OSART Good Practices

OPERATIONS

Conduct of operations

Balakovo 4, Russia

Mission Date; 19 May-5 Jun., 2008

Hand held non-contact pyrometers and vibration measuring devices are used by field operators to monitor and take readings on specific equipment during their rounds. This information is then transferred directly to the field operators's computer to allow for data sharing and trending purposes.

The main benefit to using these tools and gathering this information on a routine basis is to provide early detection of equipment degradation. The information in the logs can be presented as trending information. This can then lead to scheduling of preventive or corrective maintenance on the needs basis, prior to development of more serious condition or damage.

Mihama 3, Japan

Mission Date; 20 Jan.-5 Feb., 2009

There is a mimic drawing painted on the wall in the RCA for easy identification of the valves in case there are valve wheels on the wall and the valves itself are behind the wall. The valve station within the radiation controlled area is attached to a wall to reduce exposure during valve operations. Since the piping cannot be checked during valve handle operation, mimics are placed on the wall which helps to prevent incorrect valve identification and incorrect operations.

Mihama 3, Japan

Mission Date; 20 Jan.-5 Feb., 2009

So called "S ring" is used to place the keys which are necessary for high voltage switchyard manipulations are in the required sequence. Once the keys are placed on the "S ring", the keys can be used and manipulations conducted only in prepared and verified sequence. The use of this tool during isolation/restoration operations on transmission line systems to operate breakers, switches and ground disconnecting switches effectively prevent incorrect sequence of manipulations.

Seabrook, USA

Mission Date; 6-23 Jun., 2011

Operations has implemented a Focus on Fundamentals program.

The training consists of dynamic learning activities (DLAs) at the human performance lab, the Technical Training Centre and in the simulator where operators are allowed to perform activities and be evaluated on their use of Human Performance tools and fundamentals by the instructor and fellow students. The dynamic learning activities were developed following a fleet self-assessment and are based on a good practice benchmarked at the South Texas Project.

Subsequent to DLAs conducted in the spring of 2010, the plant benchmarked Pilgrim Station and developed a Focus on Fundamentals initiative for the station. This Focus on Fundamentals initiative complements the plant's training program in much the same way that the DLA's do and consists of Senior Nuclear System Operators, overseen by an SRO licensed individual, engaging field activities in a mentoring role. The Focus on Fundamentals initiative concentrates on the use of core human performance tools as well as comprehensive Pre-job Briefs, STAR, field work best practices and enhanced Operator rounds. The Operations Focus on Fundamentals initiative and dynamic learning activities complements the Operations Training program by providing Operators with practical field work and experience.

This program enhances knowledge transfer and mentoring of junior NSOs and system awareness.

Chooz, France

Mission Date; 17 Jun.-4 Jul., 2013

Air- and hydrogen leak detection using an ultra-sonic detector

The operations department purchased an ultrasonic leak detector in order to have a reliable, user-friendly and quick detection tool for different types of leaks, such as for example, air leaks, steam leaks, air ingress and hydrogen leaks. It can also be used to monitor passing drain valves, which cannot be done with bubble-type liquid leak detectors.

The results achieved show that numerous leaks have been quickly and safely identified, thereby bringing improvements in the area of industrial safety, radiological protection, technical and economic performance.

As an example, the air system for the diesel generators used to be operated over several cycles with air-leaks that were difficult to pinpoint. This over-burdened the compressors
and caused premature ageing. This ultrasonic leak detection device has made it possible to locate a leak quickly, to map the leaks and to conduct targeted repairs.

In order to ensure that all shift teams can make full use of this device, training has been begun to be delivered to individuals across all teams, in line with corresponding training specifications.

Chooz, France

Mission Date; 17 Jun.-4 Jul., 2013

Ergonomically designed lay-out board for tags on safety related valves in the tagging office

Depending on plant status, certain safety related valves have to be positioned in a pre- defined position in the field to guarantee the correct plant configuration. These valves are locally locked with a padlock. A red tag indicates the safety position of the valve. The position of these valves however is not indicated visually in the main control room.

The plant has developed a clear procedure on how and when the position of the locked-out valves can be changed. The position of the valves can only be changed after performing a risk analysis which has been approved by the shift manager. When the valve position is changed from the locked-out position, the associated tag is stored in the tagging office.

The plant has implemented an ergonomically designed lay-out shadow board in the tagging office for setting aside the tags for safety related valves. This allows the shift manager to carry out a simple, visual check of which safety tags have been issued and if the safety tags deployed on plant correctly match current plant status. This check is carried out at least once per shift. Since the introduction of this innovation there have been considerably fewer instances of safety related valve misalignment.

