

# Industrial Wastewater Assessment Results



*Water Preservation and Pollution Prevention Program*

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April 17, 2014



# **Goals & Objectives of the WP4 Program**

## **1 ) Update essential water program related information**

- Sewer Diagrams – Process, Sanitary, and Storm lines
- Inventory of Water Users – Water Process Flow Diagram
- Overall water balance for each facility

## **2 ) Identify potential water conservation projects**

- Calculate annual water savings
- Estimate cost of implementation
- Determine payback period - ROI

## **3 ) Identify pollutant reduction projects**

- Priority focus on compliance parameters of concern
- Source controls, rather than end-of-pipe WWT
- Additional cost savings opportunities – chemical usage / energy usage



# Participants

## 1 ) Delta Faucet – Greensburg

- Contact: Luke Fullenkamp
- Multiple plating lines
- WWT - Metals precipitation



## 2 ) Mead Johnson Nutrition – Evansville

- Contact: Chris Allen
- Infant & Adult Formula
- WWT – pH Adjustment



## 3 ) SABIC Innovative Plastics – Mt. Vernon

- Contact: Nicholas George
- LEXAN Resin Compounding & Pelletizing
- WWT – Dissolved Air Floatation

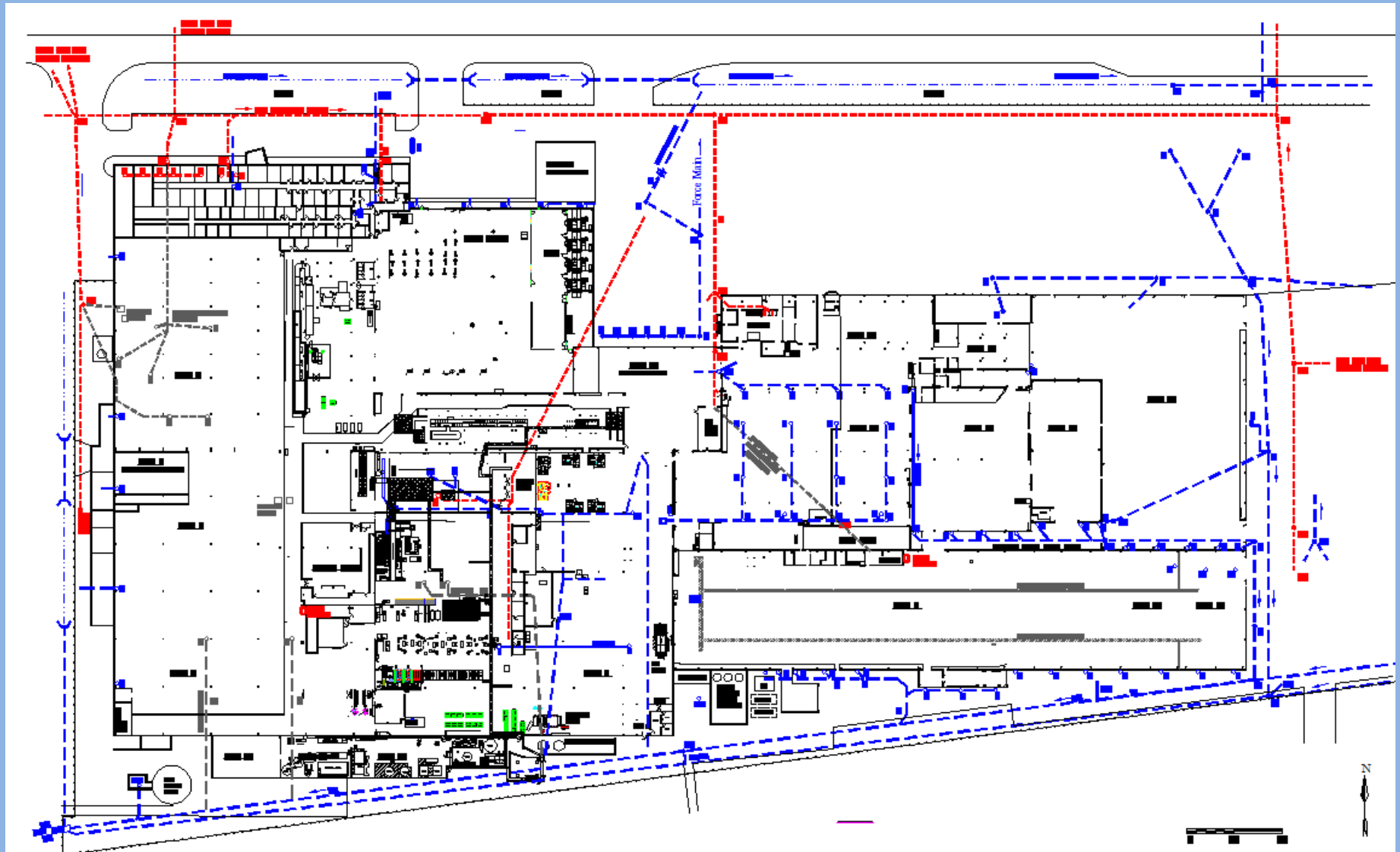


## 4 ) Red Gold – Elwood

- Shane Wingler
- Tomato Processing – Ketchup & Sauce
- WWT – Dissolved Air Floatation & Activated Sludge

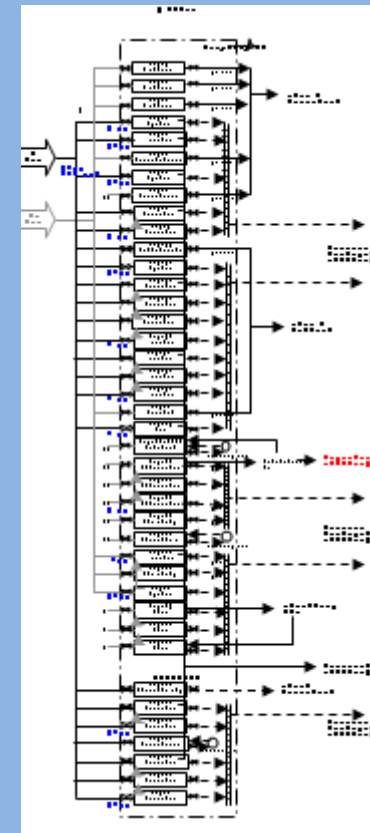
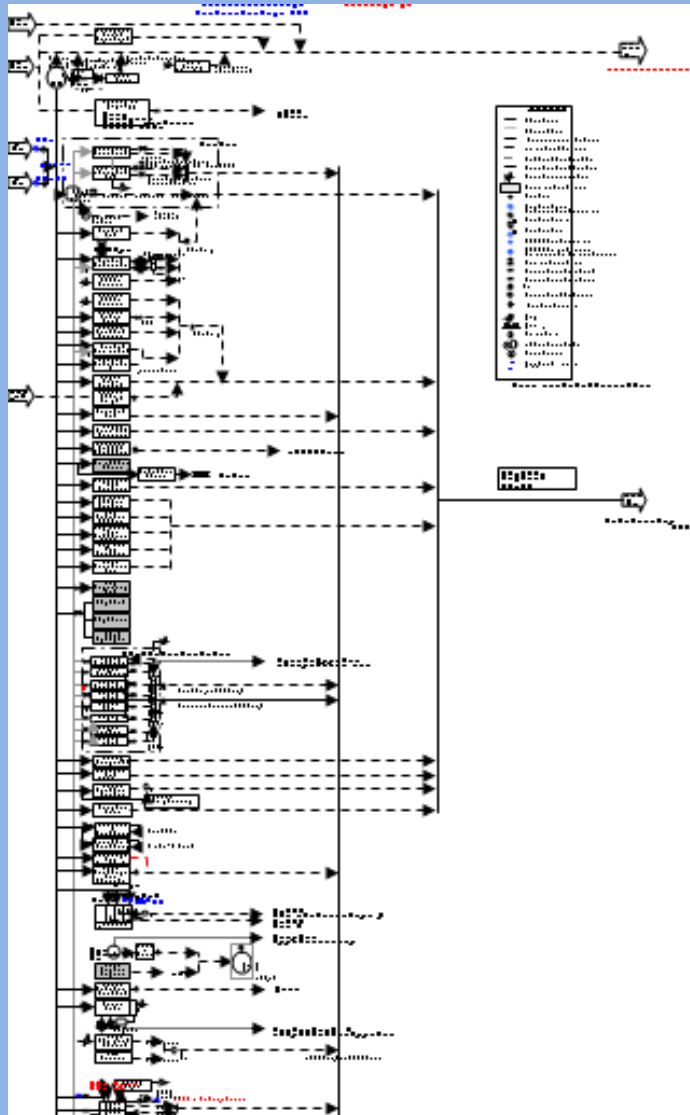


