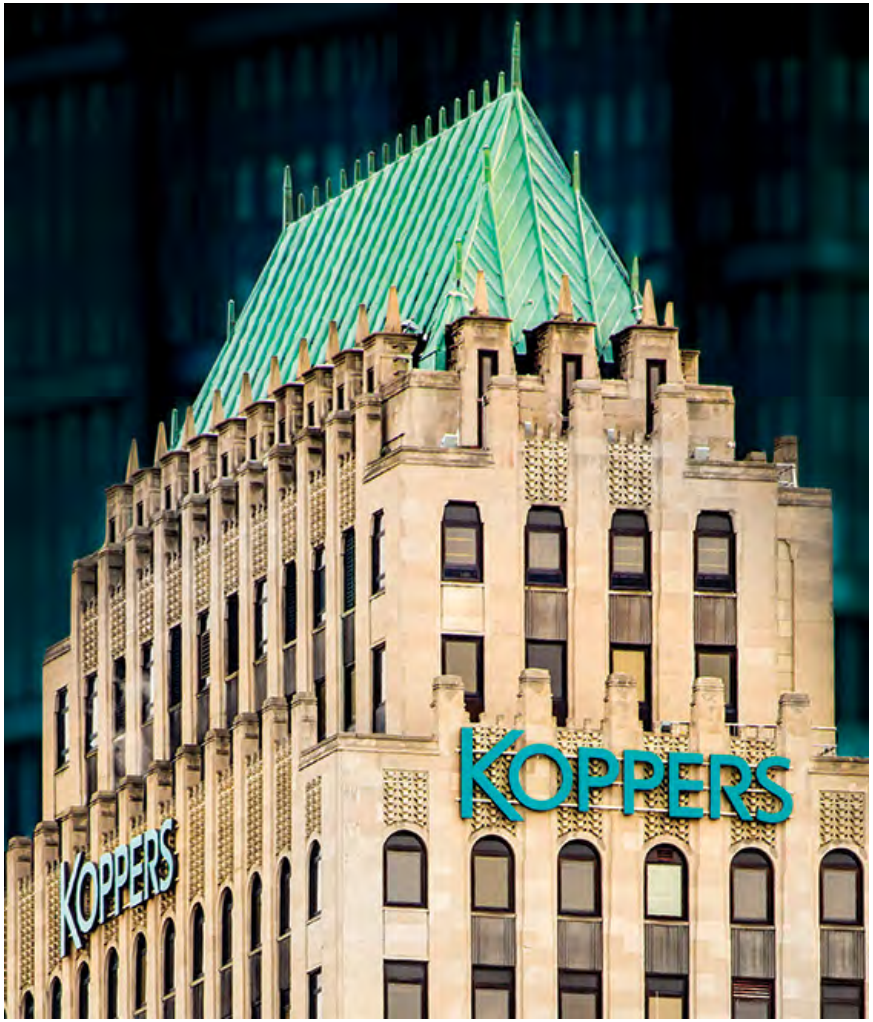