Clinton, USA

Mission Date; 11-28 Aug., 2014

Pre-Job Brief Database

The Pre-Job brief (PJB) database is used to capture lessons learned and opportunities for improvement using information acquired during post-job critiques. The database contains 'living' documents that are maintained and frequently updated with industry OPEX, recent related events and data from recent job performances. The PJB database also contains standard PJBs, tailored PJBs, Heightened Level of Awareness (HLA) briefings, checklists for Work Package Planning, sources of training for Equipment Operators and Infrequent Plant Activity (IPA) briefings for all modes of operation. The database provides a readily accessible, convenient location for all operations individuals to store lessons learned, OPEX, job performance notes and recent events. This database is seen as a significant aid in preventing events and avoiding repeat events.

Flamanville, France

Mission Date; 6-23 Oct., 2014

Plant component status tracking system

The plant has developed and implemented a comprehensive plant component tracking system (AIC) that is used during on-line and outage operations. The system uses a database that receives inputs from other station software systems, such as safety tagging and work authorization permits. These collective inputs are used to maintain the status of all plant components in one database, allowing operations personnel to easily track
components that are not in the required position at power or shutdown conditions because of maintenance or other scheduled activities. In addition, the system analyzes component positions to determine the status of important functions, such as the capability of a shutdown cooling pump to provide flow to the reactor vessel.

This plant component status tracking system has several benefits. The system enhances the risk awareness of operations personnel because it displays the impact of out-of-normal- position components and their corresponding impact to important functions. The database displays information in a visually meaningful manner that is easy to access. Also, it provides additional defense-in-depth and efficiency to ensure that all components and functions are available before an operational change is authorized. In addition, it improves the efficiency and rigour of post-outage valve line-ups because it allows operations personnel to focus on systems and components that were manipulated during maintenance.

Since the plant component status tracking system was implemented in 2012, there have been no significant component mispositionings that require reporting to the regulator, and the number of low-level component mispositionings has been significantly reduced.

Krsko, Slovenia

Mission Date; 15 May-1 Jun., 2017

Plant panoramic tour

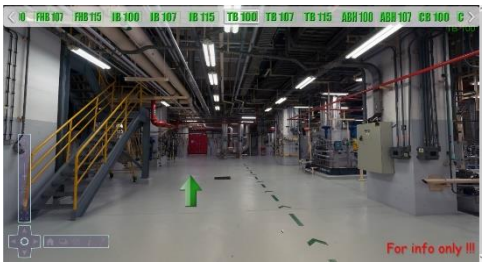
The plant has implemented panoramic tour using photos of technological areas.

Multiple panoramic snapshots were made inside plant technological areas in different elevations of buildings. The tool is available for all workers with access to a plant computer.

There are several benefits provided by this software:

- Reduced time in the tagging process: operators can readily locate and identify specific equipment and area requirements;
- Software could be used during pre-job briefings for better explanation of field specific features to workers before going in the field to do the task;
- It enhances the ability for new plant workers in becoming familiar with the plant layout;
- Civil structures engineers during the storage of equipment approval process can efficiently evaluate requested storage space;
- Areas which are not readily accessible such as the containment at power can be reviewed and discussed immediately.

This results in reduced radiation dose and improves the efficient use of plant working time.



