AUTOMATION OF A COOLING TOWER BLOWDOWN WATER TREATMENT PLANT FOR REUSE

BACKGROUND

IntelliFlux was deployed in a pilot plant for treatment of cooling tower blowdown water at an oil producer's captive power plant. The pilot objective was to evaluate a novel low cost process to treat high silica content cooling tower blowdown, maximize recovery of treated water, and reduce blowdown disposal, minimizing deep well disposal requirements. The treatment train included four unit operations:

- Chemical desilication using inclined plate clarifier to reduce feed silica concentration from the influent water
- Ultrafiltration to treat the clarifier effluent and produce a feed water suitable for reverse osmosis.
- Brackish water reverse osmosis desalination to remove dissolved solids
- Filter press to dewater the sludge produced from desilication process and minimize waste generation.

AUTOMATION FRAMEWORK

IntelliFlux was installed to optimize a treatment train including desilication chemical dosing, Inclined Plate Clarifier, UF and RO units through an integrated SCADA level automation platform, with an objective of synergistically managing the precipitant dosage for the chemical desilication, monitoring the recycle rate of the UF to optimize the floc sizes for solids removal, and managing the recovery of the RO process by maintaining a consistent RO feed quality.

The UF system was operated in crossflow mode, recycling the concentrate to the clarifier unit as a closed loop system. The in-line mixing was complemented by shear induced aggregation in the crossflow UF modules, until the UF filtrate turbidity was reduced below an acceptable setpoint. The desilication agent dosing was controlled in response to the influent water turbidity and silica content. The entire process was monitored and mapped against digital twins of the coagulation, inclined plate settling, and UF processes. The feed and UF filtrate turbidity were utilized to adjust the feed and bleed mode UF operation, as well as the chemical dosing.

SUMMARY

APPLICATION AREA: **Captive Power Plant**

CUSTOMER: **Oil Producer**

LOCATION: **California, USA**

SYSTEM: **Chemical Desilication, UF, RO, and Solids Management.**

CAPACITY: **500 barrels/day**

DATE: **2017**

BENEFITS: **Process Optimization, Economic Assessment for System Design and Scale Up**

REIMAGINE YOUR PLANTS WITH INTELLIFLUX

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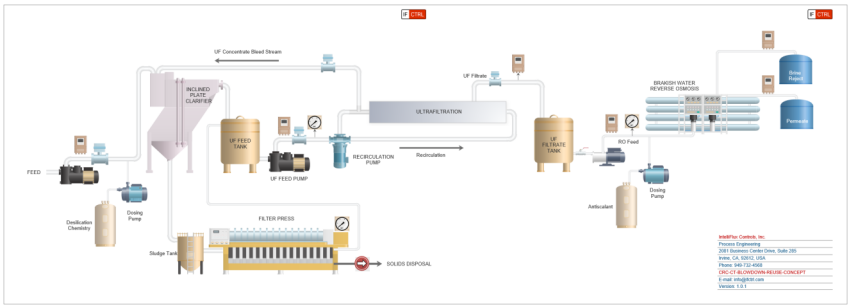
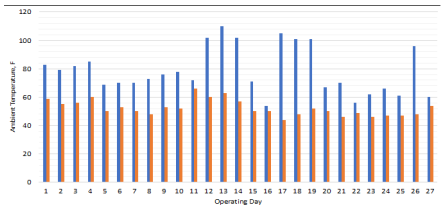
PERFORMANCE

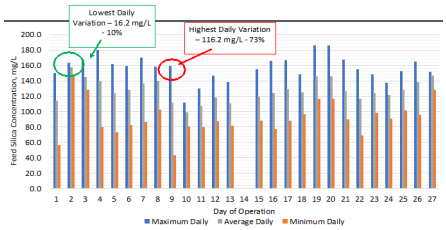
Plant Configuration



Operating Conditions

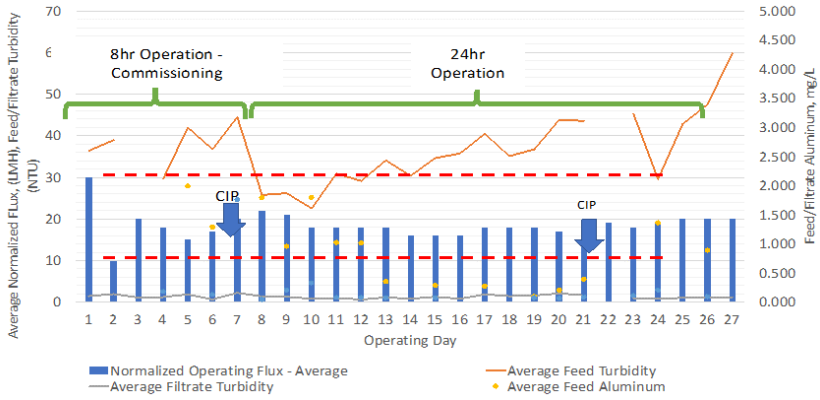
The temperature showed average daily variations of ~28 °F, and the daily influent silica concentration varied between 10 — 73%. With these variations, the desilication chemistry dosing needed continuous adjustment to enable a consistent performance of the downstream clarifier, ultrafilter and reverse osmosis systems.





Dynamic Optimization of Performance

Simultaneous autonomous optimization of the UF operation with desilication chemistry dosing maintained a sustainable RO feed quality and throughput, allowing the RO unit to maximize water recovery.



THE INTELLIFLUX TECHNOLOGY

A Patent Pending Tunable Combination of Digital Twin and Deep Learning

Deployed in a Client-Server Configuration

Deliverable on any Existing Plant Automation (DCS/SCADA) Platform

The pilot demonstrated 77% recovery with the single stage RO operation, yielding a treatment cost of $0.65-0.75 /m^3, 81% reduction in brine disposal volume, and generation of a solid waste which can be classified as a non-hazardous waste.

WITH INTELLIFLUX, YOU ARE IN CONTROL ANYWHERE— ANYTIME

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