

Dry Vacuum Pumps Dramatically Increase System Reliability

Large Chemical Manufacturer Benefits from Dry Screw Design

Dow Polyurethanes, a business group of The Dow Chemical Company, has a unit at its Texas Operations site that uses deep vacuum to remove water vapor and inerts from its product. For the past 15 years, Dow has used rotary vane vacuum pumps to achieve the vacuum level required. While the rotary vane pumps were a considerable improvement over their predecessor, their reliability was still an issue. Due to normal wear and liquid entrainment, each pump had to be overhauled several times a year. The total maintenance cost for these pumps was more than \$180,000 annually. Dow realized that it was time to look for a vacuum pump that would eliminate oil wastes and offer more reliability and flexibility in its operation.

Solution

Steam jets were ruled out because one constraint was not increasing the liquid effluent volume in the unit. Liquid ring pumps were not considered because they produce a liquid stream that must be treated; they lose efficiency during the warm months because of higher seal liquid temperatures; and they require additional booster units to



Busch COBRA on stripping column.

reach deep vacuum levels. Cliff Moore, Reliability Engineer for the Polyurethanes unit, decided to look at dry vacuum pumps. Although dry vacuum pumps have essentially no waste stream, he was concerned about the reliability of the dry design. In particular, the pump must be capable of handling liquid entrainment in the vapor stream without adverse effects. After extensive research and visiting several other sites where dry pumps were already in operation, Dow decided on Busch COBRA dry screw vacuum pumps.

"With the COBRAs installed, I don't even think about vacuum pumps anymore. That is a testament to their reliability and ease of operation"

— Cliff Moore, Reliability Engineer

The Busch COBRA dry screw vacuum pump offers greater efficiency and lower maintenance costs than other types of dry vacuum pumps for several reasons. It is a single stage design, which means fewer moving parts and no intercooler. The oil-free operation of the pump eliminates waste and subsequent disposal costs. It has a small foot print for less space requirements and non-contacting parts for longer pump life. The straight, short flow path prevents material from accumulating or condensing in the pump. Additionally, it can accept liquid injection in special applications for flushing or cooling. The COBRA operating principle also is very simple. Entering gases are trapped between flights of the screws and moved axially down a short, straight path to the exhaust where they are discharged.

Results

In 1998, Dow installed three COBRA Model AC800 dry screw vacuum booster/pump systems. Since installation of the Busch COBRA pumps, Dow has gained many advantages.

- Dry pumps generate no additional effluent from the process.



Booster blowers for deep vacuum.

- Failure rates on the equipment went from one per month to one every three years of run time. In fact, the only Busch COBRA failure incurred at Dow was due to a process upset unrelated to the vacuum pump.
- Maintenance costs for vacuum pumps were reduced by over 80%.
- Dow has local service and technical support since Busch has a direct service and distribution center in Texas.
- The improved vacuum level achieved by the vacuum pump/booster arrangement reduced the stripping time required, thereby increasing the capacity of the system.

The Polyurethanes unit has been so pleased with the COBRA's performance that the pump will be considered as the primary vacuum source for future projects. "Prior to installation of the Busch COBRA pumps", says Cliff Moore, "the only thing predictable about the vacuum equipment we used was that it would be at the top of the maintenance cost list every year. The frequent failures of the previous equipment were an unwanted distraction. With the COBRA's installed, I don't even think about vacuum pumps any more. That is a testament to their reliability and ease of operation".

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