Torness, UK

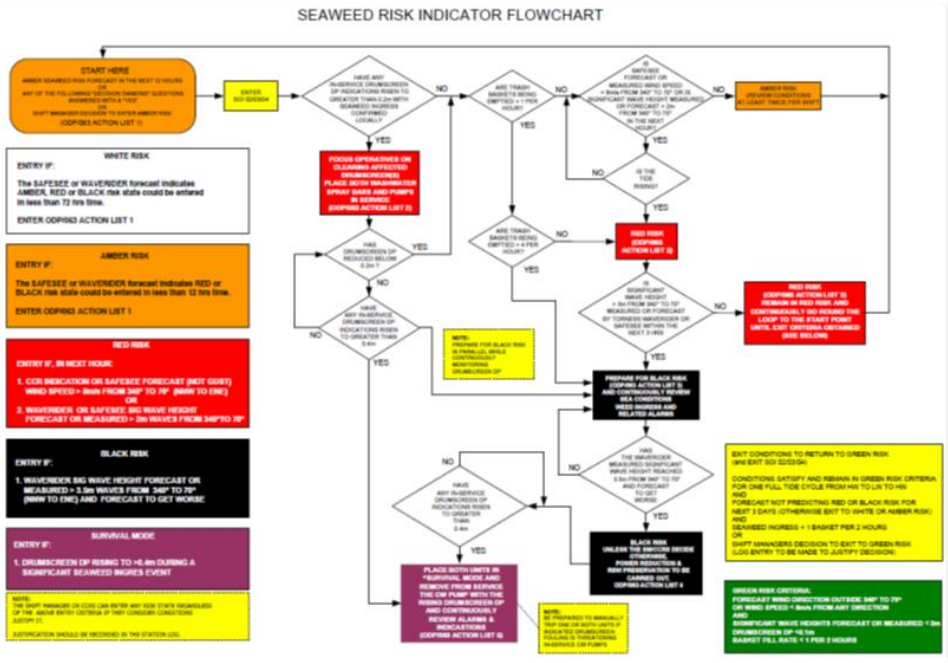
Mission Date; 22 Jan. - 8 Feb, 2018

Marine Ingress Weather Alert System

Marine Ingress into cooling water intakes, primarily related to seaweed and jelly fish, has caused operational issues across the life of the plant. Severe episodes of seaweed ingress have challenged nuclear safety and have led to reactor trips. The plant implemented comprehensive process to prepare and respond to marine ingress events. Updates were made to the plant documentation associated with the marine ingress risk indicator. This indicator is based on meteorological forecasts of wind direction, wave height and wave direction. In addition, a review of the information available to the main control room, to aid decision making, was also carried out.

Improvements implemented include:

- A new comprehensive procedure and flow chart in place which defines the process by which an assessment of marine debris risk is performed to aid operations in the deployment of appropriate mitigating actions to minimise the potential impact on the station cooling water systems.
- Improved drum screen and circulation water pump level instrumentation to give accurate and reliable indications to the main control room to support operator decision making.
- Enhanced drum screen protection system improvement - prevents drum screen failures, loss of reactor sea water system flow and automatic trips from condenser circulating water pass loss of prime, by preventing excessive drum screen differential pressure.
- Drum screen wash water augmentation uses the reactor sea water system to augment wash water supply which will address the lack of redundancy on existing system and greatly improves wash water availability.
- Installation of raking system reduces the likelihood of high drum screen differential pressure developing by removing larger weed upstream of the drum screens.



Loviisa, Finland

Mission Date; 5-22 Mar., 2018

Sophisticated key cabinets control system

There are two remote key cabinets on each unit, one inside the radiation controlled area and another in the secondary plant facilities. The key cabinets in the Radiologically Controlled Area (RCA) are in the space between the auxiliary and reactor building, on level
+12m. The secondary side boxes are near the turbine hall material corridor. The system consists of a key cabinet, key cabinet reader, ID-card reader, work order camera, general view camera, and the process control computer.

In both Main Control Rooms (MCR) the process control computer with key cabinet software is installed on the shift supervisor´s desk. In the control room there is a separate phone reserved for key management to ensure that the Shift Supervisor phone is not inundated
with key requests. At any time, the shift supervisor can control the remote key cabinets through a video camera and electronic signal for each key.

The following benefits are achieved by using the key cabinets control system:

- Shift supervisors get the working order and a picture of the person taking the key, and therefore has full control of access to the working areas important to safety, as well as information on the number and identity of the people in a particular room.
- Significant reduction in the level of disturbance to MCR crew, previously caused by key management taking place in the MCR.
- Work performance requires less time and is easier as the keys can be obtained closer to the work sites.

Having been in use for 3 years already, the key cabinets control system has proven safety and efficiency benefits.

Belleville, France

Mission Date; 15 Nov. -2 Dec., 2021

Use of a Main Control Board layover plaque to provide an alert to the operator, when control rods are in manual position.
To prevent the rods from being controlled in manual mode owing to an operator error or omission, a double-sided plaque has been created, which fits onto to rod control switches.
This plaque can only be positioned on the panel if the rods are in automatic mode. Its presence therefore confirms that rod position is controlled in automatic mode.
When an activity requires the rods to be switched over to manual mode, this plaque is positioned on the vertical panel in the control room using magnets. Its red color and its position on the vertical panel alerts all operations staff in the control room that the control rods are in manual mode, thereby facilitating plant status control. This plaque was developed with inputs from past events from the plant.

On the left, control rod switches in automatic position with plaque (green side) in place.
On the right, flip side of plate (red side), positioned on the vertical panel using magnets and visible for all the crew when the rods are controlled in manual mode.

