

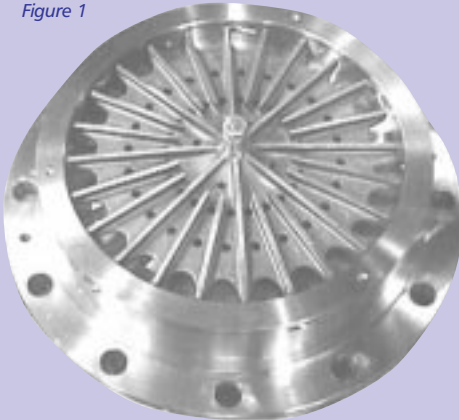
# Service Solutions

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PRO Project Engineers work with Customers and our PRO Service Centers to solve our customers pumping problems by analyzing pumping systems and providing turnkey solutions that make commercial sense.

Figure 1



**Problem:** A gulf coast chemical plant was experiencing excessive maintenance costs on three 5th Edition, API process pumps due to extreme off peak performance requirements. Vibrations averaged .3 to .5 in./sec at all times. When the pumps were purchased the pumping requirements were 415 GPM at 932 TDH and now the requirements had changed to 35-60 GPM at 932 TDH.

**Due Diligence:** To properly address this pump modification we had to first review the exact requirements of the pumping system as it currently existed to better decide to either replace or modify the existing pump. The pump was clearly oversized and the pump that this system needed was not readily available in an API design. The solution options were a new ANSI pump, a new vertical can pump, or a re-rate of the existing pump. The customer did not want to have an ANSI pump in this service due to insurance concerns. The vertical can pump was not the preferred option due to the turnkey costs associated with the removal of the existing system and the construction of the new sump and piping required for the vertical pump. The re-rate was preferred if it was possible.

To completely examine the hydraulic issues we went to our family of curves for the API overhung process pumps and did not find one

that adequately covered this application. As was stated earlier, we did find an adequate hydraulic fit in our low flow ANSI product line. The first step in this review was to find the basic head and capacity coverage. We always look at the range of flow as few pumps are run at only one point, most are run over a range Low, Design, and High. Then we cover NPSH issues; we never want unexpected cavitation. Typically the NPSH required by the pump should provide an adequate margin of 1.5' to 2' below the customers NPSH available at the maximum flow required. Once, the hydraulic characteristics of the pump are confirmed to be adequate the physical issues of making the existing pump act like the new pump are examined.

All process pumps have two components that develop the head and maintain the capacity, the impeller and the volute (case). Energy is transferred from the driver through the coupling into the shaft and then into the fluid along the working side of the impeller vanes. This is the end of energy transfer from the driver. While energy is being transferred into the fluid, the impeller is also slowing the product down through a diffusion process (smaller area to larger area as the vanes develop from inlet to exit). This reduction in velocity head increases the pressure head as defined by Bernoulli. When the product is discharged into the volute it also is diffused to complete the head required of the pump. The product capacity is regulated by the impeller eye area and also by the volute opening area

at the discharge of the impeller. These two areas are sized to define a certain capacity typically known as the Best Efficiency Point.

**Solution:** For our re-rate to work we had to take all these issues into account and then mechanically conform the existing pump to their requirements. In this case our impeller turned out to be a radial vane open face low flow type (see Figure 1). Typically an API process pump utilizes a closed impeller (see Figure 2). We designed in a case adapter to accommodate the open impeller. The volute area was too large on the existing volute to reduce it by extending the existing volute tongue so we utilized a diffuser designed into the seal chamber cover (see Figure 1). This is similar to a diffuser style pump or barrel type pump. Commercially this allowed the customer to spend about 27 cents on the dollar versus the total replacement of the pump with a new unit. The 27 cents included the removal of the pump by their personnel, the modification of the pump with new components including an upgraded power frame in our PRO shop, new mechanical seal, reinstallation of the pump by their plant personnel and all software associated with the job. The pumps were out of service for 4 to 5 days. Vibration readings averaged .07 in./sec. after this upgrade.

For more information on this re-rate or to explore a re-rate opportunity on another pump please contact your local PRO Service Center or Service Engineer.

Figure 2



**Send your comments or suggestions to:**  
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