EnergySmart Pumping for Energy Savings

Energy Management and Operational Modeling

A poster by IDModeling in conjunction with Indio Water Authority

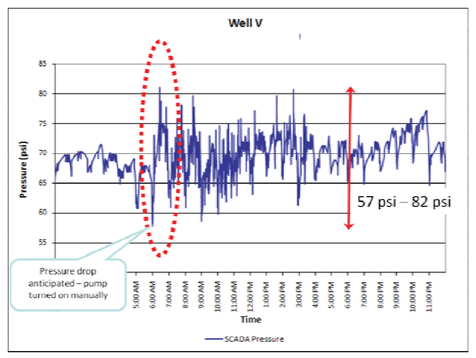
IDModeling ENGINEERING INNOVATION

Indio Water Authority Your Water. Our Responsibility.

The Challenge:

"If we sit here and do nothing, it's going to be expensive"
- Indio Water Authority

A Desert Utility's Challenge to Sustainable Closed System Operations



- Unstable system—VFDs "fight" each other
- Unique diurnal pattern with hourly irrigation peaks
- **High energy costs**

The Solution:

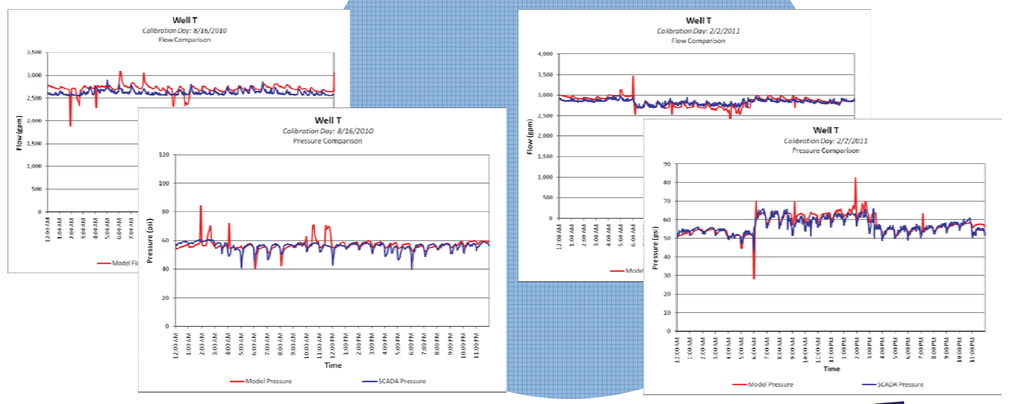
Develop an operation plan to optimize pumping and lower energy costs.

Indio Water Authority Pump Operational Plan
Operational Matrix

Facility Type		Low Demand: Solid State	Low Demand: VFD	Low Demand: Control	Transition Demand: Solid State	Transition Demand: VFD	Transition Demand: Control	High Demand: Solid State	High Demand: VFD	High Demand: Control
Plant 1	Booster Pump 1		X	HGL = 175 ft		X	HGL = 175 ft		X	HGL = 175 ft
	Booster Pump 1								X	HGL = 172 ft
Plant 2	Booster Pump 2		X	HGL = 179 ft		X	HGL = 179 ft	X		On: Pressure < 60 psi Off: Pressure > 80 psi
Plant 3	Booster Pump 1		X	HGL = 170 ft		X	HGL = 170 ft		X	HGL = 170 ft
	Booster Pump 2							X		On All Day
Plant 4	Booster Pump 1							X		On: Pressure < 50 psi Off: Pressure > 60 psi
	Booster Pump 3							X		On: Pressure < 58 psi Off: Pressure > 65 psi
	Booster Pump 4	X		On All Day	X		On All Day			
Wells	Well T				X		On All Day	X		On All Day
	Well U							X		On All Day
	Well W	X		On: Pressure < 50 psi Off: Pressure > 90 psi	X		On: Pressure < 50 psi Off: Pressure > 90 psi	X		On: Pressure < 50 psi Off: Pressure > 80 psi

