



Sludge Processing Extraction Head

Sharing Good Practice in Decommissioning and Waste Management

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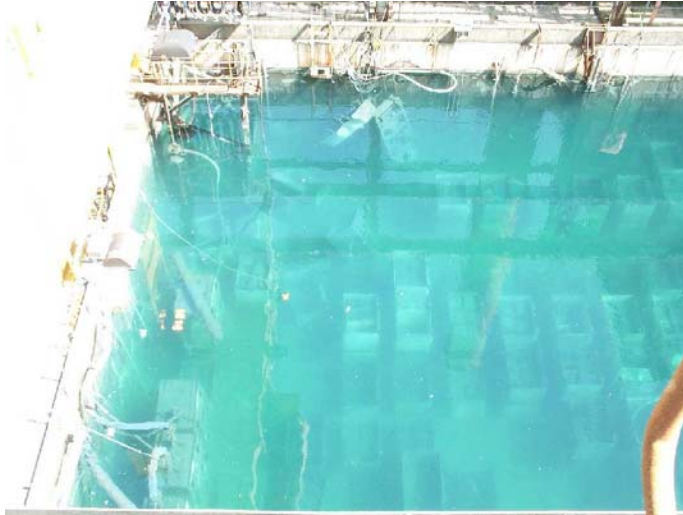
Historical Background

- **Spent Magnox Fuel was stored in open ponds (eg B30) at Sellafield prior to reprocessing**
- **Ponds constructed in 1950s**
- **Magnox Reprocessing Plant had lengthy shutdown in 1970s**
 - Spent fuel stored longer than intended
 - Cladding corroded
 - Degradation of the uranium metal fuel itself
- **Processing Delay Caused...**
 - Increased radiation levels
 - Poor underwater visibility
 - Slower rate of de-canning which gave perpetual delay to throughput
 - Additional corrosion
- **FHP came on line in 1986 to replace the original ponds**

Historical background

- **Pond Status (B30)**
 - 27000 Te Fuel Processed
 - Last batch received 1992 and POCO commenced
 - Estimated 1200 m³ of sludge in pond
- **Sludge contains:**
 - Corrosion products from degraded fuel rods
 - Miscellaneous solid items (equipment, tools)
 - Organic material (eg guano, algae)
 - Environmental particulates

B30 Pond



Pond decommissioning

- Liquor processed via SIXEP (continuous purging)
- Sludge will be removed and processed into solid waste containers
- Sludge retrieval is achieved by pumping the sludge from the pond
- One of the most significant challenges is separating debris material from the sludge
- Goal is to remove the small material and leave the large items in the pond pending later retrieval. Filter meshes 3-6mm aperture are used to achieve this
- Meshes can blind, reducing processing rate and giving rise to operator intervention, and dose

Sludge Removal Head with On-line Cleaning Capability

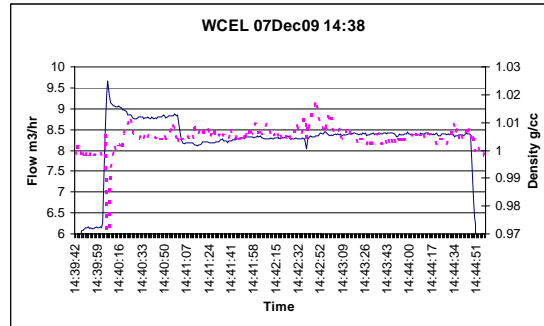
- Nuvia has patented a system for sludge processing
- Two prototypes have been built and tested with simulant sludge
- Operating principle is
 - Suck sludge through a rotating filter mesh
 - As mesh rotates it passes under a water jet which cleans the filter
 - On next cycle clean filter is presented under suction line
 - Design also incorporates sparge ring to mobilise sludge

Potential Solution

On line clean-in-place
sludge processing head



Test Results



Test Results

- **Experimental Parameters**
- Filter mesh: 6mm
- Sludge simulant: 80% sand/10% peat/10% absorbent granules
- Filter rotational speed: 5 rpm
- Wash water flowrate: 13.33 l/min
- Volume of simulant in box prior to trial = 25300 cm³
- **Post trial measurements**
- Total duration of trial = 5 minutes 8 seconds
- Time processing solids = 3 minutes 44 seconds
- Volume of simulant in box after trial = 8000 cm³
- Volume of simulant processed through filter = 17300 cm³
- Solids processing rate = 0.27 m³/hr
- 'Pond liquor' processing rate = 2.6 m³/hr (approx – varies during trial as shown in graph)
- Indicative solids fraction in 'pond liquor' processed = 10% (volume basis)

Benefits

- **Enhanced operational performance**

- Increased plant availability
- Reduced intervention (and operator dose) for maintenance
- Removal of any issues associated with presence of large solid items within the sludge processing system.

Integrated Design Solution

