

Presented for
PNWS AWWA Preconference
GRFF Tour
Bellevue, WA
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Operators in Engineering, Engineers in Operations

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BUILDING A BETTER WORLD

- Team collaboration for the Green River Filtration Facility
 - Predesign
 - Design
 - Construction
 - Startup
- Involving Operations in Engineering
- Involving Engineering in Operations
- Challenges and solutions for collaboration



Collaboration in Predesign

16 Technical Memos



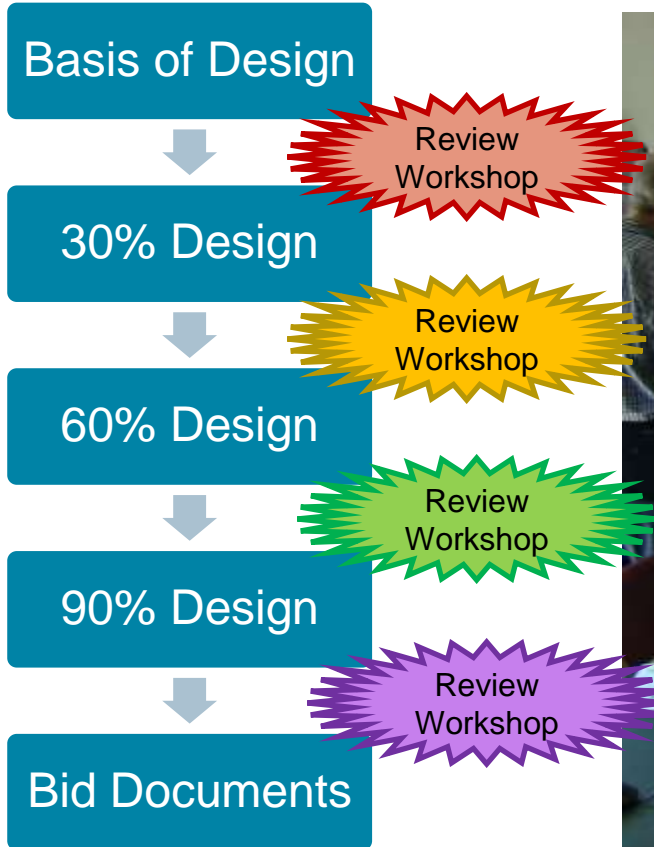
6 Pre-Design Workshops



- Pilot Testing
- Pretreatment and Filtration
- Hydraulics, Clearwell & Pump Station
- North Fork Wellfield & Residuals
- SCADA & Controls
- Site & Stormwater



Collaboration in Design



Collaboration in Construction

Partnering Session

- Owner
- Engineer
- Contractor

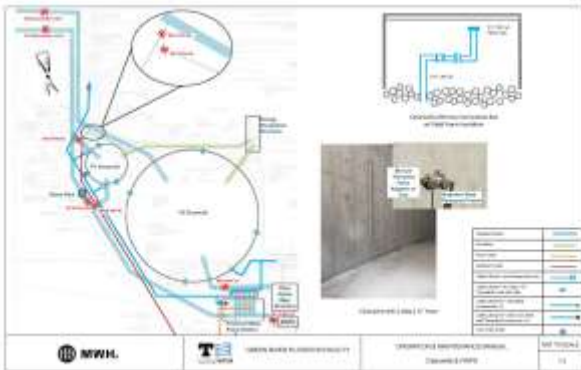
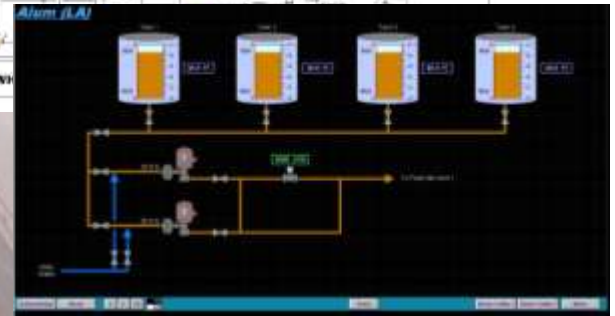
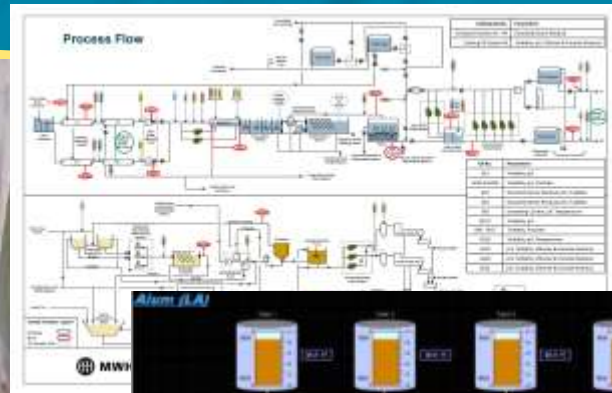