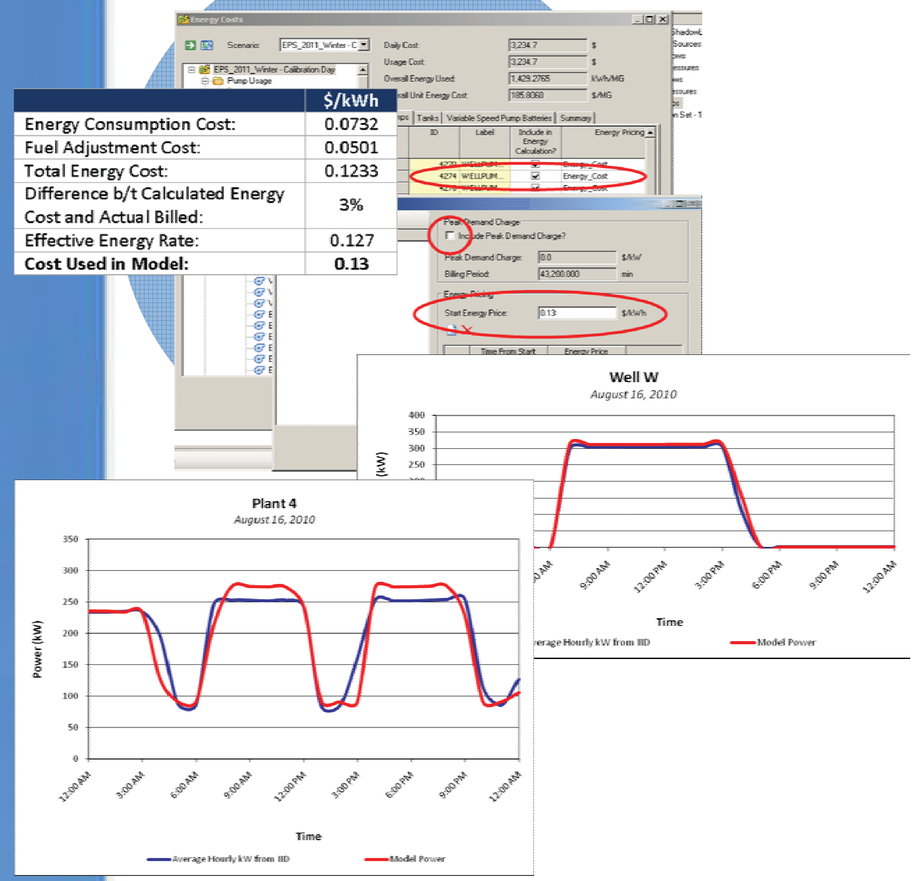
The Process:

1. Hydraulic Model Calibration



2. Energy Model Calibration

	$/kWh
Energy Consumption Cost:	0.0732
Fuel Adjustment Cost:	0.0501
Total Energy Cost:	0.1233
Difference b/t Calculated Energy Cost and Actual Billed:	3%
Effective Energy Rate:	0.127
Cost Used in Model:	**0.13**



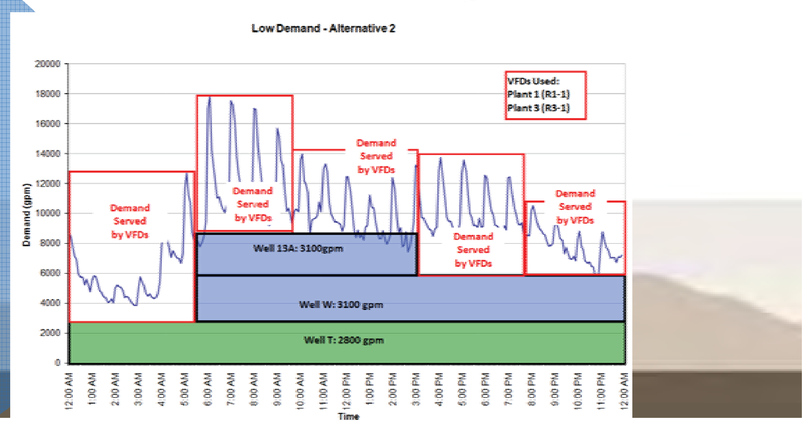
3. Calibration Cost Comparison

Total System Daily Cost:	**$5,559.40**
Projected Over August -->	**$172,341.40**
Actual Energy Billings:	**$165,647.53**
Percent Difference:	4.0%

