McIlvaine Hot Topic Hour

Nuclear Power Plant Water Treatment

Thursday, July 1, 2010
Introduction

VEOLIA

Introduction

Water

Energy

Transport

Environmental Services

HPD

HPD is a subsidiary of Veolia Water Solutions & Technologies
(waste)Water at a Nuclear Station

“Process Water”
- Polishing demin regen
- Boron blowdown
- Laundry drains

Non-Process
- River water
- Reclaim (grey) water
- Cooling tower blowdown
Actiflo® Turbo Clarification

- Raw Water
- Coagulant
- Sludge
- Hydrocyclone
- Pump Capacity Function of Solids in Raw Water
- Clarified water

Coagulation, Injection, Ballasted Flocculation & Maturation with Turbomix™
Clarifier with Lamella

80% Ginicsand
20% Microsand
Turbomix®

- Downflow axial flow impeller
- Ring shaped perforated pipe for polymer addition
- Anti-vortex and anti-bypass baffles
- Flux vanes
- Funnel reducing head loss
- Vertical draft-tube with mixer used as flow guide
Veolia Actisoft® Cold Lime Settler Design
Two Stage Softening

Hydrated Lime

Soda Ash

Scrubber Blowdown

Multiflo® 1

Multiflo® 2

Thickener

Thickener

Filter Press

To Scrubber?

To Disposal

To ZLD
Removal of Suspended Solids: Packaged Actiflo® Clarifier
Discfilter Operation

- Stationary filter discs
- Partially submerged
- Automatic operation
- Gravity operation
Discfilter Applications

- Effluent Filtration
- Water Reuse
- Title 22 Applications

- Process Water Filtration
- Process Water Recovery
- Aquaculture
HPD CeraMem® Product

- Long life
- High temperature – > 200 °C.
- Chemical cleanability – can take pH 2 – 13 cleaning solutions.
- Robust and can take high operating and backpulse pressures
- Absolute TSS barrier
Degreaser Bath Recovery

- cross-flow system for treatment of alkaline
- Portable systems
40 years of nuclear application
MVR Crystallizer

- Crystallizer
- Vapor Body
- NCG Vent
- Crystallizer Heater
- Recirculation Pump
- Compression Device
- Dewatering Device
- Recovered Water
- Slurry Tank
- Solids to Disposal
- Feed
Steam Driven Crystallizer

- NCG Vent
- Crystallizer Vapor Body
- Recirculation Pump
- Vacuum Pump
- Surface Condenser
- Chilled Water
- Recovered Water
- Dewatering Device
- Solids to Disposal
- Crystallizer Feed Tank
- Feed
- Recovered Water
- Crystallizer Heater
Heat Pump Crystallizer
Evaporator Demineralizer Waste
MVR Crystallizers
Brine Evaporator - MVR

- Feed Tank
- Blowdown
- Chemicals
- Feed Preheater
- Non-Condensable Gases
- Deaerator
- Falling Film Evaporator
- Recirculation Pump
- Recovered Water
- Level Tank
- Vapor Compressor
- Concentrated Brine
- Seed Recycle
Brine Evaporator - MEE

1\textsuperscript{st} Effect

2\textsuperscript{nd} Effect

Condenser

Blowdown

Recirculation Pump

Recirculation Pump

Seed Recycle

Recovered Water

Waste Heat

Waste
Cooling Water Management
Zero Liquid Discharge
Water Reclamation

- Biological treatment
- UF, RO
- 3 – 1,060 GPM MVR Evaporators
- 3 – 30 GPM Crystallizers
Waste Heat not for Waste Treatment
Thank You!

HPD