Weekly Construction Meeting and Site Walks



Collaboration in Training

Classroom Portion



Field Walk



Collaboration in Startup



Operators in Engineering

Ownership of the issues – no solution is perfect



Operators in Engineering

How things are done matters



Operators in Engineering

Experience is just as important (or more important!) than book knowledge



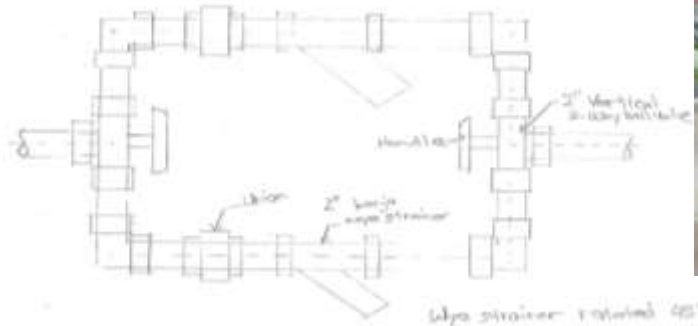
Engineers in Operations

How were YOU thinking we were going to...



Engineers in Operations

This isn't performing as expected...
What should we change?



Engineers in Operations

Spreadsheets!

We use this spreadsheet...

We need a spreadsheet that...

Green River Headworks Treatment Facilities
Chemical Dosage

Reactor Flow: **20.00** (10% to 30.00)

$$\frac{\text{Flow (mgd)} \times \text{dose (mg/l)} \times 8.34 \text{ (lb / 1MG)}}{\text{concentration (\%)} \times \text{density (\# / gal)}} = \text{gallons per day of product}$$

Chemical	Target Dosage (mg/l)	Reactor Flow (MGD)	Supply Chem (MGD)	Supply Solution (MGD)	Storage Chem (MGD)	Supply Solution (MGD)	Supply Solution (MGD)	Supply Solution (MGD)	Supply Solution (MGD)
Starch	0.70	20.00	118.79	621.91	8.84	48.85	8.85	7.04	188.82
Oxygen	22.00								
Caustic	22.00	0.80						1.10	1.18
Sodium Bicarbonate	2.00	22.00	332.89	867.28	14.66	82.28	2.18	0.04	127.28
Hydrochloric Acid	20.00	0.80	0.80	0.80	0.80	0.80	0.00	0.00	8.00
Hydrochloric Acid - 10%	1.81	20.00	161.91	2342.57	14.10	251.34	8.84	0.16	288.18



Green River Headworks Treatment Facilities
Chemical Dosage

Plant Flow: **20.00** (10% to 30.00)

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Plant Influent Flowrate (MGD) **20**
River Turbidity (NTU) **10**