HEYSHAM 2, United Kingdom

Mission Date; 2 - 19 Oct., 2023

Use of hot connection indicators to monitor cable connections temperature.

Hot connection indicators are installed in the plant over cables to give a warning of high temperature connections by changing colour, i.e., Purple is normal temperature (OK), Pink indicates high temperature (Warning).

Figure 3.1: Cable hot connection indicators

These were installed as part of the lighting and small power inspection and testing programme. They allow a visual inspection without the need for monitoring equipment. The inspections can be carried out by any plant-based staff, such as staff from Maintenance or Operations.

Once the connector has detected overheating, the colour change is permanent and does not revert to the normal temperature colour. This identifies whether a previous overheating event has occurred.

In addition to the routine lighting and small power inspections, the indicators allow early signs of degradation to be identified outside of the planned routines.

There have been numerous examples where hot connectors have changed colour, indicating early signs of degradation. These have been rectified in a timely manner before any medium or high-risk events occur.

This was communicated to all plant staff via a number of different communication routes. This has been shared within the fleet, and it is now documented in the Corporate technical guidance note for safety of fixed low voltage equipment and the electricity at work regulations.

HEYSHAM 2, United Kingdom

Mission Date; 2 - 19 Oct., 2023

Contingency plans during routine maintenance or emergent issues

During routine start of work authorization or in response to emergent equipment issues, the Central Control Room Supervisor (CCRS) generates contingency planning documentation. This documentation is transmitted in the shift handover package to align crews on the impact and response to any subsequent failures given the initial abnormal equipment lineup. These contingency plans do not replace approved alarm response procedures or Station Operating Instructions (SOI); however they are used to complement them and support Operations' knowledge, monitoring and control of plant conditions. The contingency plans are saved for posterity and able to be replicated during future work.

For example, an electrical fault SOI would govern the crew response and recovery from a loss of the power supply. The contingency documentation instead would outline the effects of the loss of the power supply, given the initial abnormal equipment lineup, and the compensatory measures to be undertaken. As part of the shift handover brief, the Central Control Room Supervisor (CCRS) discusses the contingencies in effect with the Unit Desk Engineer (UDE) to confirm an aligned understanding in the event of a fault.

These pre-written contingencies have been implemented over the years with improved Operations performance as a result. One example involved a failure of a gas circulator variable frequency converter during an outage period and restoration of cooling to that reactor quadrant.

R7 Contingency briefs	
Issue	Actions
TG7 EHG Duplex PLC	HYB/ROTA/0303 – Until the next R7 ODR, please review page 2 of the ROTA, it lists the valves that would not be in control should the 2nd PLC of the DUPLEX system fail. Envisaged immediate actions: - **First Action -** The plc failure will close the TG7-WC-244. The valve will need to be opened by taking the Air off and venting any residual Air within the valve actuator. - The DA will then start filling once the WC-244 is open and level can be controlled by the desk using the WC-342. - **Second Action -** The SS-202 will open admitting high pressure steam to the glands, the SS-210 will also close (this will over pressurise the glands). Slowly close in the SS-201. - Because the SA-201 and SS-207 will open, Aux steam will then be packing on. - All the spray water valves for the de-super heaters will be affected and the manual valves will need to be adjusted. - The SS-244 will close, causing BLAST to trip. This could cause a drop in pressure whilst the Aux boilers fire up and could result in the SA-75 closing.
7DY 110v Essential UPS	Replacement of 7DY 110v Essential UPS system including Battery, Battery Charger, Inverter, DC Distribution Cubicle, Static Bypass and Maintenance Bypass. See HYB/OPS/ORAF/0143 for Risk and Mitigations. Primary risk: Loss of AC supplies to 110v AC Ess UPS Board 7DY. This will cause loss of supplies to: Safety Thermocouple Marshalling Cubicle Channel 4 (LEH 7/958) causing control rods to trip to manual.
Station Tx 7	<file:\\G:\Operate\Shift Operations\Contingencies\Active contingencies - Unit 7\Station Transformer 7.doc>

R8 Contingency briefs	
Issue	Actions

Common Plant Contingency briefs	
Issue	Actions
CCR H&V	If PLC fails emergency recovery procedure is PIOI 3.40.25/140.
8 MCW Sealing flushing	Standby Pump currently running hot. S/By pump in service. In the first instance start the Main Pump as it has been ran for ~10 hours before a noticeable temperature increase. Contingency TOI HYB/TOI/1800 to enact whilst the Main pump is in service and monitored

Figure 3.2: Examples of Contingency Briefs