أرامكو السعودية
saudi aramco

Boiler Chemical Treatment System Design Modification for More Effective and Optimum Operation

Albara A. Alharbi

Saudi Aramco Yanbu Refinery

where energy is opportunity℠

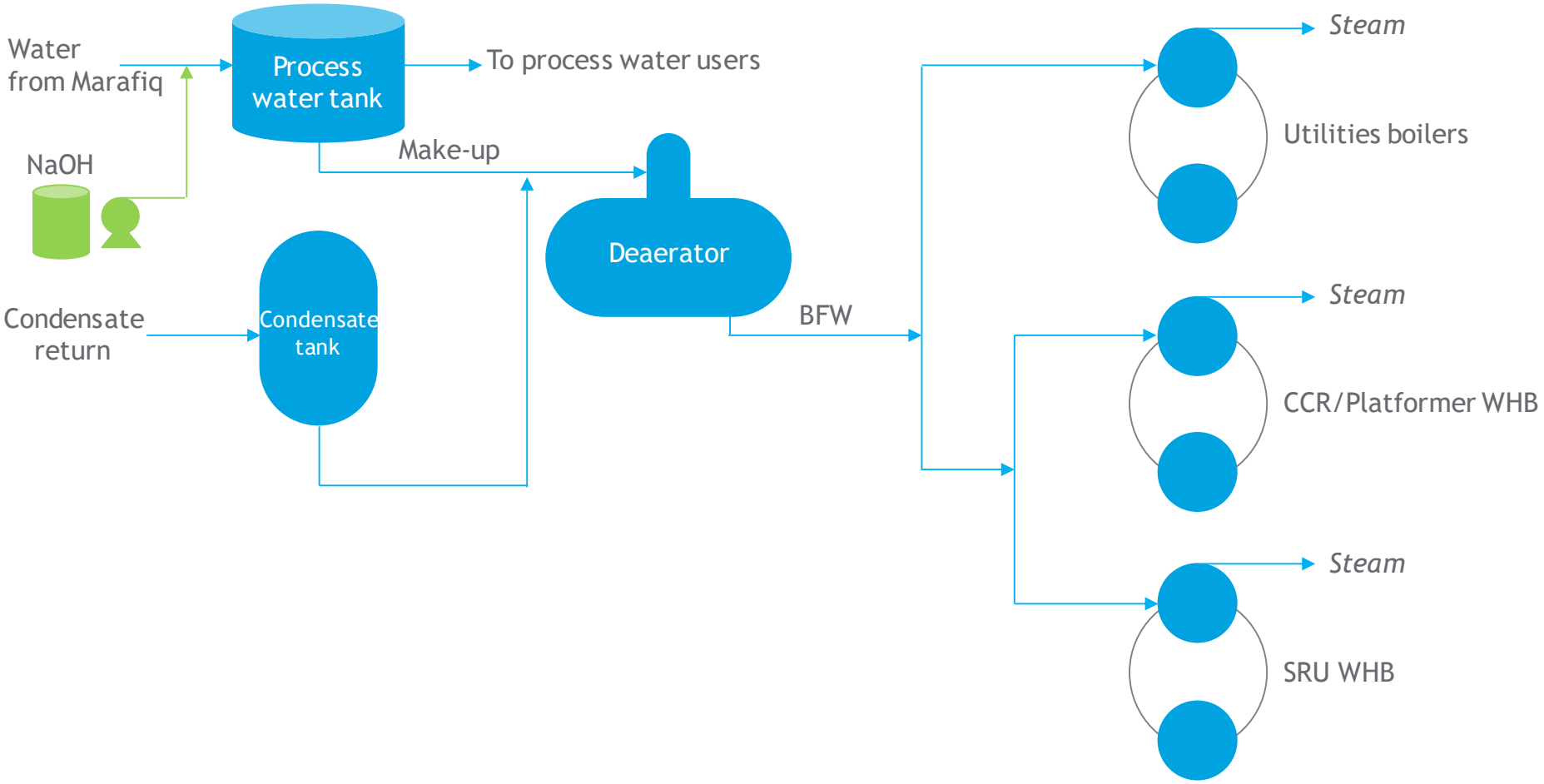
Outline

1. Objectives
2. Overview of water chemical treatment in Yanbu Refinery
3. Challenges
4. Chemical treatment reconfiguration
5. Benefits
6. Summary

Objectives

- To ensure efficient and reliable operation of the steam and condensate system
- To ensure there is proper chemical treatment in the BFW system
- To reduce costs and chemical usage where possible

