
- Each manual point is a distinct piece of equipment!
Actual DROP Report

California Water Service Company

Summary of Daily Production Totals

Record Date: Thursday, May 31, 2018

Total Production

<table>
<thead>
<tr>
<th>Date</th>
<th>KGALS</th>
<th>Acre Feet</th>
<th>CCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-May-18</td>
<td>10,837</td>
<td>33.26</td>
<td>14,487.23</td>
</tr>
<tr>
<td>2-May-18</td>
<td>11,569</td>
<td>35.50</td>
<td>15,465.54</td>
</tr>
<tr>
<td>3-May-18</td>
<td>11,343</td>
<td>34.81</td>
<td>15,163.03</td>
</tr>
</tbody>
</table>

- 28 Daily Report of Production (DROP) documents per month
- Validated, digitally signed by District Managers and Engineering
- Aggregated into one Water Production Report (WPR)

CWS WELLS

<table>
<thead>
<tr>
<th>Pump:</th>
<th>Kgallons</th>
<th>Month to Date</th>
<th>Hours</th>
<th>Month to Date</th>
<th>KWH</th>
<th>Month to Date</th>
<th>GPM</th>
<th>Average for Month to Date</th>
<th>Difference as a Percent</th>
<th>Production Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAS-001-02</td>
<td>Null</td>
<td>Null</td>
<td>0.00</td>
<td>3.65</td>
<td>Null</td>
<td>Null</td>
<td>0.00</td>
<td>0.00</td>
<td>0%</td>
<td>Yes</td>
</tr>
<tr>
<td>LAS-004-02</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>530.74</td>
<td>28.56</td>
<td>-1758% Yes</td>
</tr>
<tr>
<td>LAS-006-02</td>
<td>764.27</td>
<td>1,275.06</td>
<td>2.95</td>
<td>34.50</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>163.33</td>
<td>77.34</td>
<td>-111% Yes</td>
</tr>
<tr>
<td>LAS-015-01</td>
<td>235.20</td>
<td>3,452.44</td>
<td>12.64</td>
<td>167.78</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>685.05</td>
<td>839.32</td>
<td>18% Yes</td>
</tr>
<tr>
<td>LAS-017-01</td>
<td>986.47</td>
<td>37,467.45</td>
<td>14.71</td>
<td>572.81</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Producing the Report

Requirement:

- Users can be anywhere on Enterprise Network without needing PI account

Data access and security requirements:

- Users are on enterprise network
- Shouldn’t have access to PI System

Two spreadsheet solution:

- DataLink Spreadsheet queries PI System
- Formatted Spreadsheet copies values only from DataLink Spreadsheet – isolated from PI System
Report Life Cycle

PI and Excel
- Data organization, and calculations
- Report generation

Operations
- District Managers
  - Deal with one district
  - Verify raw data
  - Digitally sign

Engineering
- Water Engineers
  - Deal with 28 districts
  - Check monthly averages and statistics
  - Can request edits and changes

Accounting and Compliance
- Accountants
  - Aggregate 28 District reports into one
SharePoint

- Workflow guides the report through its life cycle
  - Validation by District
  - Verification by Engineering
  - Aggregation by Accounting

- SharePoint manages electronic signatures, and controls access to reports
Digital Transformation in Water Production

Cal Water produces 10+ billion gallons per year of clean and cost effective water to ½ million CA residents and businesses. Our biggest challenge is keeping track of each gallon.

Our new production reporting process is an entirely digital process composed of clicks with little manual handling. More accurate data, delivered sooner means users discuss business issues rather than production mechanics.

Maximizing water for CA means keeping track of each gallon- its cost, its price, its quality and its location

- Monthly production reports were plagued by outdated water data, analyzed in manually manipulated spreadsheet reports.
- Monthly effort involved many people, cost too much in time and money

We re-organized our production information architecture into a digital data hierarchy managed by PI AF and PI analytics

- The data hierarchy is based on business information needs (flow, cost, location) in addition to engineering needs (pumps, meters, etc.)
- Each Water District has its own standard AF structure that is easy to maintain.

Production reporting effort cut in half; quantity and quality of data improved. Accounting and Engineering now discuss business values rather than production mechanics.

- 30 separate reports automatically compiled into one report within minutes
- SOX compliance, accounting, much easier
Let’s talk again…. 

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You can trust Gary and Greg!  
Visit them at DST’s booth

Doggo, the best Golden Lab in the world
THANK YOU

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