## Deliverables Package – Sewer Diagrams



Updated mapping with inspection findings  
(multi-layered AutoCAD drawing)

## Deliverables Package – Water PFD



Depicts all incoming water supplies, users, WW generators, and WWT  
(MS Excel)

## Example - Water / Energy Conservation Project (SABIC)

- Reduce NCCW water use on vacuum pumps.

Opportunity: Install flow control orifices on supply lines – 9 missing. Also check to ensure solenoid valves are working properly.

Result:

- Reduced mill water use by 9pumps \* 7gpm \* 1440min/d reduction \* 365d \* 70%  
**= 23,100,000gpy** (at \$1.44/1000gal cost savings **\$33,264/yr**)



No Orifice – 10gpm



With Solenoid & Orifice  
<5gpm, and flow stops when  
pump stops.



## Example - Water / Energy Conservation Project (SABIC)

- Reduce / Eliminate RO Storage Tank Overflows

## Opportunity:

Overflows result in 80gpm of lost RO water. Overflow pipe was hard-piped to sewer and therefore difficult to detect flow during process walk-throughs.

## Result:

- Adjusted tank high-level set-point downward by 8%
- Reduced RO water losses

**= 31,500,000 gal/yr RO (@ \$4.50/1000gal = \$136,800)**





## Example - Water / Energy Conservation Project (SABIC)

- Evaluate and Adjust RO Water Flows on OQ Pellet Washers (5)

### Opportunity:

Determine proper flow ranges and adjust set-points. During WP4 event, one washer was running at 25gpm while others were only 5gpm.

### Result:

- Reduce RO water use on at least 1 OQ pellet washer.

$(13\text{gpm} * 1440\text{min/day} * 365 \text{ d} * 90\% \text{ uptime}) =$

**= 6,100,000 gal/yr RO**

**= \$35,100 / yr**





## Example - Water / Energy Conservation Project (SABIC)

- Reuse of Reverse Osmosis (RO) Reject Water

Opportunity:

Replace carbon steel recirculation pipeline with c-PVC pipe, to avoid past corrosion issues. Options include OQ Blob cooling, OQ vacuum pump cooling (4).

Result:

- Reduced mill water use  $(20\text{gpm} * 75\% \text{ uptime} * 1440\text{min/day} * 365\text{days})$   
**= 7,900,000 gal/yr      = \$11,400/yr**



## **Other Potential Opportunities for Reuse of RO Reject Water**

- Cooling Water (e.g. cooling tower make-up, quench water, & once-thru) (All)
- Equipment and/or floor wash-downs (MJN)
- Chemical make-down systems (Red Gold)
- Lawn Irrigation (MJN)



## Example - Water / Energy Conservation Project (SABIC)

- Reconnect steam condensate collection tank to site recovery/return system.

Opportunity: Replace failed pump and re-pipe to nearby return tank system.