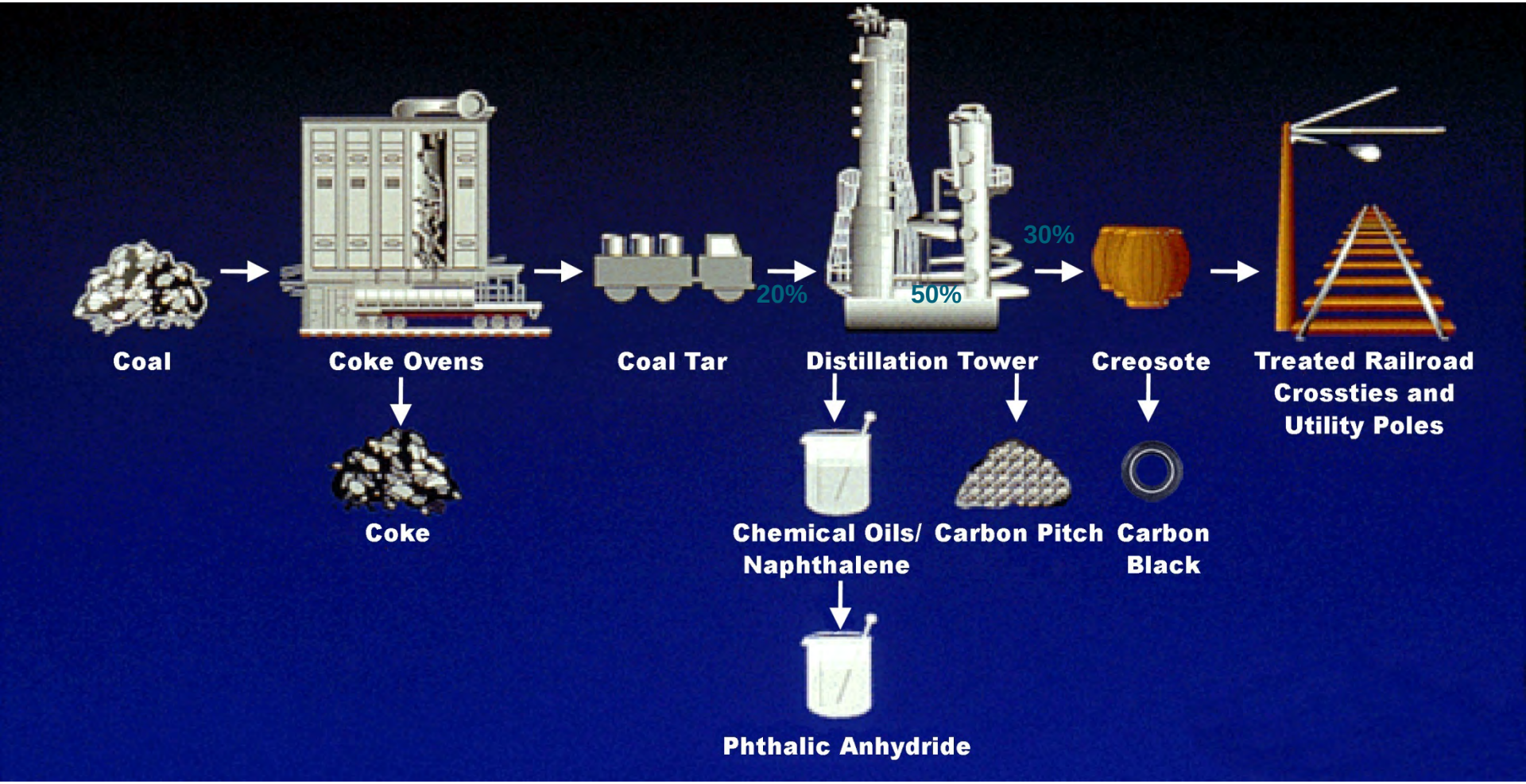
Energy Efficiency at Koppers



RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

May 21, 2015

Distillation and Railroad Tie Treatment



Global Locations

Facilities are well-positioned to capture worldwide growth in demand

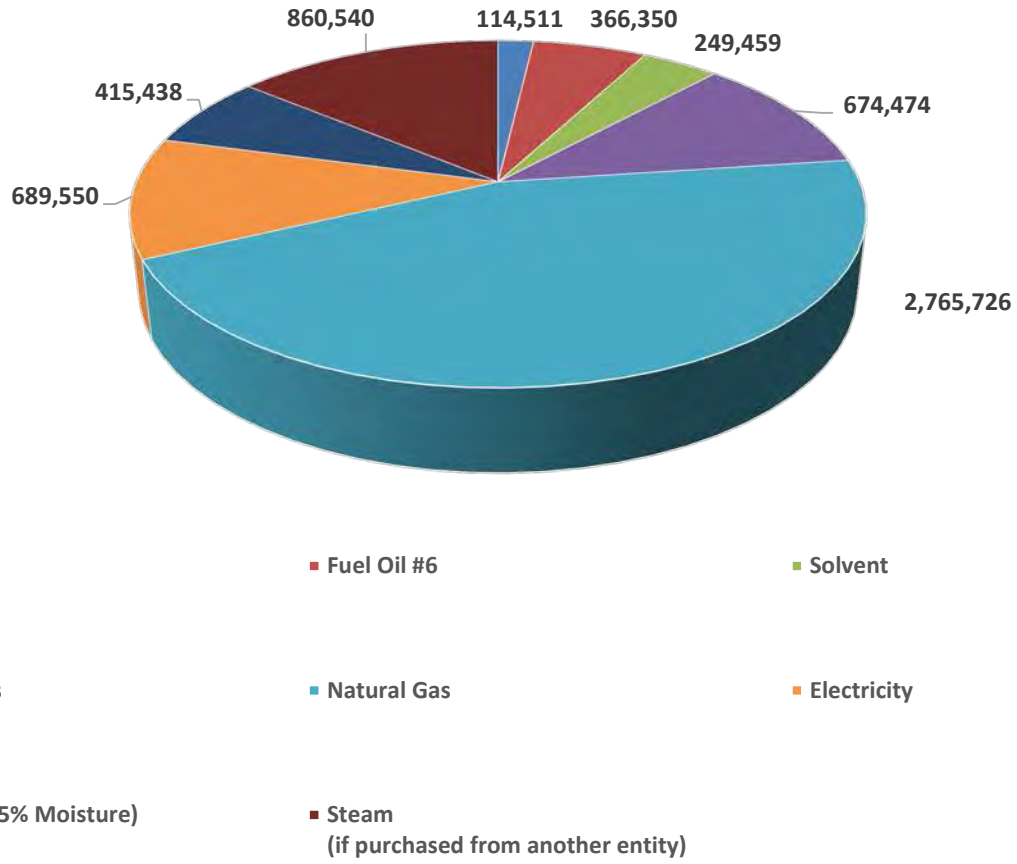
2013 Point of Sale

- Carbon Materials and Chemicals
- Railroad and Utility Products and Services
- Performance Chemicals

(1) Toll producing facilities

2014 Energy Use by Type

Koppers' 2014 Global Energy Usage – 6.2 Million GJ (excludes Performance Chemicals group)



Energy Assessments

- Koppers had 14 energy assessments completed by Universities funded by DOE and consultants funded by local utilities
- WVU performed four assessments for Koppers
  - Follansbee, WV (Distillation)
  - Clairton, PA (Distillation)
  - Green Spring, WV (Wood Treating)
  - Huntington, WV (Rail Joints)
- **These energy assessments are logged into a shared drive and are the foundation for projects to reduce usage**

Energy Assessment Spreadsheet

- Core information from assessment
  - Project title
  - Annual energy savings
  - Cost to implement
  - Annual cost savings
  - Payback
- If project considered, detailed analysis is performed.
- Depending on funding, projects can be split into multiple projects

Energy Assessment Spreadsheet (2)

- Used as a working document, also includes
  - Date
  - Status
  - Rate – projects can rise to top if rates increase
  - Usage
  - % energy savings
  - Plant Manager's Comments
- Look for good paybacks and large % energy savings

Sample of energy assessment spreadsheet

Date

Status

Usage

% Usage Savings

Plant Manager's Comments

Adjust Pricing Regularly

Energy Projects
Clairton
6/7/2013

Electricity	Rate:	0.063	($/kWh)	Usage:	11,170,000	(kWh/yr)
Natural Gas	Rate:	6.220	($/MMBtu)	Usage:	204,441	(MMBtu/yr)

