Report on the use of Vapor Phase Inhibitors for Mothballing a Chemical Plant

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Company:	Rhone-Poulehnc Chimie De Base Sales: 13 Billion Francs
Plant:	Chalampe - Oberelsass, France
	Main Production:
	Adipic Acid Adiponitrile Hexamethylene Diamine (HMD) Dihexamethylene Diamine Adipate Oxalix Acid Terephthalic Acid (mothballed since 1982)
Production Capacity 1984:	355,000 Metric Tons
Exports:	55 to 58%
Employment:	1,450 persons

Foreward

The report discusses the provisional shutdown of production plant for Terephtalic acid in an outdoor installation, for an indefinite period.

The mothballing is to be done without disassembly of the apparatus, so that restarting of production can take place in short order (around 2-3 months).

There is one exception:

> The turbo compressor (6050 kw) built into this plant must be made operational again within 2-3 day period.

Some facts about the above plant:

> Daily production: 520 Million Francs
> Square footage: 13,794 sq. meters (137,000 sq. feet)
> No. of apparatus: 130
> Pipe diameter: _ " to 24"
> Electronic Analog Controls

Types of Processes

The apparatus were divided into three large families:

Family 1: Irregular apparatus, such as compressors, dryers, centrifuges, ovens, etc., for which the processes had to be individually developed.

Family 2: Standard apparatus, such as electric motors, switches, meters, pumps, valves, casings, gearboxes, vents, etc.

The type of protection was determined for each grouping.

Family 3: Apparatus which are connected to collecting pipes.

The type of protection was determined and effected for each network (pipes and apparatus).

For example:

-Steam pipes and associated apparatus
-condensate lines and collection apparatus

According to these types, the protection of the entire installation was determined.

Implementation

Four forms of inhibitor were used:

1. VCI-101 and VCI-110: Impregnated foam

   For enclosed spaces (Families 1 and 2)

   -switch boxes and safety casings
   -control boxes
   -Cavities within compressors, ventilators, centrifuges

Air vents were closed as tightly as possible. Caps in control and electric apparatus were sealed with a silicone compound.

2. VCI-309 Powder

Used in two ways:

2.1 Methanol solution: 20g VCI-309 per 100 ml.
Used mainly for networks in Family 3, such as:

-Steam lines
-Water lines
-Pressure and "process-air" lines

See Sketches 1 & 2

Also used for particular apparatus in Family 1: before injecting the solution, the apparatus were purged with nitrogen.

2.2 Direct application of VIC-309 Powder used for particular apparatus of Family 1 when nitrogen purging wasn't possible. In this case, after drying the apparatus, 50g of powder per cubic meter was fogged in.

3. VCI-329: Oil base concentrate

For drives, lubricating and hydraulic systems, ball bearings, etc. (Families 1 and 2).

-Drive mechanisms lubricated with oil, hydraulic systems: the old oil was removed, replaced with fresh oil containing VCI concentrate in ratio of 1:10 (filled as full as possible).

-Pneumatic servo motors: both sides of the piston were sprayed with concentrate (through the air ports).

-Ball-bearing housings: greased replaced with a mixture of fresh grease and concentrate in ratios 1:10.

4. VCI-369: Spray coating

For protection of unpainted surfaces (Families 1 and 2).

-Safety vents
-Valves
-Pulleys
-Flange bolts and nuts
-Motor and drive mechanism surfaces
-Couplings

NOTE:

-Motors which stand in the open were dismounted, dried and stored indoors.
-Stainless steel apparatus and pipes were dried and otherwise left untouched.
-Damage to painted surfaces was repaired.
-Gaskets were left in place, to be replaced at time of re-installation.
-Certain parts of the control mechanism were removed and stored.

Quantities

The following quantities were used:

VCI-101 Foam	700 devices
VCI-110 Foam	120 devices
VCI-309 Powder	185 kg
VCI-329 Concentrate	925 liters
VCI-369 Coating	200 kg

Total Cost of Mothballing

-Shutdown
-Inhibitor
-Repairs
-Dismantling
-Cleaning
-Painting

Total: 2.5 Million FF
(January 1983 Value)

In Fall 1983 and Summer 1984, inspections were carried out. To date, no corrosion damage has been witnessed.

Of note is that during these inspections, small quantities of water were discovered collecting in certain apparatus. In spite of the present water, no corrosion was found.

After inspection, a certain amount of VCI-309 Powder was reintroduced in the appropriate apparatus.

In Spring of 1985, the period of protection runs out. It is projected that the protection will be replenished at that time.