Recent upgrades at the Studsvik Concrete hot cell laboratory and cell waste management

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Introduction

1. Overview of Studsvik concrete cells for fuel testing
2. Power manipulator
   1. Installation of remote control
3. 120 kN in-cell tensile tester
   1. Studsvik design
   2. installation and
   3. commissioning
4. Cell waste management
   1. Sorting
   2. conditioning and
   3. long term storage
- Studsvik site, Sweden
- From 1960
- 3 nuclear labs
- Ro-ro port
- 150 employees
- Contract research only
- Private company
- No gov. Funds
Overview of Studsvik concrete cells for fuel testing

Loading area (man/equipment entry to cells)

Cell equipment storage

Reception area (casks)

SEM rooms

Microscopy cells

7 concrete cells

Operators area (MSM)

Spectroscopy lab

Chemistry labs
Remote controlled Power manipulator

PAR M3000 power manipulator
Installed 2005
Wired joystick control module

- Touch screen failure
- Emergency stop communication
- Bulky wired controls

Install industrial remote control
Power manipulator cont.

Requirements on control system:
11 degrees of freedom
Fulfill standards for emergency stop
Improve operator ergonomics
Wireless
Easy to use
Proven technology (mining industry)
Power manipulator remote control

Changes made to the system:
Install radio communication module
Remove old PLC (WAGO)
Install new PLC
Test

No changes made in the cell

Cost:
Approx. 30 kEuro

Time for installation (down time):
Approx. 3 days including tests
120 kN in-cell tensile test machine
120 kN in-cell tensile test machine

The problem: Logistics

1. Sample preparation in concrete cell
   1. Cutting and pre-test inspection
2. Transportation to separate cell in separate building
   1. The separate cell can only handle one sample at the time
3. Tensile testing of sample
4. Transportation back to concrete facility
5. Post-test inspection
6. GoTo line 1 – repeat 500 times

The solution

1. Install a tensile test machine in the concrete lab

Boundary conditions

1. The machine need to fit the entrance of the cell
2. 120 kN max load
3. Hydraulic grips
4. Extensiometers
5. Split tube furnace 700°C
The machine setup

- Position (LVDT)
- Servo motor
- Gear 100:1
- Furnace
- Grips 120 kN
- Loadcell 150 kN
Cell preparations

Plugs for hydraulics, thermocouples and welding

Operator controls
Machine transfer to cell
Tensile test machine cont.
Cell waste management

High level waste (HLW): Irradiated fuel -> see J. Martinsson, presentation 46, Wednesday
Intermediate level waste (ILW): metals, tissues, plastics, broken machines
Repositories in Sweden

- Nuclear power plant
- Sigyn
- High-level waste
- Central interim repository facility for spent nuclear fuel (CLAB)
- Encapsulation plant
- Low- and intermediate-level waste
- Repository for radioactive operational waste (SFR)
- Health care, industry, and research
- Fuel repository for spent nuclear fuel
Steel or concrete
1.2x1.2x1.2 m³
Cell waste - preparation
Cell waste - packing

Will it fit?

Waste is expensive – fill it to the brim!
Cell waste – transport
Studsvik

Thank you for your attention