Project Title	Status	Responsibility	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (MMBtu/yr)	Cost to Implement ($)	Annual Cost Savings ($/yr)	Simple Payback (years)	Energy Savings (%)	Plant Manager comments:
Adjust Air-Fuel Ratio for Natural Gas Heaters	Complete 9/21/2012			4,000	$5,000	$24,880	0.2	2.0%	Contractor scheduled for next week to adjust. Costs $5,000
Rework Piping for Heaters to optimize Air-Fuel ratio				23,000	$100,000	$143,060	0.7	11.3%	Estimated Cost only
Preheat Combustion Air for Natural Gas Heaters Using Stack Gases	Air Permitting issues have stalled project						5.5	10.0%	Already in Capex program for 2012 at cost to implement of $700k. Have run into air permiting issues with NOX emissions and now may want to expand the scope of the project to add individual exhaust stacks to the heaters in light of events surrounding the heaters on 9/7
Install a Nitrogen Generator to Clean Storage Tanks and Utilize Produced Oxygen Enriched Air to Feed Natural Gas Heaters							4.1	8.3%	Exploring costs now, have included it as a project in Capex program sent to Greg Traczek for next year at around $400k
Install Variable Speed Drives on the Two 250-hp Water Pumps	Installing						1.3	5.2%	**Rebate of $34,722.48 expected**
Install Timers to Switch-off Outside Light	Ongoing						0.6	1.6%	Will complete over an extended period of time as manpower permits
Perform Vibration Analysis on Equipment			186,420		$1,000	$11,744	0.1	1.7%	Plan on performing, need to find a good consultant/contractor to perform the analysis.
Preheat Oxidizer Combustion Air Using Stack Gases				1,511	$21,120	$9,398	2.2	0.7%	Needs to be explored more. Current TO use expected to change/shift in the upcoming year due to the addition of a new DFTO.
Replace T12 with T8 along with other Lighting	Ongoing		141,305		$18,267	$8,902	2.1	1.3%	Will complete over an extended period of time as manpower permits
Implement Motor Management System	Complete		149,140		$1,210	$9,396	0.1	1.3%	Completed. Summer intern Luci Keenan compiled all the motor data and trained Ken Suss on how to use it
Replace 45 ton Air Conditioner with 25 ton unit			730,000		$99,000	$45,990	2.2	6.5%	Cooling tower in old unit needs to be repaired at a cost of $25K. New unit has no cooling tower.
Use Outside Air for 150-hp Air Compressor Intake			43,627		$1,800	$2,749	0.7	0.4%	Exploring costs now, should be done as plant expense if less than $10,000
Incorporate VFD with new 2T-1 Bottoms Pumps	Proceeding		19,250		$1,700	$1,213	1.4	0.2%	CapEx approved on 10/18/2012

Save Energy Now at Follansbee

- Change in Management focus over past year
  - Personnel
  - Priorities
- Overhaul of steam traps
- Repair steam leaks
- Re-evaluate boiler piping
- Implementing more changes that were initially identified in the SEN assessment

Projects Completed from Energy Assessments

- Installed Variable Speed Drives (VSD)
- Added air receiver to compressed air system
- Implemented a motor management system
- Reduced air compressor set-point
- Changed to use outside air for air compressors
- Upgraded light bulbs and fixtures
- Replaced drive belts
- Performed vibration analysis
- Replaced steam traps and repaired steam leaks

Clairton 250 HP VSD Project

- Originally, we had two, single speed 250 HP cooling tower water pumps with variable flow requirements controlled by a bypass, recirculation valve.
- Energy Savings identified by WVU by using VSD's on 250 HP cooling tower water pumps during the May 2012 energy assessment.
  - Annual Savings: $36,459
  - Energy Saved: 578,708 kWh or 5.2% Electricity usage
  - Cost to complete: $46,822
  - Original payback of 1.3 years

Clairton 250 HP VSD Project (2)