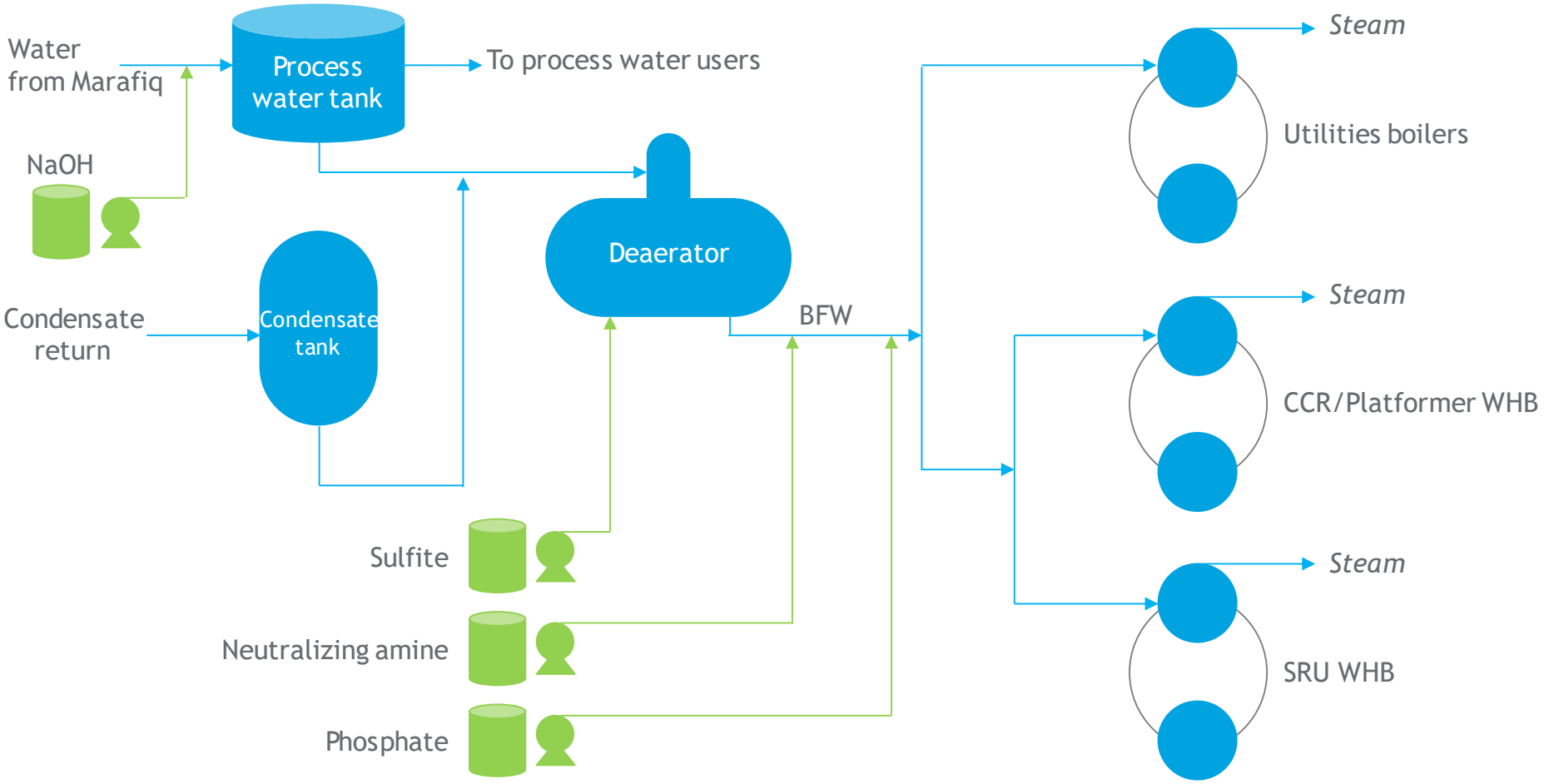
Overview of Boiler Feed Water System Yanbu Refinery



