

ASDOC_D-MOD

Chemical Decontamination Process for NPPs Primary Circuits

For the chemical decontamination of PWR and BWR primary systems and the auxiliary systems in the nuclear power plant, Siempelkamp NIS developed the ASDOC_D-MOD Process. This chemical decontamination process is completely operated and controlled by the plant equipment on site.



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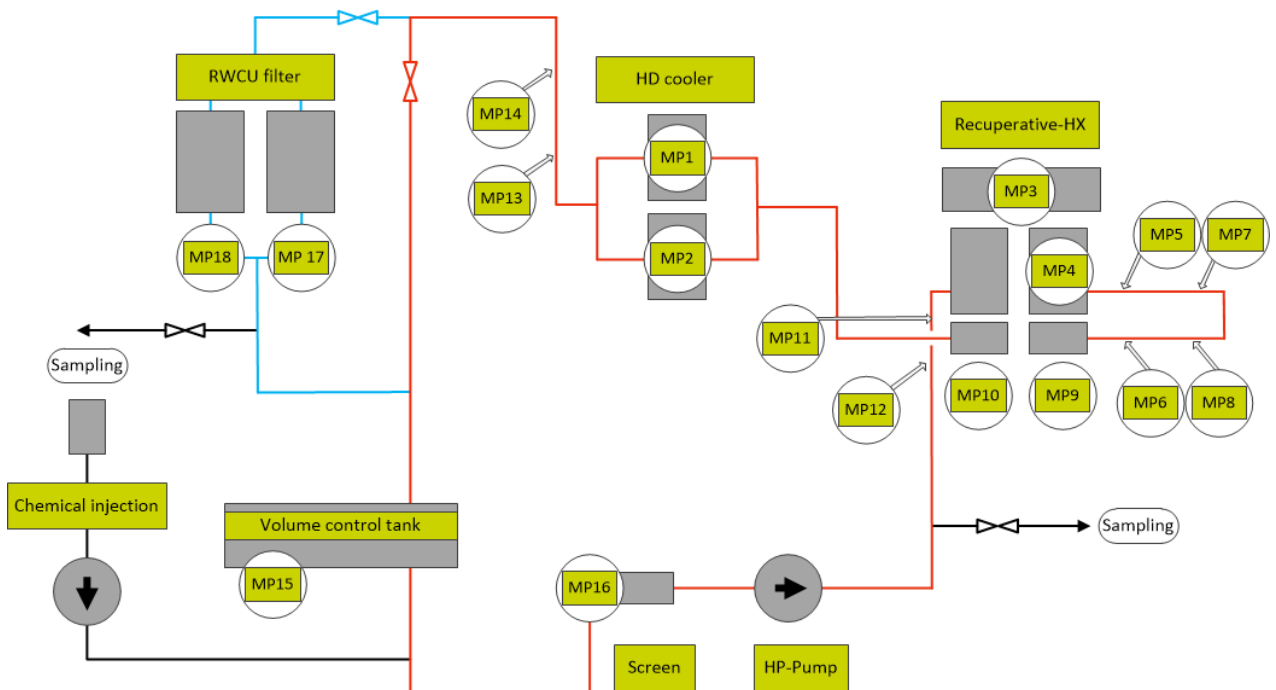
NIS Ingenieurgesellschaft

Effective and comprehensive reduction of the dose rate in the nuclear power plant

The Chemical Decontamination Process ASDOC_D-MOD

ASDOC_D-MOD uses well-known and freely accessible process chemicals in significantly reduced concentrations and with modified operating logistics. The chemical concentrates are injected into the reactor primary circuit via the site's dosing system and then circulated in the primary circuit.

Like in regular plant operation, the control of plant systems needed for the decontamination is performed by the operating personnel from the control room. Required parameters for e.g. dosing processes, throughputs or temperatures are given by Siempelkamp NIS. Dissolved ions and nuclides from the primary circuit's oxide layers are removed by means of the site's ion exchange water clean-up system. The ASDOC_D-MOD process may be interrupted and restarted at any time without any precipitations of chemical compounds. The decontamination process which is subdivided in several processing steps can precisely be terminated at the interface between oxide layer and base material. An unintentional damage of the base metal and hence an increase of waste can thus be prevented safely.



For qualification of the ASDOC_D-MOD process, a partial decontamination of the volume control system in the Biblis nuclear power plant has been successfully carried out. In 2016 and 2017, a complete primary circuit decontamination with the ASDOC_D-MOD process was successfully executed in both units of the Biblis nuclear power plant. In unit A, a decontamination factor of 90.2 was achieved within 37 days over 13 decontamination cycles with a collective dose of 25 mSv. In unit B, 44 days with 19 cycles resulted in a decontamination factor of 85 and a collective dose of 7.7 mSv.

ASDOC – Advanced System Decontamination by Oxidizing Chemistry

The process shows that a removal of the oxide layers can be performed and tracked in a controlled manner. This is due to the precisely dosed and limited amount of chemicals. After the individual process steps, the used chemicals are stoichiometrically converted. Therefore, no surplus chemicals remain in the decontamination cycle. The oxide layers dissolve during the individual process steps - This is achieved by nearly constant oxide layer removal rates. The process steps can be repeated several

times until the desired decontamination result is achieved. The activity distribution on metal surfaces can thereby be lowered to the release limit. As the ASDOC_D-MOD process requires no external components which need to be assembled or disassembled, the accumulated operator dose rate during a decontamination campaign stands low at some mSv. Thanks to the precise process control, the ASDOC_D-MOD process reaches decontamination factors of > 75 .



Laboratory experiments on the ASDOC_D-MOD Decontamination Process



Open valve of a volume control system after decontamination

ASDOC_D-MOD: Innovation with many advantages

- Primary circuit decontamination integrates plant operating staff
- Process control by Siempelkamp NIS from outside the containment
- No elaborate setup of equipment in radiation fields
- Reduced danger of leakages: The primary circuit does not need to be opened, the cooling water is not led along additional external facilities
- Only soluble compounds, no precipitations of oxides in the process
- Small and well-controllable use of chemicals
- Small amount of waste



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