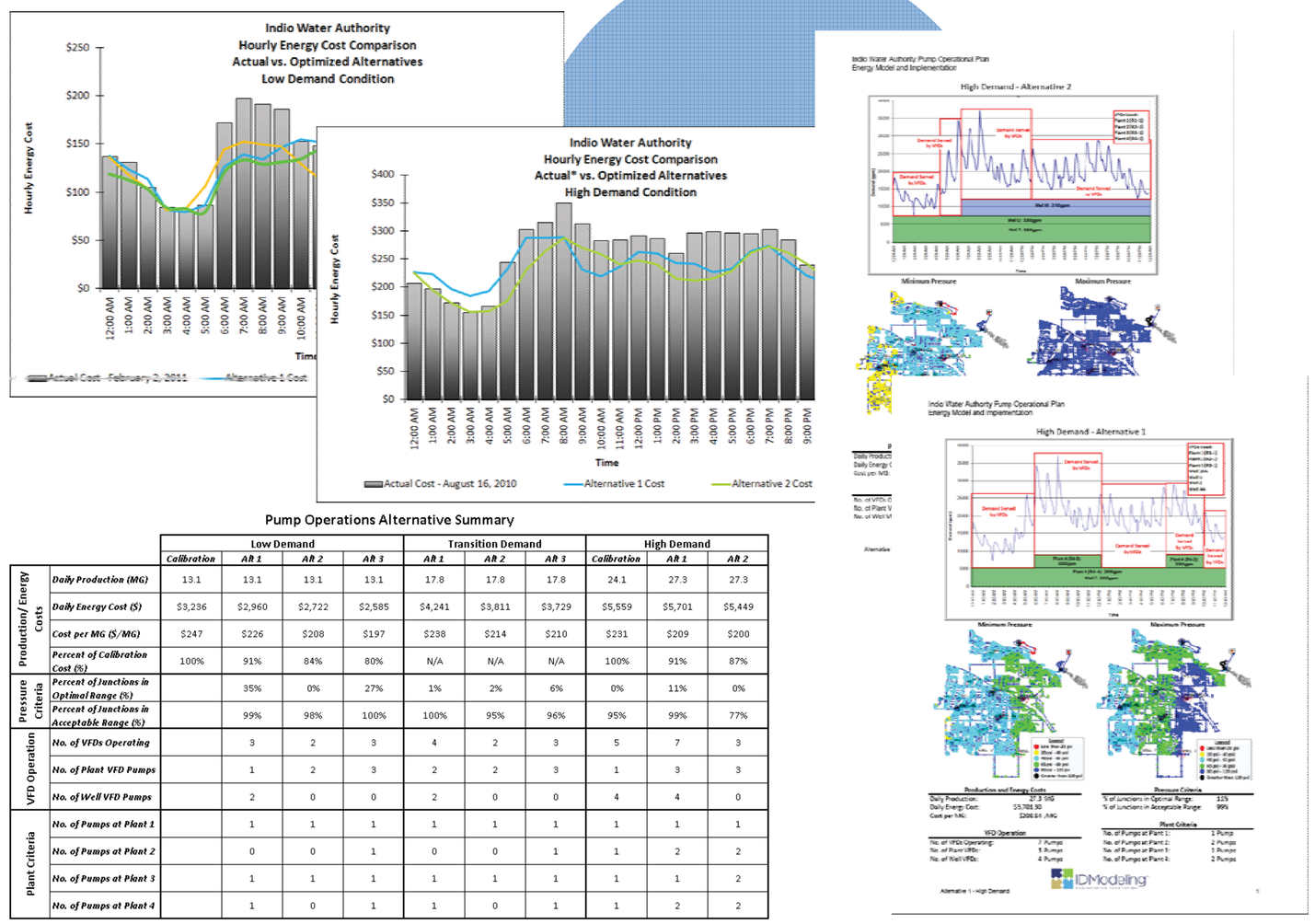
Total System Daily Cost:	**$3,234.70**
Projected Over February --:	**$90,571.60**
Actual Energy Billings:	**$89,397.00**
Percent Difference:	1.3%