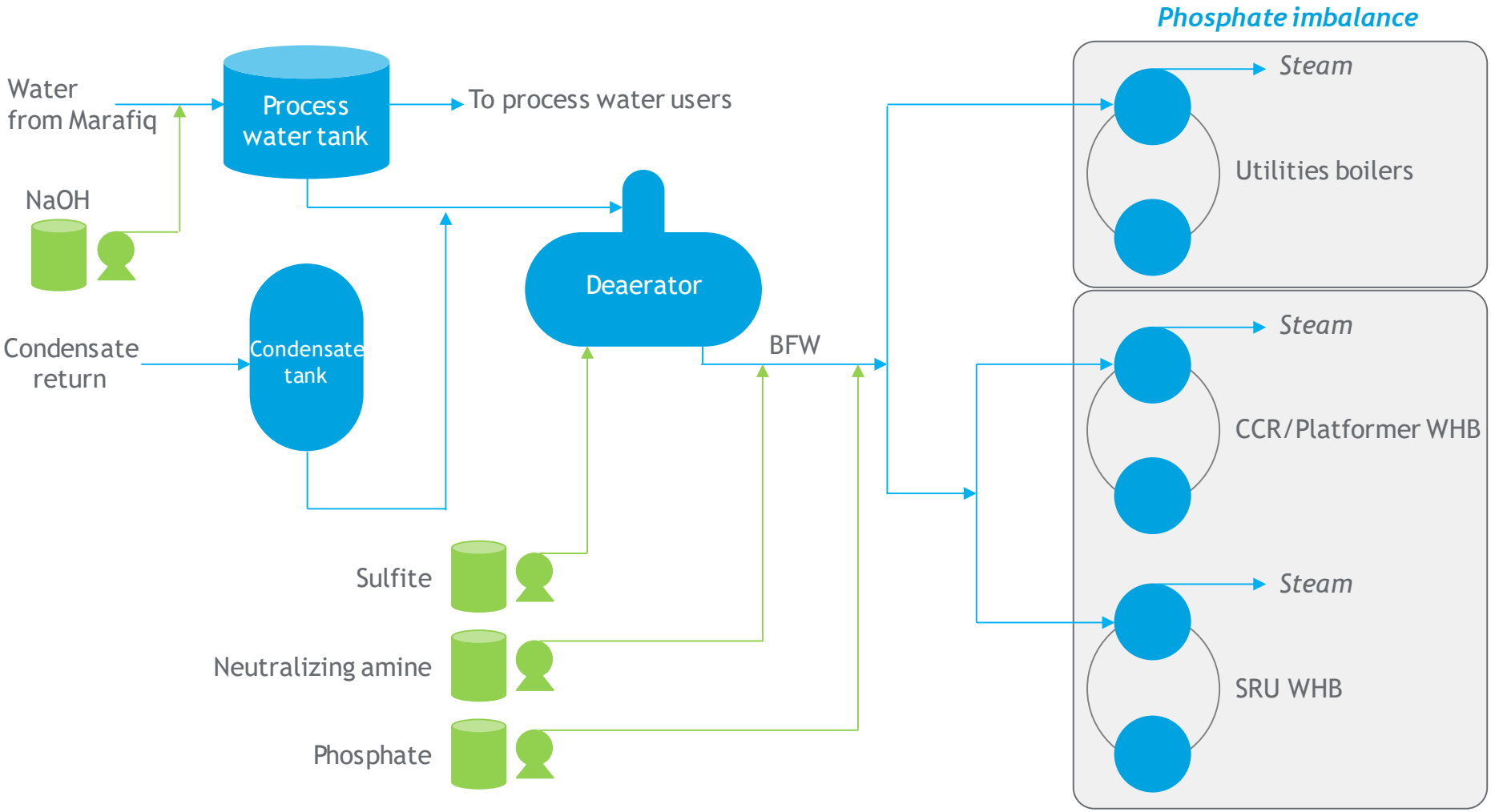
Brief of Chemical Treatment

Active component	Function	Control limits
Sulfite (SO_3^{2-})	**Oxygen scavenger:** Reduction agent that combines rapidly with oxygen to form a non-corrosive compound in water	20 - 40 ppm
Phosphate (PO_4^{3-})	**Scale inhibitor:** Reacts preferentially with calcium to form non-adherent fine particles which are removed through blowdown	20 – 60 ppm
Neutralizing amine	**Corrosion inhibitor:** Neutralizes carbonic acid that forms in return condensate. Raises pH from 6 to above 8.5. Corrosion tendency is controlled as such.	8.5 – 9.3

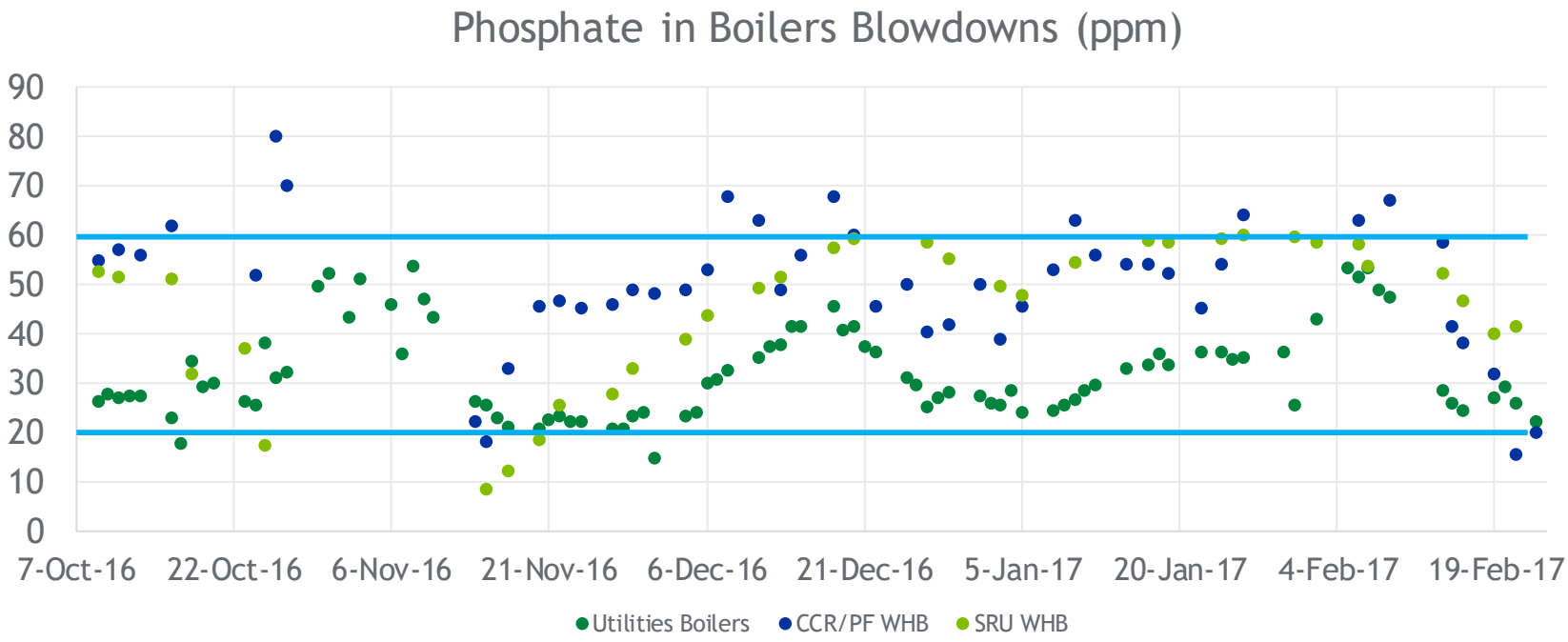
Overview of Water Chemical Treatment in Yanbu Refinery



