



**WESTPOWER EXECUTES THE  
HYDRAULIC RE-RATE OF A  
MAJOR US REFINERY'S CRUDE  
CHARGE PUMP, ALLOWING  
THEM TO REALIZE THEIR  
RELIABILITY  
POTENTIAL.**

**KEY FACTS**

**LOCATION** | Salt Lake City,  
Utah, USA

**PROJECT OBJECTIVE** | Minimize  
costs to upgrade a historically  
inefficient crude charge pump

**SERVICE TYPE** | Engineering, Pump  
Re-Rate, Repair, Reliability, Performance &  
Efficiency Enhancements

**BENEFITS** | Significantly reduced critical vibration  
levels and improved efficiency. Minimized downtime,  
project costs, customer impact and reduced  
catastrophic failures.

Just a year after the Westpower Group amalgamated with R&R Machine Service in Salt Lake City, the strategy of combining each company's strengths continues to be demonstrated. Under the Westpower Group of companies - together R&R and Westpower have forged alliances with several international pump and mixer manufacturers, while providing our Clients with excellent engineered product guidance through our Utah, California and Colorado locations. Westpower's engineering strengths are combining flawlessly with R&R's Salt Lake City repair center to provide significant value for our Clients.

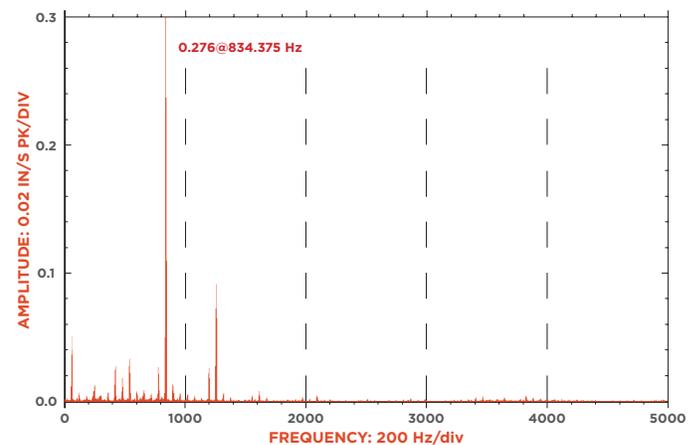
**CHALLENGE**

A major Salt Lake City refinery needed to upgrade their crude charge pump after years of running significantly off the best efficiency point (BEP). Issues experienced by this pump included cavitation and high vibration levels that led to pre-mature bearing failure, internal erosion, decreased equipment reliability, and lower efficiency.

Replacing the charge pump with a new fit-for-purpose or existing OEM solution was not feasible due to a long lead time of over 1-year. Additionally, new pump installation, grouting, piping, planning, engineering, design, installation and commissioning would require the Client to undergo a lengthy and costly management of change process (MOC), on an already failing pump. Years of reliability issues

including a broken shaft due to excessive vibration, finally forced this Client, one of the world’s leading oil companies, to take action to mitigate safety concerns, unplanned downtime and the potential loss of production.

**FIGURE 1 |** Vibration spectrum of P21020 inboard bearing with very high vibration before the re-rate.



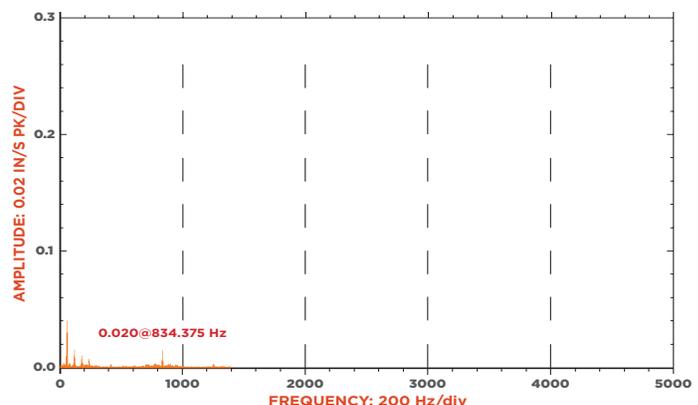
**SOLUTION & OUTCOME**

Westpower created a custom engineered solution, as the existing OEM pump specifications would not satisfy this project’s unique scope requirements. The solution included Westpower completing the hydraulic design engineering and provided R&R with the guidance to modify the volutes and source the custom designed impellers. A stationary component material upgrade to the Vespel CR-6300 reduced the running clearances which should also extend the pump’s lifespan.