Result:

- Reduced mill water use = **5,256,000 gal/yr MW**
- Heat and chemical recovery = **\$40,000 / yr**



## Delta Faucet Opportunities

1) Reduce water usage on 1038 Plating line	<ul style="list-style-type: none"> <li>a) Convert Tank 16 from DI to city water</li> <li>b) Repair/replace/calibration conductivity controllers</li> </ul>
2) R&D RO Unit– Increase cycle time, pre-filter and membrane life  (Eventually scale-up recycle using larger RO unit)	<ul style="list-style-type: none"> <li>a) Segregate ammonium (n) bifluoride,</li> <li>b) Find more effective way to destroy bacteria (chlorine / biocide)</li> <li>c) bio-membrane technologies</li> </ul>
3) Eliminate only remaining cooling tower by utilizing existing chiller capacity	<ul style="list-style-type: none"> <li>a) Cost savings from reduced water use, treatment, and discharge</li> <li>b) Additional cost savings from reduced chemical use, reduced electric on recirc pump, cooling tower maintenance.</li> <li>c) Potential increase in chiller operating efficiency</li> </ul>
★ 4) Consider using city water as back-up to RO concentrate on air scrubbers.	<ul style="list-style-type: none"> <li>a) Measure current soft water usage on air scrubbers to quantify the opportunity.</li> <li>b) If attractive, simply switch break tank controllers between soft and city water.</li> </ul>
5) Reduce metal loading in anticipation of lower regulatory limits (eg. ammonia, phosphates)	Also discuss with City POTW, the possibility of converting to mass based limits, to ensure that clean water reductions do not trigger a violation of concentration limit.
6) Evaluate + / - of converting to NPDES permit	Potential cost savings – reduced sewer cost



# Mead Johnson Opportunities

Project #	Project Description	Assumptions / Comments
1	Increase Boiler Blowdown Temp Control Setpoint from 110F to 150F (Permit Limit is 160F)	City Water usage estimated during Feb 2013 study, a short evaluation of heat exchanger performance yielded blowdown exit temps between 80-140deg F.
2	Eliminate RO Purges Passing Through Conductivity Probes (Water World)	Measured 4gpm x 1440min/d x 365 x 0.8 (on-line percentage). Cost is for re-plumbing.
3	Eliminate CW Purges Passing Through pH Probes (Water World)	Measured 1gpm x 1440min/d x 365 x 0.8 (on-line percentage), Cost is for re-plumbing.
4	Reduce RO System Stand-by Flushes by 50+%	2 standby units use 50gpm for 15min (timer setting to be confirmed), and cycle every 4 hrs. Value of water usage at this point falls between City Water and RO Water.
5	Install Tank & Distribution System for RO Reject Water for use in B33 irrigation and B33 floor washdowns (in place of RO).	B33 landscaping area is 37,000 sf. Typical irrigation application is 1.25" per week. System operates May-Sept. Site-wide irrigation use determined to be 1.4MMgal in 2012.
6	Extend RO Reject distribution to allow supply to fire water tank.	Fire system leaks are common in industry, loss amounts at MJN are currently unknown. Consider installing a temporary flow meter on C.W. make-up to fire water tank or determine run-time on fire water booster pump. Cost is piping from B33 to Fire Water Tank (a tunnel already exists), plus control valve.
7	Install Rain / Moisture sensor(s) on Irrigation System and adjust timers on zones	Annual irrigation C.W. usage is 1.0 Mmgal for all but B33, anticipate saving 30% with sensors and timer adjustment
8	Increase pH setpoint on boiler blowdown mix tank from 7.0 to 9.0	Potential Carbon Dioxide Savings. Discharge Permit allows up to pH 11.0, so this change would provide similar compliance margin. Perhaps pH setpoint of 10.0 is still acceptable.
9	Re-Use 160degF Hydrostat Cooling Water for RO System Supply	RO System may be able to utilize 160degF Hydrostat water 'As-Is' since existing system pre-heats the City Water prior to purification. If so, no heat exchanger as in Project 9a, would be necessary. In addition, some existing steam use would be off-set. Project cost has not been determined, rather only a placeholder entered to calculate an ROI.