4. Operational Alternative Development

- Pressure Criteria:
  - 40-120 psi min/max acceptable operating range
  - Preferred (optimal) operating range 65-80 psi
- Pump Criteria:
  - Use most efficient pump
  - Well Pumps "on" for > 6 hours
  - Minimize # of VFDs at any one time
- VFD Criteria:
  - Minimize VFDs
  - Use Plant VFDs foremost
- Plant Criteria:
  - Plants operate at firm capacity



5. Operational Alternative Comparison



Pump Operations Alternative Summary

		Low Demand: Calibration	Low Demand: Alt 1	Low Demand: Alt 2	Low Demand: Alt 3	Transition Demand: Alt 1	Transition Demand: Alt 2	Transition Demand: Alt 3	High Demand: Calibration	High Demand: Alt 1	High Demand: Alt 2
Production/ Energy Costs	Daily Production (MG)	13.1	13.1	13.1	13.1	17.8	17.8	17.8	24.1	27.3	27.3
	Daily Energy Cost ($)	$3,236	$2,960	$2,722	$2,585	$4,241	$3,811	$3,729	$5,559	$5,701	$5,449
	Cost per MG ($/MG)	$247	$226	$208	$197	$238	$214	$210	$231	$209	$200
	Percent of Calibration Cost (%)	100%	91%	84%	80%	N/A	N/A	N/A	100%	91%	87%
Pressure Criteria	Percent of Junctions in Optimal Range (%)		35%	0%	27%	1%	2%	6%	0%	11%	0%
	Percent of Junctions in Acceptable Range (%)		99%	98%	100%	100%	95%	96%	95%	99%	77%
VFD Operation	No. of VFDs Operating		3	2	3	4	2	3	5	7	3
	No. of Plant VFD Pumps		1	2	3	2	2	3	1	3	3
	No. of Well VFD Pumps		2	0	0	2	0	0	4	4	0
Plant Criteria	No. of Pumps at Plant 1		1	1	1	1	1	1	1	1	1
	No. of Pumps at Plant 2		0	0	1	0	0	1	1	2	2
	No. of Pumps at Plant 3		1	1	1	1	1	1	1	1	2
	No. of Pumps at Plant 4		1	0	1	1	0	1	1	2	2

6. Cost and Energy Savings

	2010 Production (CCF)	2010 Production (MG)	2010 Average MGD	2010 Monthly Cost	Demand Condition	$/MG (lowest Alt)	Projected Cost	Cost Saving
January	597757	447	14.4	$93,801	Low	$197	$88,083	6.1%
February	506771	379	14.0	$104,484	Low	$197	$74,676	28.5%
March	578868	433	14.4	$109,202	Low	$197	$85,300	21.9%
April	871258	652	19.7	$129,127	Transition	$210	$136,857	-6.0%
May	785941	588	21.0	$136,897	Transition	$210	$123,456	9.8%
June	968663	725	24.2	$160,615	High	$200	$144,912	9.8%
July	1123066	840	26.3	$187,393	High	$200	$168,011	10.3%
August	1057989	791	27.3	$183,308	High	$200	$158,275	13.7%
September	1031986	773	27.7	$174,607	High	$200	$154,586	11.5%
October	674096	504	18.0	$151,687	Transition	$210	$105,887	30.2%
November	681098	509	18.2	$138,735	Transition	$210	$106,977	20.0%
December	554439	415	15.4	$134,896	Low	$197	$81,700	39.4%
Overall				**$1,699,752**			**$1,428,670**	**15.9%**

- April billing data contained some errant readings; Actual savings may be *higher*.
- Save over $250,000 per year on Energy;
- A nearly 16% savings!!!