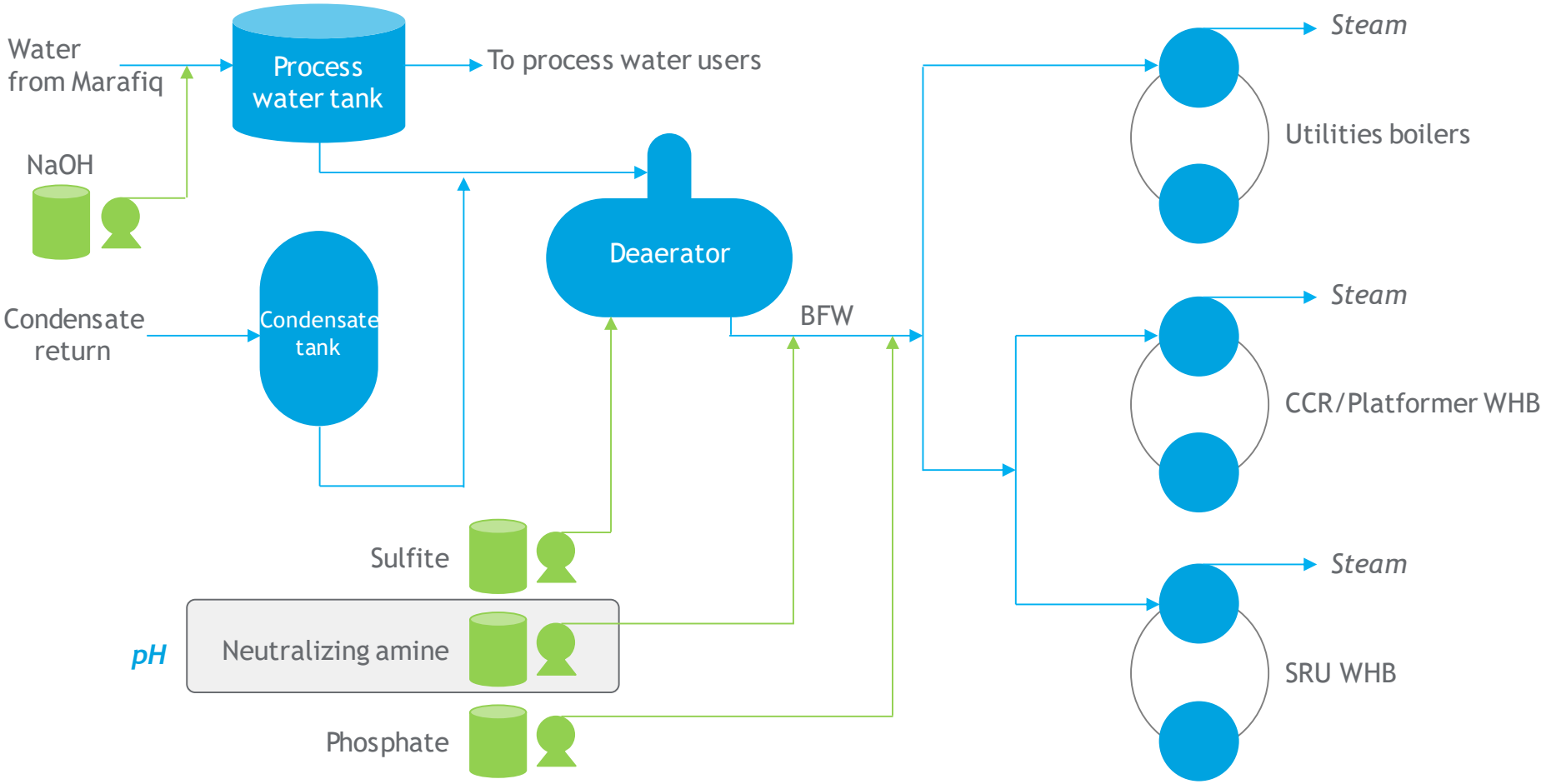
Challenges



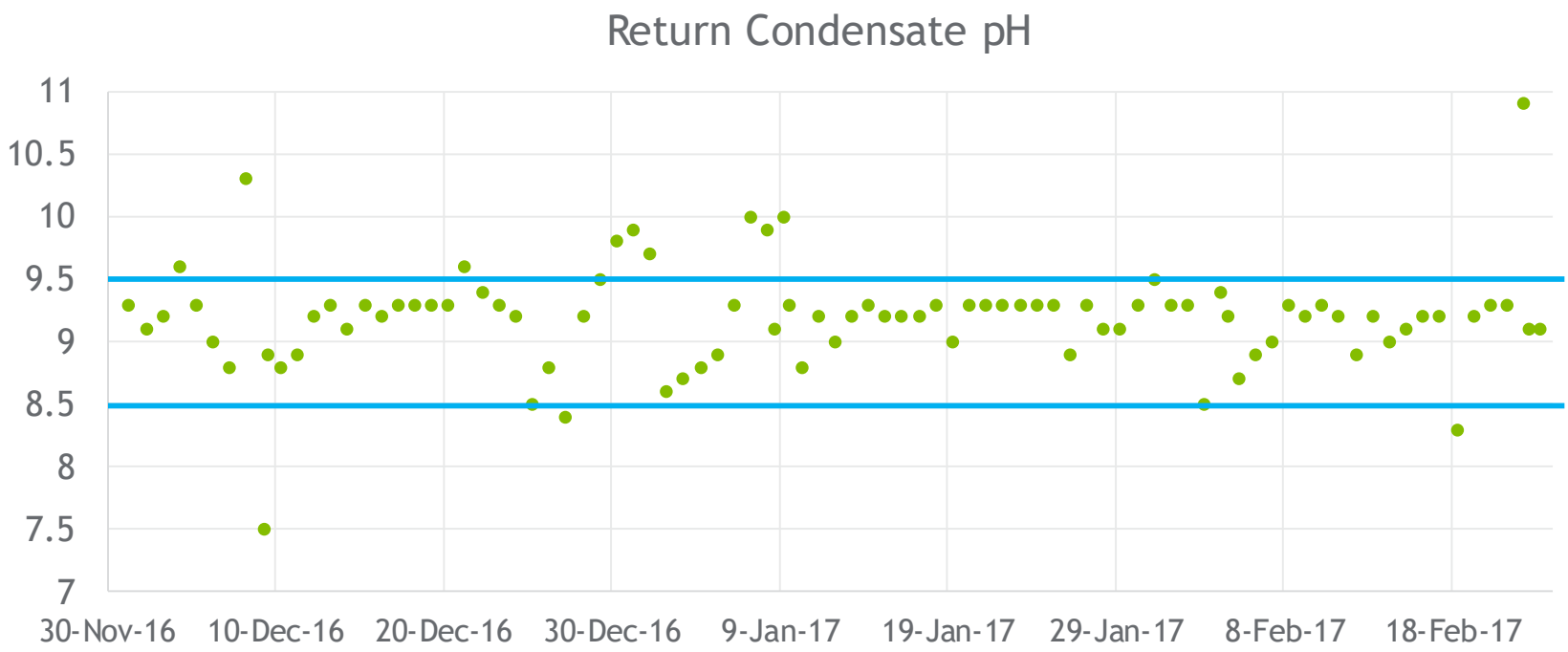
Challenges



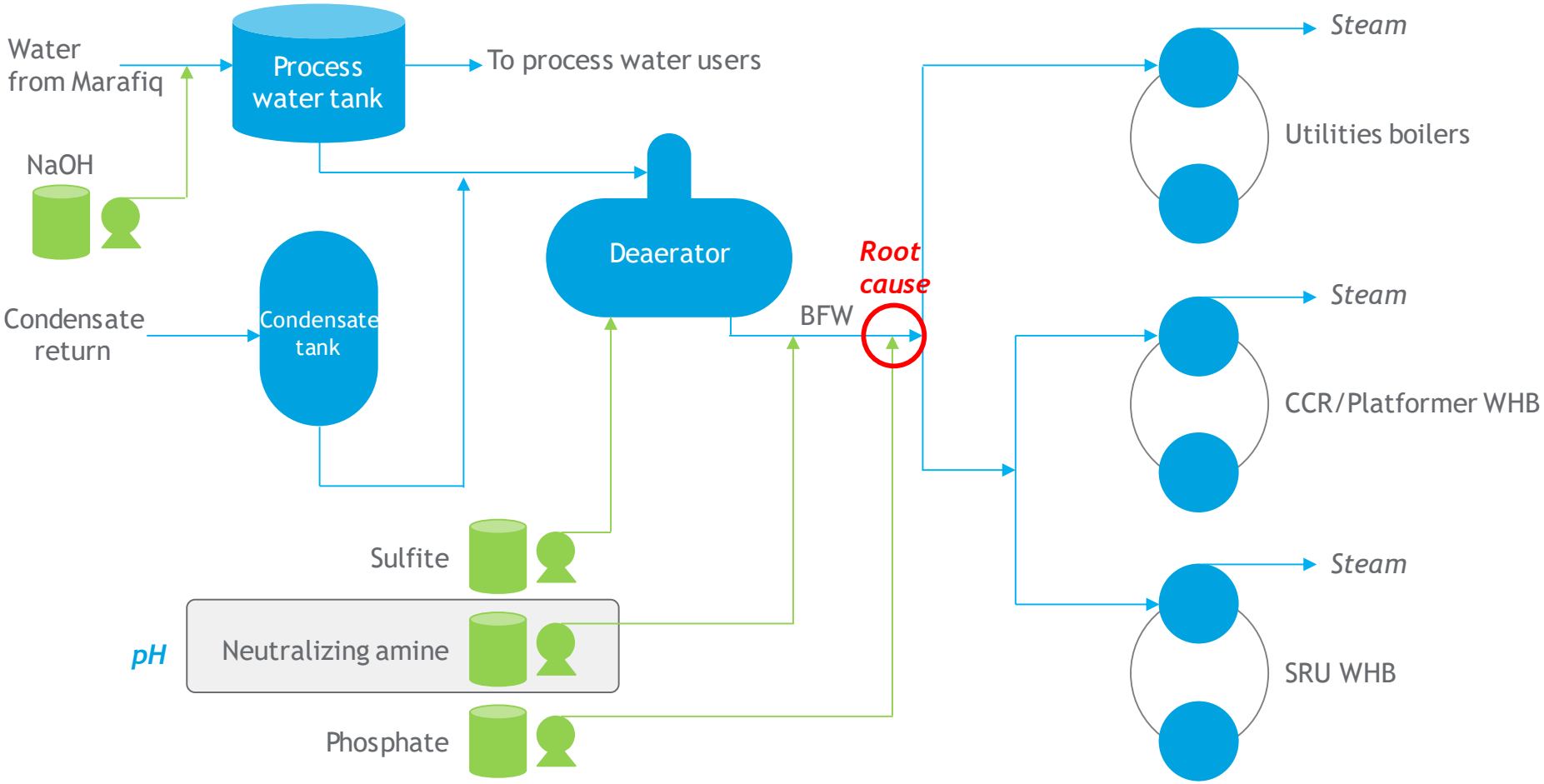
Challenges



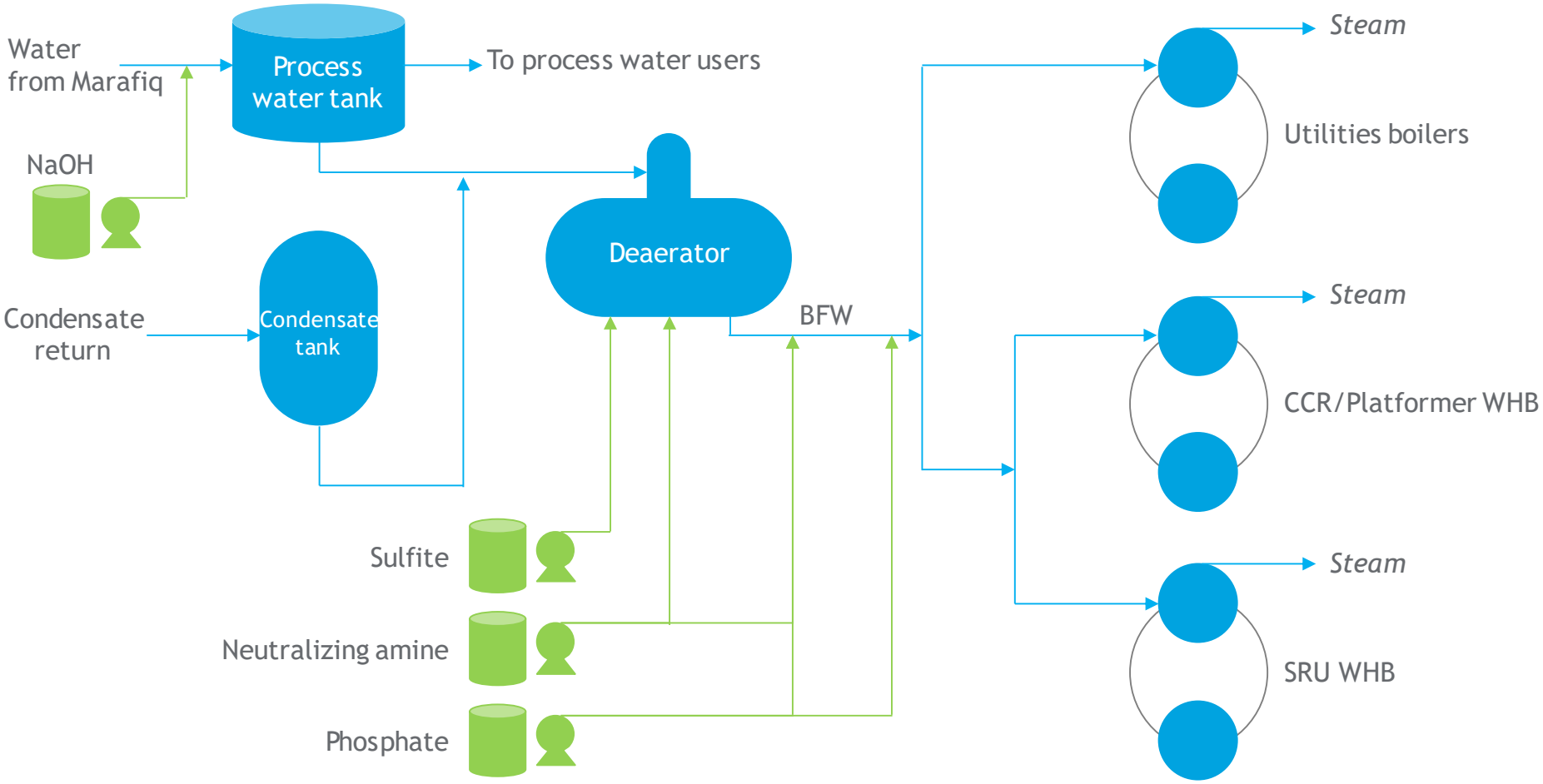
Challenges



