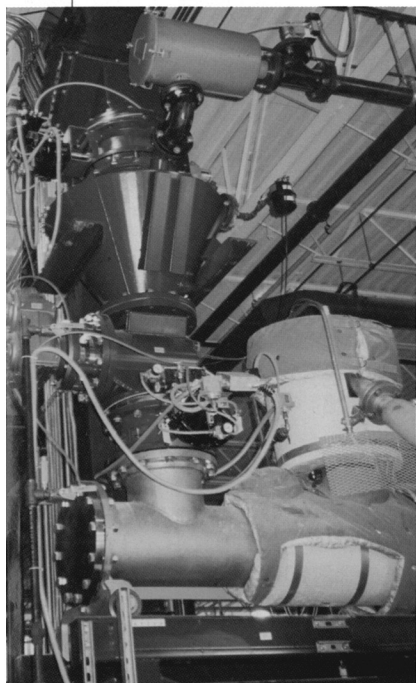


High Temperature Hazardous Material Recovery



Above:
The discharge is the same except Roto-Flate valves are water cooled against 700 degrees F hot process materials

Right:
Airlock feed arrangement from the top: inlet hopper from the bucket elevator; upper Roto-Flate valve; conical intermediate chamber with rotary volumetric feeder; bottom Roto-Flate valve immediately above the silver colored processor.

Hazardous substances are in many present day disposable products. EPA restrictions can require the removal of the hazard before land filling or incineration. A processor of scrap glass contaminated with mercury uses a continuously fed calciner. Deep vacuum at temperatures in excess of 500° F, produced by indirect heat is used to vaporize off the mercury to a recovery system. The scrap broken glass is both angular and abrasive causing harsh wear on the feed and discharge valves. These valves need to be extremely tight because any leakage of air into the vacuum system will result in mercury losses. Excess non-condensable gases (atmospheric nitrogen and oxygen) carry the vaporized mercury out through the chilled water condenser. ASTM Class 6, bubble tight valves are required for this application.

One typical way to feed solids is with rotary star feeders that have a typical clearance of .003" to .006". Under high vacuum, this is enough to allow a great deal of leakage even when the valve is in new condition. Considering the abrasive rubbing wear such vane type rotary feeders experience, the clearance leakage would quickly become massive. Rotary vane feeders were not considered to be suitable candidates. Other types of valves such as metal-seated butterfly, ball valves, slide gates, and knife gates were considered or tried. None was able to meet the requirements. For abrasive dry materials, an inflatable seal valve can maintain itself in this degree of tightness thru many cycles. Thus the only significant ingress of air into the vacuum processor is from the intermediate chamber at each cycling. Since the cycling is infrequent, this leakage is small. Here is how the process works.

Cold product is air-locked into the processor thru a set of two Roto-Flate" valves with an intermediate air lock chamber, on a cycle frequency of about 20 minutes. Likewise, hot decontaminated waste is air-locked out at a temperature well in excess of 500° F. When the system was first installed, it was fed and discharged by two pairs of inflatable sealed butterfly valves acting as airlocks. Unfortunately, these butterfly valves failed after a short time. With the butterfly valves the seal is exposed directly to the hot product both above and below the vane. The sharpness of the glass along with the squeegee action of the butterfly vane against the hot inflatable seal simply cut the elastomeric seals of the butterfly valves.

Roto-Flate valves were installed as replacements. With

the Roto-Flate, the dome is sealed against the inverted unexposed surface of the elastomer. Material falls away from the seal by gravity before the seal is inflated against the dome surface. The seal material is quite thick and tough. The upper valve is opened to allow material to fill the intermediate chamber. It is then closed and the lower valve is opened to charge the contaminated product into the processor. Cycle frequency is about once every 20 minutes. The processor feed is at ambient conditions and since the lower inlet valve is separated from the processor by a 3'-long screw feeder, there is not much radiant or conductive heat applied to the inlet valves. Standard neoprene seals are used for these.

At the discharge end however, the temperature of the product is well over 500° F. It is in a continuous flow over the opened valve dome for as much as 20 minutes at a time. When the valve is closed the temperature of the dome could approach the product temperature. When the silicone seal inflates, it might fry against the hot dome. Likewise, on the lower valve, the roasted product could lie on the dome for 20 minutes at a time and thus similarly destroy the elastomer inflatable seal.

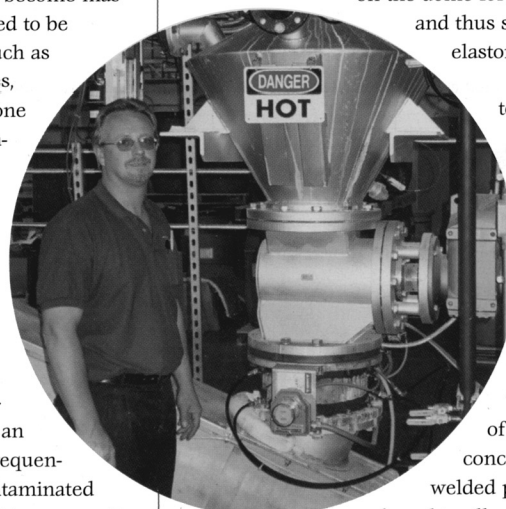
Two steps were taken to handle this high temperature. The seals for the two discharge valves were made of silicon rubber that has a temperature limit of about 400° F. Also, these valves were water-cooled. For these two "hot" valves, the back of the dome, which is concave, was closed with a welded plate. The shafts were

bored to allow a water channel in through one shaft, through the hollow dome and out through the other shaft. Fifty degree chilled water is circulated. The cooling water is also circulated through coils around the body that are imbedded in heat transfer cement and through hollows on the mating flanges on the processor.

The valves have been in service for about two years with low maintenance.

Roto-Disc® Co.

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High-Temp RF Application