## Red Gold Opportunities

Project #	Project Description	Assumptions / Comments
1a	Reduce / Control Pump Seal Water from average of 1 gpm to <0.05 gpm	45 total pumps using seal water. Per specs, 20 drops per minute is sufficient. (45 x 0.95 gpm x 1440min/d x 5 d/wk x 52 wk/yr. 5% of softener throughput is drained during Regen cycle. Needle valves (incl install) \$150 ea x 45 pumps = \$6,750
1b	Re-route pump seal water from WWT to Non-contact discharge, to reduce WWT cost	Current seal water usage is 16.8 MMgpy, so potential annual savings is 16.8MMgpy x \$7.00/Mgal {wwt cost}x 1000Mgal/Mmgal = \$117,600/yr. If Project 1a is completed, potential savings drops to \$5,600/yr.
2a	Reduce / Control Flow through Homogenizers from average of 5gpm to 2.5gpm (8 units)	8 homogenizers x 2.5 gpm reduction x 1440 min/d x 5 d/wk x 52 wk/yr x .65 uptime. O&M manual spec - 2.3gpm. \$400 each for solenoids with orifices. Wiring and installation - \$2100 each.
2b	Re-route Homogenizer water from WWT to Non-contact discharge, to reduce WWT cost	Current homogenizer water usage is 9.8 MMgpy, so potential annual savings is 9.8 MMgpy x \$7.00Mgal x 1000Mgal/Mmgal = \$68,600. If Project 2a is completed, potential savings drops to \$34,300.
3	Reduce / Control Flow through Vacuum Pumps from average of 10 gpm to 3gpm.	6 vacuum pumps x 7gpm x 1440 min/d x 5 d/wk x 52 wk/yr x .80 uptime. O&M manual spec - 3 gpm. \$500 each for solenoids valves with orifices. Wiring, controls, installation - \$2100 each.
4	Collect and distribute pump seal and homogenizer cooling water for re-use (floor cleaning)	(4.9 + 0.84 Mmgal/yr) x 0.50 projected utilization rate
5	Collect and Re-Use RO Reject Water from re-use (17.5 gpm), for Fresh Pack Nozzle Rinses	17.5 gpm x 1440 min/d x 7 d/wk x 8 wk/yr. Requires collection tank, pump, and piping from Boilerhouse directly outside to Fresh Pack unloading.
6	Adjust Process RO system to achieve 75% Permeate flow (up from 55%)	Produce additional 2.05 gpm x 1440 min/d x 5 d/wk x 52 wk/yr x 0.50 estimated uptime. Assume RO water cost is 2 times City Water
7	Adjust Boiler RO system to achieve 75% Permeate flow (up from 66%)	Produce additional 3 gpm x 1440 min/d x 5 d/wk x 52 wk/yr x 0.50 est uptime. Assume RO water cost is 2 times City Water.
8	Improve control / management of end of batch water rinses in Cook Rooms.	Operations has been requesting 2-3 times the volume necessary for equipment rinses.
9	Install controls for packaging line conveyor lubrication.	0.25 gpm for each conveyor, approx. 10 hoses = 2.5 gpm, assume 50% excess flow (during line outages). 2.5 x 1440 x 5 x 52 x .5 = 0.47 MMgpy. Drains to city (not WWT).
10	Utilize treated (reclaimed) wastewater for WWT Polymer Make-Down	Need to determine current water use on polymer make-down, as well as piping requirements to pump reclaim water inside WWT Bldg.
11	Complete evaluation of L2 MAT Cooler Operation to minimize need for manual cooling water blowdown	Approx. 15gpm is drained to trench primarily for juice bottle temperature control. Uptime on MAT cooler is approx 58%. 15gpm x 1440 min/d x 5 d/wk x 52 wk/yr x .58 uptime. Additional cost savings will be realized from reduced chemical use on Line 2 CT. Not discharged to WWTP.



# Results Summary



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*Environmental Health & Safety Compliance Experts*



## Grant-Funded Water Management Pilot Program RESULTS!

SES was selected by the Indiana Department of Environmental Management's (IDEM's) Office of Compliance Support to work directly with manufacturing facilities to assess ways in which to reduce unnecessary water consumption, waste and costs.

Identified  
Reductions



Identified Reductions				
Water Usage (gallons/yr)	TBD	100,000,000	22,700,000	43,800,000
Wastewater (gallons/yr)	TBD	100,000,000	22,400,000	43,800,000
Waste to Landfill (pounds/yr)	0	90,000	0	0
Total Potential Annualized Cost Savings (\$/yr)	TBD	\$563,657	\$140,930	\$463,047

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# Q & A