Interoffice Communication

To C. L. Miller, Aberdeen, Mississippi

From M. S. Whitney, Ponca City, Oklahoma

Date September 18, 1980

Subject Reactor Relief Modifications--Simulation Results

The design basis for setting CRD relief area requirements needs to be resolved. Relief requirements for Oklahoma City and V-11 size reactors producing 5385 resin were set at a June 6 meeting in Oklahoma City attended by Aberdeen, Oklahoma City and PED personnel. However, the CRD reactors are charged with more VCM than the smaller reactors. More important, different resin types are produced in the CRD and the reactor relief simulation indicates that this can have a significant effect in relief requirements.

The reactor relief simulation indicates that relief valves provide somewhat less relief capacity than the double rupture disc system even given equal relief area. However, the double rupture disc system appears to be quite conservative allowing overpressures of only one to two percent for 5385 resin. The decision was then made to allow relief capacity for the relief valve (only) system to be less than that of the existing double disc system, but to limit the difference in relief capacities to a minimal value, ie, 202 psig versus 208 psig maximum reactor pressure, respectively, for the base case 5385 simulation. Other considerations which dictated a generally conservative approach were that the existing relief area for Conoco PVC reactors is only 40 percent of that recommended in a 1970 FIA article, the complexity of the reaction - relief system and simulation, and the lack of good data on the existing system during actual worse case relief situations.

As you can see, the basis that was arrived at is not definitive. The review issue of the relief modification design specifies that the CRD module have greater relief protection than V-11 or Oklahoma City reactors, mainly due to 5425 and 5465 production (in the CRD). This is not a clear cut decision as shown later and should be confirmed during the Class "A" review.

Simulations have been run for the following systems:

1. Existing
   Two "Q" orifice relief valves
   One eight-inch rupture disc

2. Design (V-11 or Oklahoma City Reactors)
   Two "Q" orifice relief valves
   Two "T" orifice relief valves

3. Design (CRD Reactors)
   Two "R" orifice relief valves
   Two "T" orifice relief valves

4. Alternate (CRD Reactors)
   Two "Q" orifice relief valves
   Two "T" orifice relief valves

Results are shown in Table I. The basis of calculation, including charge amounts and set points, are shown in Tables II and III.

These results indicate:

1. For 5385 resin base case, the existing double disc system limits maximum pressure to less than 205 psig for all reactors.

2. The maximum reactor pressure increases with decreasing poly temperature, ie, relief requirements for 5385 < 5425 < 5465.

3. Maximum reactor pressure increases substantially at higher initiator loadings (150 and 200 percent of base case initiator charge), or with a "plugged" relief valve.

The design case given for the CRD reactors (two "R" and two "T" relief valves) gives lower pressures than the alternate system (two "Q" and two "T" relief valves) and gives about equal results to the existing system (two "Q" relief valves and an eight-inch rupture disc). The design case was selected because it gives the same maximum reactor pressure for 5465 resin as Oklahoma City and V-11 reactors do with 5385 resin.

While simulation results do not give a decisive basis for the proposed design relief system, a conservative approach is recommended. The kinetic model used for the simulation does not have available experimental parameters for the dual initiator system used for 5465 resin or the 5305 initiator system. Also, the L-223 initiator kinetics (used in the simulation) have not been updated to reflect the fifty-gallon reactor heat release data. While pilot plant relief tests have been proposed, it may be some time before viable results are obtained.

If you feel that further simulation computer runs would be worthwhile in reaching a decision, please let us know before the review meeting now scheduled for September 30.

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CC:
CRM:JB:RAF:VEM:VLT:AHS:SV
JAD:JF:JPW:(DJR-RJR):PAS
JHM:RDM:REB:BGL:PM