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SUBJECT: Instrumentation for HRT-CP Dissolver System

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TO: R. K. Adams, C. S. Lisser

FROM: H. O. Weeren

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The instrumentation for the dissolving system of the HRT-CP will, in some cases, be subjected to rather stringent environmental conditions. As an aid to selection of this instrumentation a brief list of these instruments now known to be required has been prepared. For those cases where the service conditions are known, this information is also included.

Vessel -- Dissolver

Conditions

Radiation - 1×10^{10} R/yr
D₂O Recovery - 215°F, 15 psia, UO₂SO₄ solution
Dissolving - 320°F, 15 psia, 10.8 M H₂SO₄, agitated, boiling
Sampling - 120°F, 15 psia, 4 M H₂SO₄
Discharging - 230°F, 30 psia, 4 M H₂SO₄ boiling
Drying - 330°F, 5 to 15 psia

Instrumentation

- A pressure vacuum gage on the vapor line
- A temperature indication in the liquid
- A level indication of the dissolver solution. An air bubbler can be used here if the air flow is kept to a minimum. A flow control and timer will be needed on the air line.
- A flow indication of the sampler solution. 1 to 5 gal/min, 150°F, 4 M H₂SO₄ solution.

Associated Instrumentation

- A flow control on the steam supply to the jacket. 250 lb steam, 10 lb/hr. A manual by-pass around this valve will be needed.
- A flow control on the steam supply for agitation. 15 lb steam, 2 to 5 lb/hr.
- A pressure indicator on the sample jet steam supply. 80 lb steam, 175 lb/hr.
- A level control on the cooling water level of H-20.
- A flow control on the cooling water supply of H-20. 1/4- 1 gal/min.

Control Instrumentation

During the boildown of the D₂O solution the temperature indicator on the dissolver should be connected to valve HCV T-3-2 so that a temperature of 220°F will cause the valve to open. This connection should be cut out during later stages of the dissolving operation.

During the dissolution of the solids it will be necessary to maintain the acid concentration in the dissolver at a nearly constant value. It is proposed to do this by making the level of cooling water in H-20 vary with the temperature of the dissolver solution. This will regulate the amount of water vapor leaving the dissolver and therefore the acid concentration. This connection should also be by-passed when not required.

Vessel -- Decay TankConditions

Temperature - 225°F
Pressure - 15 psia
Radiation - 4×10^9 R/yr
Chemicals - 4 M H_2SO_4

Instrumentation

A temperature indicator in the liquid
A level indicator of the liquid
A flow indicator in the vapor line. 2-5 lb/hr

Associated Instrumentation

A flow indicator in the steam supply to the jacket. 15 lb steam,
2-10 lb/hr
A pressure indicator in the steam supply to the jet
A flow indicator on the make-up water

Vessel -- Condensate Catch TankConditions

Temperature - 100°F
Pressure - 15 psia
Solution - Water

Instrumentation

A level measurement of the liquid. A high level alarm should be attached.

Vessel -- CarrierConditions

Temperature - 150°F
Pressure - 15 to 30 psia
Solution - 4 M H_2SO_4
Radiation - High

Instrumentation

A temperature measurement of the liquid
A level measurement of the liquid
A high level liquid indicator. This may be the same device as the level element.

Control Instrumentation

Whenever the liquid level in the carrier reached the high level liquid indicator the steam supply to the jets on the decay tanks should be promptly cut off.

Vessel -- Dissolving Solution Addition TankConditions

Temperature - 80°F
Pressure - 15 psia
Solution - 10.8 M H₂SO₄

Instrumentation

A level indication of the liquid
A pressure indicator in the vapor space
A radiation monitor in the vapor space

Vessel -- D₂O Addition TankConditions

Temperature - 80°F
Pressure - 15 psia
Solution - D₂O

Instrumentation

A level indication of the liquid. A sight glass will do nicely.

General

All steam lines leading into the cell should be provided with instrumentation that will automatically stop the flow whenever the cell pressure is above 12 psia.

The water supply and return lines and the condensate return lines serving the dissolver, the decay tanks, and condensers H-20 through H-24 should be provided with instrumentation that will automatically stop the flow whenever any activity is detected in these lines.

The lines from the D₂O addition tank, the dissolving solution addition tank, and the oxygen pressurization system that lead inside the cell should be provided with instrumentation that will prevent flow in the line except when the line pressure is below a fixed value. This value will be about 15 psia, but will be somewhat different in each case.

The lines supplying process water to the decay tanks and the line from the dissolving solution addition tank should be provided with instrumentation that will automatically stop the flow whenever any activity is detected in these lines. The instrument on the dissolving solution tank will be installed downstream of the pressure control valve requested above.

Herman Weeren
H. O. Weeren

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