

CONFIDENTIAL

RELIEF VALVE DISCHARGE CALCULATION

REACTOR D-745

2:05 P.M. - JANUARY 13, 1983

Flow through the D-745 relief valve was calculated using the charge system capacity at conditions during the release. The calculated flow was then cross checked against the relief valve capacity at the respective conditions. In general, the relief valve discharged at a rate of 925 gallons per minutes for a period of 15 seconds, at a pressure of 200 PSIG (2% overpressure). The following conditions were used in the calculations:

- 1) The VCM charge tank would have been half empty at the time of the release, which corresponds to a level of 20 feet above grade. Using a VCM temperature of 50° F, a static head of 8 PSIG would have been present.
- 2) The VCM pressure in the VCM charge tank would have been 70 PSIG.
- 3) The pressure drop through the VCM charge filters would have been 17 PSIG at a VCM flow of 925 gallons per minute.
- 4) The pressure drop through the VCM charge meters (2) would have been 7 PSIG at a VCM flow of 925 gallons per minute.
- 5) The pressure drop through the VCM charge piping would have been 14 PSIG at a VCM flow of 925 gallons per minute.
- 6) The hot water charge tank would have been half empty at the time of the release, which corresponds to a level of 20 feet above grade. A static head of 9 PSIG would have been present.
- 7) The pressure drop through the water charge meters would have been 0 PSIG at a water flow of 0 gallons per minute.
- 8) The pressure drop through the water charge piping would have been 0 PSIG at a water flow of 0 gallons per minute.
- 9) The relief valve on D-745 is 50 feet above grade. Since the D-745 contents would have been 12.5% VCM by volume, a static head of 21 PSIG would have been present.
- 10) At a flow of 925 gallons per minute the pressure at the D-745 relief valve would have been 200 PSIG (2% overpressure).

CHARGE WATER PUMP FLOWRATE

TDH Of Charge Water Pumps = Reactor Pressure
+ Reactor Static Head
+ Charge Water Piping Pressure Drop
+ Charge Water Meters Pressure Drop
- Charge Water Tank Static Head

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TDH Of Charge Water Pumps = 200 PSIG
+ 21 PSIG
+ 0 PSIG
+ 0 PSIG
- 9 PSIG
= 212 PSIG

The pump curve for the hot water charge pumps indicates a flow of 0 gallons per minute at 212 PSIG TDH. Therefore, the water flow rate into D-745 would have been 0 gallons per minute.

VCM CHARGE PUMP FLOWRATE

TDH Of VCM Charge pumps = Reactor Pressure
+ Reactor Static Head
+ VCM Charge Piping Pressure Drop
+ VCM Charge Meters Pressure Drop
+ VCM Charge Filters Pressure Drop
- VCM Charge Tank Static Head
- VCM Charge Tank Pressure

TDH Of VCM Charge Pumps = 197 PSIG
+ 21 PSIG
+ 14 PSIG
+ 7 PSIG
+ 17 PSIG
- 8 PSIG
- 20 PSIG
= 180 PSIG

The pump curve for the VCM charge pumps indicate a flow of 925 gallons per minute at 180 PSIG TDH. Therefore, the VCM flow into D-745 would have been 925 gallons per minute.

The net flow of water and VCM into D-745 at the time of the release would have been 925 gallons per minute.

VCM Discharge Calculation

At the time when the panel operator stopped the charge system, the VCM charge meters read 619 and 623 counts. It is assumed that 621 counts of VCM (6210 gallons) would have been charged into D-745 at the time of the release. The total volume of D-745 equals 4,487 cu. ft., or 33,560 gallons. The specific gravity of VCM at the reactor temperature would have been 0.92.

Volume percent VCM in D-745 = $\frac{4,210 \text{ gal.}}{33,560 \text{ gal.}}$ = 12.5% VCM

VCM discharged in 15 seconds =

$\frac{925 \text{ gal.}}{\text{min.}} \times \frac{\text{min.}}{60 \text{ sec.}} \times \frac{15 \text{ sec.}}{1} \times \frac{0.125 \text{ gal. VCM}}{\text{gal.}} \times \frac{8.34 \text{ lbs.}}{\text{gal. H}_2\text{O}} \times$
 $\frac{0.92 \text{ gal. H}_2\text{O}}{\text{gal. VCM}} = 222 \text{ lbs. VCM}$

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