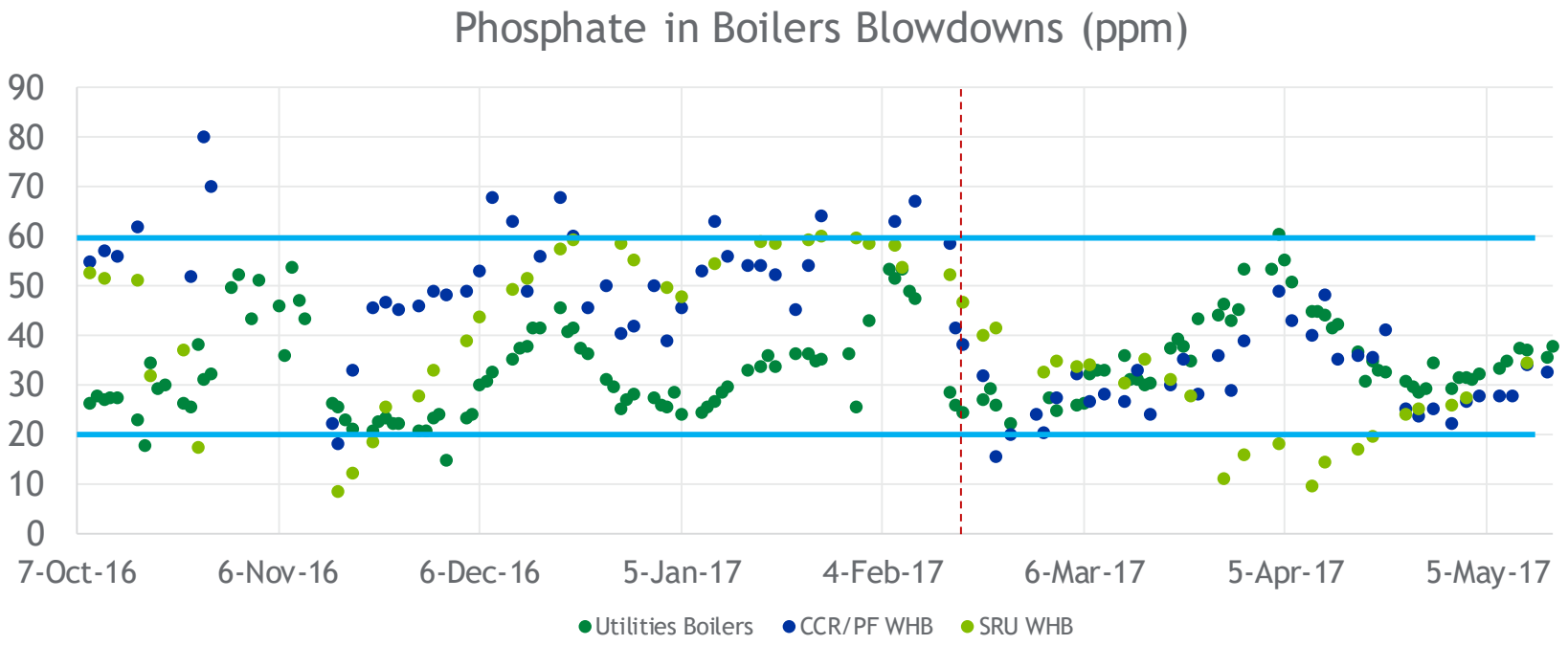
Challenges



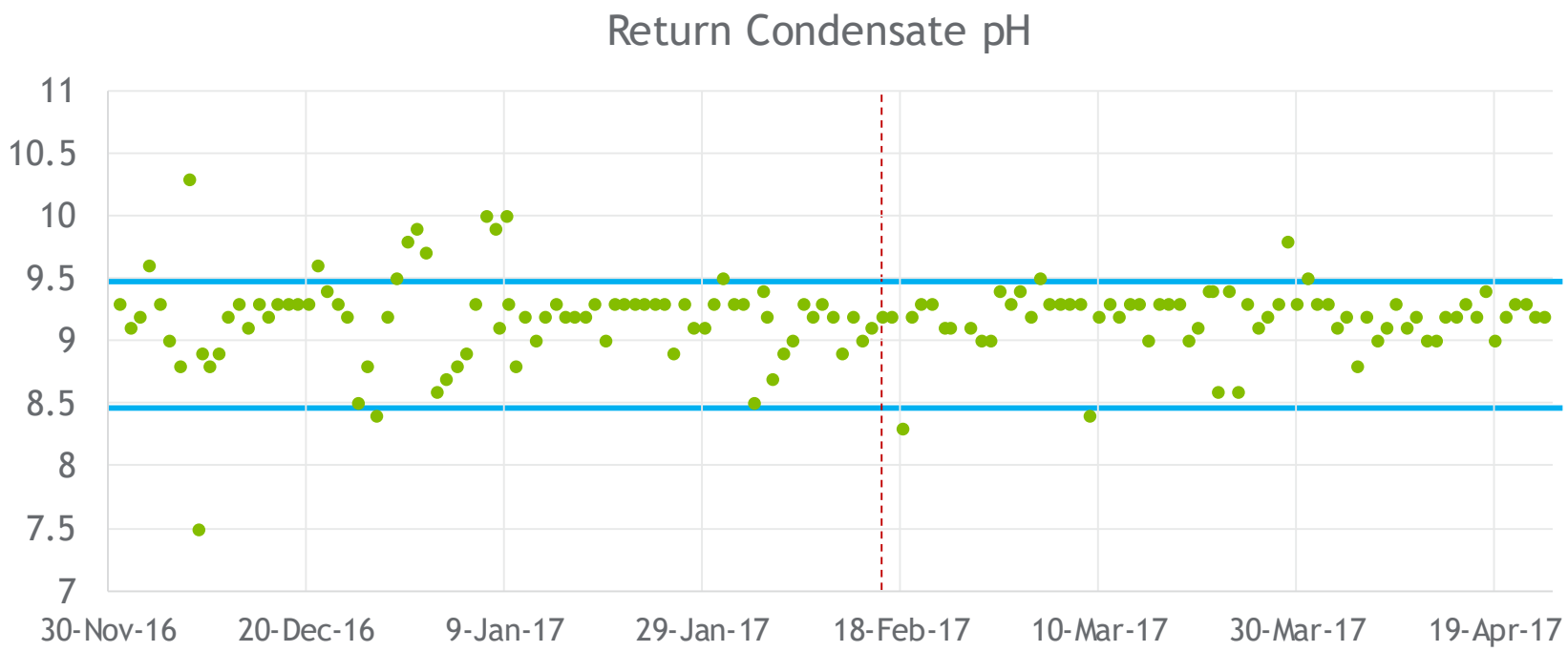
Chemical Treatment Reconfiguration



Benefits



Benefits



Benefits

Chemicals Savings

Chemical	Previous Rate of Consumption	Current Rate of Consumption	Savings
Phosphate (PO_4^{3-})	66 gallons/month	52 gallons/month	14 gallons/month
Neutralizing amine	100 gallons/month	70 gallons/month	30 gallons/month

Item		Cost/Saving
Modification costs		-$33,000
Reduction in chemicals consumption		+$11,000/year
Reduction in blowdown		+$19,000/year
	Total savings	+$30,000/year
Payback period		1 year

Summary

- Phosphate imbalance between boilers was resolved.
- Condensate pH was stabilized.
- Corrosion control was enhanced.
- Costs in chemicals consumption were saved.
- Costs in installing new injection points were avoided by utilizing current points.
- Blowdown rate was reduced saving water and energy.
- Cycle of concentration increased as a result.


أرامكو السعودية
saudi aramco