

10.17 PROCESS SAMPLING SYSTEMS

10.17.1 Power Generation Objective

The objective in sampling process liquids and gases is to provide representative samples for testing to obtain data from which the performance of the plant, items of equipment, and systems may be determined.

10.17.2 Power Generation Design Basis

1. Sampling points shall be located so as to provide information needed for plant operation as well as for special tests.
2. The sampling systems shall be designed to provide samples which are representative of the fluids being sampled.

10.17.3 Description

10.17.3.1 Liquid Sampling Systems

Table 10.17-1 gives a list of liquid samples taken (additional samples may be obtained as warranted by plant conditions), the location of the sample connection, and the primary purpose for which the sample is taken. Figures 10.17-1a, 10.17-1b, 10.17-1c sheets 1 and 2, 10.17-1d, 10.17-1e, and 10.17-1f provide diagrams of the systems.

Normally, liquid grab samples which could contain radioactivity in excess of background are taken within sampling hoods. Most hoods have doors which are normally kept closed except when sample bottles are being inserted or removed. Handles of most sample valves are located outside the hood. The hoods have windows for observation of the sampling. Most sample points have a method of flushing to ensure representative samples.

Hoods are located close to sample points to minimize the lengths of sample lines. Sampling hoods are located in various locations throughout the plant including the Reactor Building, Turbine Building, and Radwaste Building.

10.17.3.1.1 Reactor Water Cleanup System

When the Reactor Water Cleanup System is in operation, reactor water quality is monitored by means of a sample connection located upstream of the two cleanup filter/demineralizers.

Performance of the individual filter/demineralizers can be assessed on a comparison of samples taken downstream of each filter/demineralizer to those samples taken

upstream. At each of these sample points, a continuously flowing stream is passed through a cooling system and then through a conductivity cell. The streams from the three sample points are combined and routed back into the cleanup system or to radwaste. Grab samples can be taken at each of the three sample points for determination of radiochemical constituents of interest.

When the Reactor Water Cleanup System is not in operation, grab samples of recirculation system reactor water can be taken at a sample connection located on Recirculation Loop A. The reactor water recirculation system sample is cooled by a cooler which is supplied with cooling water from the Reactor Building Closed Cooling Water System.

10.17.3.1.2 Main Steam System

Reactor steam may be sampled for determination of radioactivity and content of noncondensables. Samples may be withdrawn from each of the four steam lines at points upstream of the respective stop valves.

10.17.3.1.3 Condensate System

Inleakage of condenser cooling water is indicated by an increase in conductivity of the condensate or reactor water. With the waterbox out-of-service, condenser leaks may be located by use of a Helium leak detection system.

Continuously flowing sample streams from the filter/demineralizer inlet and outlet sample points and from the outlets of filter/demineralizer units are monitored for conductivity with values being recorded. Exhaustion of the ion exchange capacity of a demineralizer results in an increase in conductivity in the outlet of that demineralizer.

Grab samples can be taken from each of the continuously flowing stream samples.

10.17.3.1.4 Feedwater

Samples may be taken from the combined flow from the No. 1 heaters before the feedwater line penetrates the primary containment. A portion of the combined-flow sample can be passed continuously through particulate filters and ion exchange papers with another portion being passed through a conductivity cell. A sample cooler is used for cooling samples at the feedwater sampling point.

Grab samples can be taken from the feedwater sample point.

10.17.3.1.5 Radwaste and Fuel Pool Systems

Samples used for monitoring the Radwaste and Fuel Pool Cooling and Cleanup Systems are piped to a hooded sink located in the Radwaste Building. All liquids to be released to the river, from the Radwaste System, are sampled and analyzed before release. Water to be returned to process is checked for quality before it is sent to condensate storage. Samples can also be taken of liquids before and during processing.

When any of the fuel pool filter/demineralizers, the waste demineralizer, or the floor drain filter is in operation, continuously flowing samples of the effluents can be passed through inline conductivity cells. Conductivity readings are recorded. High-conductivity alarms are provided for the demineralizer.

10.17.3.1.6 Other Liquid Systems

The Reactor Building Closed Cooling Water Systems are provided with grab sample connections which are used to determine whether inleakage of radioactive liquid is taking place.

Raw water used in cooling the Residual Heat Removal System heat exchangers is monitored continuously for radioactivity while the system is in operation. The monitor is supplemented by grab sampling and analysis. Grab sample points are located downstream of each RHR heat exchanger.

Auxiliary systems such as the water treatment plant, the various raw water cooling systems, and the auxiliary boilers, are provided with sampling connections needed for their proper operation.

10.17.3.1.7 Recorders and Alarms

Recorders/Displays giving the readouts of conductivity and other analytical instrumentation, and associated alarms, are located on local panels, in the Main Control Room, or for Units 2 and 3 in the radio-chemical laboratory.

10.17.3.2 Gas Sampling Systems

Table 10.17-2 gives a list of gas samples taken, the location of the sample connection, and the primary purpose for which the sample is taken.

10.17.3.2.1 Air Ejector Offgas

A sample is withdrawn from the offgas line at a point downstream of the air ejector after-condenser. A diagram of the air ejector offgas sampler is shown in Figure 10.17-2. This sampler supplies the gas sample for the Air Ejector Offgas Radiation Monitoring System (see Subsection 7.12) and also provides a grab sample of the

BFN-19

offgas for laboratory analysis. Determination of radioactive constituents can be made as desired.

10.17.3.2.2 Modified Offgas Filters

Sample connections are provided upstream and downstream of the prefilters and after filters. These connections may be used for taking grab samples and for conducting DOP (dioctyl phthalate) smoke tests to determine filter efficiency (see Subsection 9.5) as appropriate. The differential pressure across each set of filters is monitored and annunciated in the Main Control Room.

10.17.3.2.3 Stack

A sample is withdrawn from the stack at a point where offgas and dilution air are well mixed. The sample is delivered to the Stack Radiation Monitoring System (see Subsection 7.12).

10.17.4 Inspections and Tests

No special inspections or tests are required for the sampling systems.

10.17.5 Power Generation Evaluation

The sampling systems, as designed, meet the objective and design bases stated in paragraphs 10.17.1 and 10.17.2.