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PVC PLANT/R&E MEETING

NOVEMBER 28-29, 1982
ABERDEEN, MISSISSIPPI
REACTOR INERTS/VENTING

Analysis of potential sources of inerts in PVC reactors which would cause venting shows $CO_2$ to be the inert present in greatest amounts. This is followed by nitrogen in much smaller quantities. The major source of $CO_2$ in a reactor appears to be the monomer and RVCM. A process for removal of $CO_2$ from the monomer recovery system would eliminate much of the reactor venting problems.

I. Composition of Inerts

The reactor inerts are primarily $CO_2$ and nitrogen. Oxygen that is initially present is consumed early in the run. There are also traces of ethane, ethylene, CO, and methyl chloride, plus other light hydrocarbons. These are not a problem at their present levels.

II. Inerts Sources

Monomer/RVCM

This is the single largest potential source of inerts in a reactor. As all vapor from a reactor must pass through the recovery system, inerts are contacted with and dissolve in the RVCM and probably the fresh monomer. $CO_2$ is particularly soluble in VCM and within the range of operating conditions of the RVCM system, it could comprise several percent of the liquid RVCM. A recent liquid sample of RVCM from the new module at Aberdeen was 1.9 mole percent $CO_2$. Nitrogen also has some solubility in VCM but is well below that of $CO_2$.

Initiator

Release of $CO_2$ from the breakdown of initiator is probably the main source of $CO_2$ dissolved in the monomer. However, initiator is a secondary source of inerts for a particular batch. Table I lists the maximum $CO_2$ release for various initiators. Actual $CO_2$ generated by initiators is probably less than listed and will vary between types.

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Reactor Evacuation

About 0.3 mole of air is left in the reactor after evacuation. This is the major source of nitrogen and oxygen.

Charge Water

About 20 ppm dissolved air may be present in the charge water. Analysis of the Aberdeen water gave an average of 50 ppm Total Inorganic Carbon as $CO_2$. This would be the maximum $CO_2$ released from carbonates in the water.

III. Example

The following example illustrates the relative magnitudes of the inerts sources.

Reactor Charge: 50,000 lb VCM, 20% RVCM
70,000 lb $H_2O$
5 gallon L-223 Initiator

| Source | | Quantity |
|---|---|---|
| RVCM (2% $CO_2$)<br>Receiver at 70°F, 65 psig<br>Assumes no $CO_2$ in fresh monomer | | 141 lb $CO_2$<br>9 lb $N_2$ |
| Initiator-Maximum | | 6.7 lb $CO_2$ |
| Evacuation | | 7.3 lb $N_2$<br>2.4 lb $O_2$ |
| Water-Dissolved Air | | 1 lb $N_2$<br>0.35 lb $O_2$ |
| Carbonates, Maximum | | 3.5 lb $CO_2$ |
| Totals | $CO_2$<br>$N_2$<br>$O_2$ | 151.2 lb<br>17.3 lb<br>2.7 lb<br>171.2 lb |

If fresh monomer has inerts dissolved in it, via the recovery system, the $CO_2$ and $N_2$ will be much higher.