- Explored possibility of a rebate for this energy efficient project
- Energy rebate from local utility based on WVU's write-up
  - Amount of rebate: $34,725 or 74% of project cost
  - Actual 250 HP VSD project payback: 0.3 years or 4 months
- Justified to management by using WVU write-up

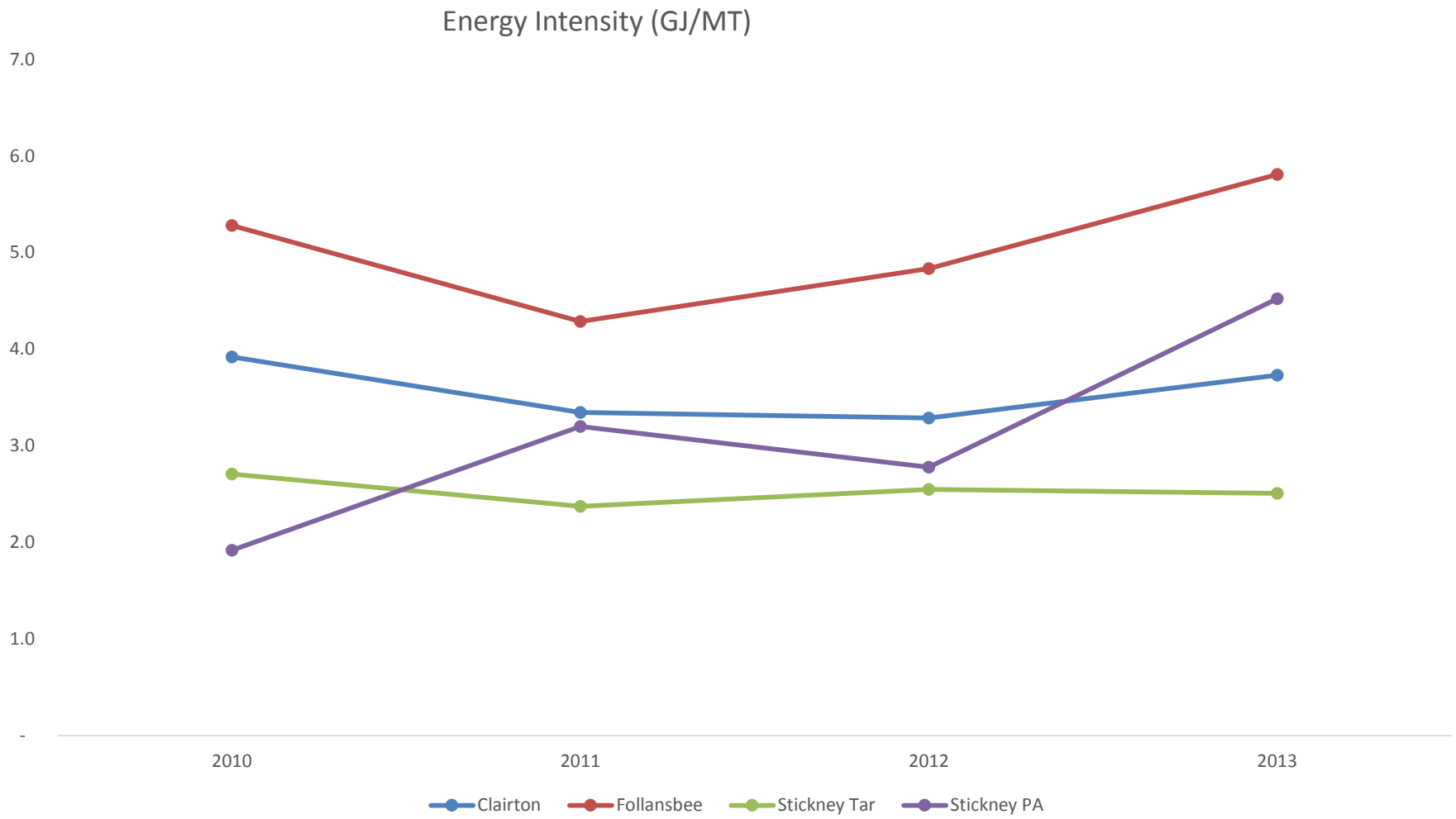
Clairton 250 HP VSD Project (3)