# of Pumps	0	1	2	3	4	5	6
MGD	60	48	36	24	12	6	3
Plant Influent Turbidity (NTU)	10.0	8.1	6.2	4.3	2.4	0.5	N/A
NPW Pumping Cost (USD/Day)	\$ -	\$ 218.22	\$ 436.45	\$ 654.67	\$ 872.90	\$ 1,091.12	\$ 1,309.35
Comp. Chemical Total (USD/Day)	\$ 1,234.27	\$ 1,306.50	\$ 1,378.73	\$ 1,450.96	\$ 1,523.19	\$ 1,595.42	\$ 1,667.65
Influent Solids Handling Total (USD/Day)	\$ 442.48	\$ 277.12	\$ 111.77	\$ 24.84	\$ 163.50	\$ 82.76	\$ 22.78
Amort. Total (USD/Day)	\$ 3.55	\$ 3.28	\$ 3.00	\$ 2.71	\$ 2.40	\$ 2.08	\$ 1.76
Total (USD/Day)	\$ 2,083.83	\$ 2,365.62	\$ 2,620.95	\$ 2,859.72	\$ 3,113.09	\$ 3,382.70	\$ 3,649.61
Total (USD/MGD)	\$ 34.73	\$ 49.29	\$ 72.81	\$ 119.16	\$ 259.42	\$ 563.78	\$ 1216.50

Days Sustainable: days Continuous Continuous Continuous

Green River Treatment Facility Process Flow Summary

Raw Water Water Setting: **20.00** MGD
Green River Supply: **24.00** MGD
NPW Supply: **2.00** MGD
Avg. Return ED Pump Station: **MGD @ 4% of Plant Flow**
Water Wtg @ 1.84 Acre
Blended Turbidity: **10.0** NTU

System Parameters

Chemical Doses
Starch Dose: **0.70** mg/l
Oxygen Dose: **22.00** mg/l
Caustic Target: **22.00** mg/l
Caustic Dose: **0.80** mg/l
Caustic Stock Dose: **0.80** mg/l

Flow Mts
PUMP Flowrate: **20.00** MGD
Flowrate (gpm): **1,440.00**
Flowrate (MGD): **20.00**

PH/Al/ACHS Dose
PH Dose: **0.00** mg/l
Al Dose: **0.00** mg/l
ACHS Dose: **0.00** mg/l

Flocculation Basins
of Basins on-line: **2**
Total Residence Time: **60.00** min
Floculation: **20.00** min
Stage 1: **10.00** min
Stage 2: **10.00** min
Stage 3: **10.00** min
Stage 4: **10.00** min

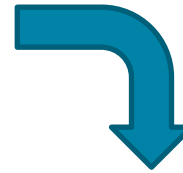
Settlement Basins
of Basins on-line: **1**
Total Residence Time: **60.00** min
Sludge Retention in Bed Basin: **3.00** day (daily)
Bed Basin Sludge Checkrate: **40.00** gpm/day
Bed Basin Sludge Accumulation Rate: **0.8** ft/day
Max. Sludge Bedded Depth: **4.00** ft
Sludge Blowdown - Flocculate to Thickener: **100** gpm
Sludge Blowdown - Clarifier: **10** gpm
Required Blowdown Frequency: **5** per day



Engineers in Operations

Spreadsheets!

We collect this data and need to make a report...



Engineers in Operations

What do we need to do to update...

HAZARDOUS MATERIALS MANAGEMENT PLAN GREEN RIVER FILTRATION FACILITY- RAVENSDALE, WASHINGTON



DECEMBER 2014



Green River Filtration Facility Operating Procedures

Title: Area 05 - Flash Mix - Startup

Purpose: Start up the Flash Mix System

Safety Precautions: Required PPE - none for the flash mix pumps. For chemical 02 SOP Safety Precautions.

References: O&M Manual Figure 5-1, Area 02 - Chemical Building SOPs

System Overview: The flash mix system rapidly mixes coagulation chemicals into to promote particle destabilization prior to flocculation.

Steps:

1. Determine which grid(s) and Flash Mix Pump(s) will be used for the flash mix. Manually adjust the pump isolation valves to direct the selected pump to the selected flash mix moving grid to be used.
2. Confirm that the isolation valve on the 16" suction header is open, the isolation valves on the Automatic Backwash Strainers are open on the suction header.
3. Set the G-Value or Pump Flowrate and start the flash mix pump.
4. Set the desired dosing parameters for the chemical feed pumps (coagulant or coagulant aid (Alum, PACL, or PEC) and start the feed pumps.