- In process of installing VSD's on cooling tower pumps in other locations.
- Using VSD's in other applications as well
  - Cooling Tower Fans
  - Process Pumps
  - Potentially Air Compressors
- Due to successful project, wider implementation at Koppers

Energy Intensity

- Began measuring in 2013
- Measure total energy at plant
- Divide by total raw materials (distillation) or cubic feet of wood treated (railroad)
- Compare Energy Intensity worldwide
- Note differences based on plant capabilities

Energy Intensity Metric

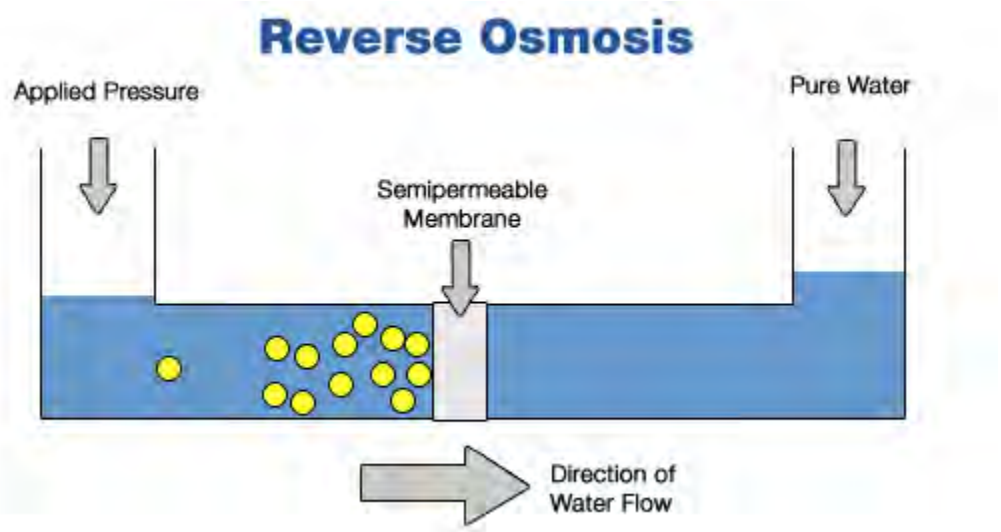


Reverse Osmosis System

- Blowdown for our steam system is based on conductivity, which represents impurities.
- The RO system reduced the impurities by 90%
- With less blowdown, less water is needed in the boiler, which means that less natural gas is needed to heat the water.
- Savings on natural gas, water and water treatment chemicals.
- Rebates from utility for this.

Reverse Osmosis System (2)

Potential 17,000 MMBtu/yr. in Natural Gas Savings



Reverse Osmosis (3)

- RO System operational in April 2015
- Capital intensive project ($500,000+)
- Determining actual savings
- Expect significant energy, water and chemical savings ($200,000+)
- Expect Rebate for natural gas savings (Over $150,000)
- If successful, may roll out to other plants as we have done with the cooling tower water pump VSDs

Conclusion

- Increasing focus on energy intensity
- Actively honing the way that we measure energy and normalizing it for production
- Implementing energy efficiency projects due to past successes
- Increasing activity/behavioral based initiatives
- Next focus is operational monitoring of energy usage
- Determining meters needed for this and appropriate metrics

Thank You!

- Koppers thanks the US Department of Energy, WVU and other Universities that have performed energy assessments at our facilities
- Special thanks to the State of West Virginia for providing energy efficiency programs
- We look forward to working with energy efficiency programs in the future