Note: Alum or PACL may be dosed at Grid 1. Manual valves at the grid chemical can be dosed. See Area 02 - Process and Operating Notes and 02 SOPs for specific chemicals for further details.

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Filter Backwash

West Cell | Operation | East Cell

Bringing a Filter Online

Normal Filter Rise

Backwash Rate (GPM) for Filter Bed Purification

Backwash Rate (GPM)	Backwash Flow Rate (MGD)	Backwash Flow Rate (MGD)	Backwash Flow Rate (MGD)
100	0.01	0.01	0.01
200	0.02	0.02	0.02
300	0.03	0.03	0.03
400	0.04	0.04	0.04
500	0.05	0.05	0.05
600	0.06	0.06	0.06
700	0.07	0.07	0.07
800	0.08	0.08	0.08
900	0.09	0.09	0.09
1000	0.10	0.10	0.10

GREEN RIVER
FILTRATION FACILITY

OPERATION &
MAINTENANCE MANUAL

FILTER OPERATION & BACKWASHING

ISSUE 000002

82



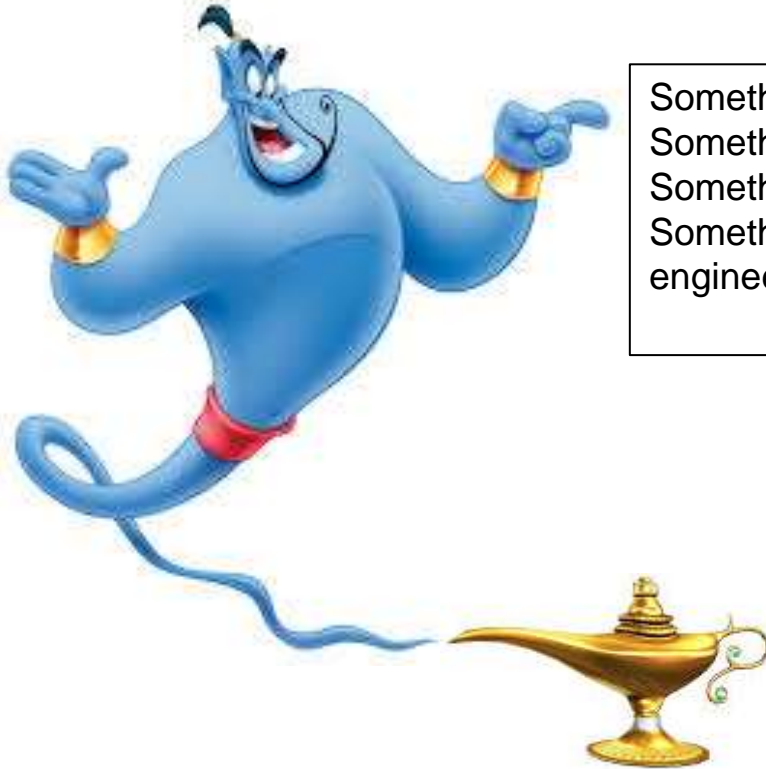
Challenges/Solutions

Operator-engineer exchange is limited because of:

- Concerns about creating a wish list
- Schedule/Time
- Cost



Challenges/Solutions



Something Expensive
Something Really Expensive
Something Crazy Expensive
Something that confused the engineer



Challenge: Myriad of voices creating a “wish list”

Solution: Have an assigned communicator to provide a singular voice after internal discussion



Challenges/Solutions



Challenge: Its hard to find a time to get everyone together

Solution: For meetings or workshops, solicit feedback before hand if people are unable to attend
Have presentations or trainings held a couple of times



Challenges/Solutions



Challenge: It costs money to get people together

Solution: Offer CEUs where possible

GOT CEUs?



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Questions?

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