Downtime was significantly reduced compared to installing a new pump; as a revision to the existing pump didn’t warrant the Client to go through their lengthy and costly MOC process. Now installed, the crude charge pumps are operating flawlessly and this Client was able to significantly reduce their vibration levels, in turn

also reducing their operating costs while significantly improving their overall performance and reliability.

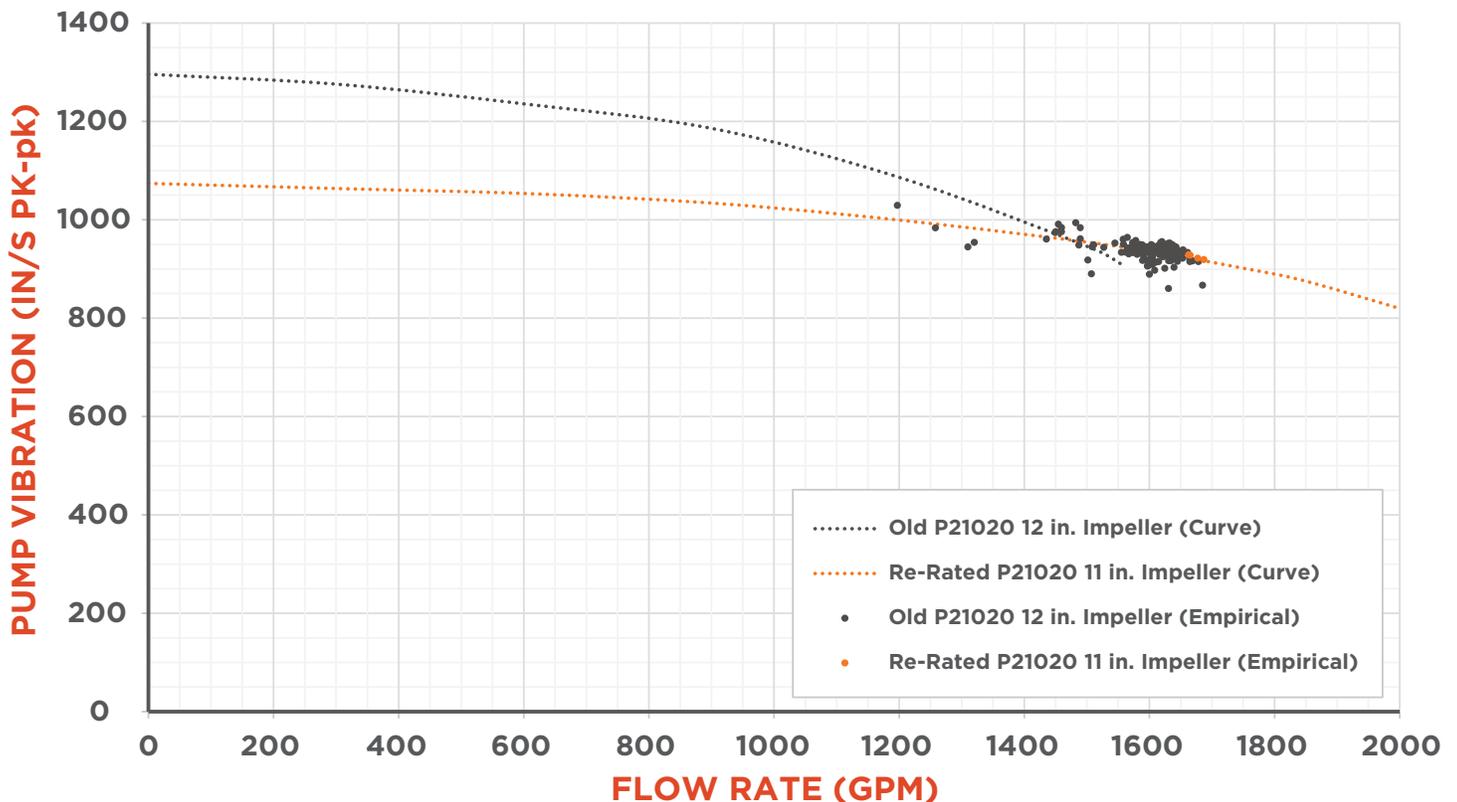
**FIGURE 2 |** Vibration spectrum of the inboard bearing after the re-rate. Direct vibration amplitude decreased significantly from 0.420 in/s pk to 0.060 in/s pk while the vibration amplitude at vane pass frequency (834 hz) decreased from 0.276 in/s pk to 0.020 in/s pk.



**SOLUTION & OUTCOME CONTINUED**

The successful outcome of this initiative was the result of Westpower’s engineering and technical expertise, that delivered a cost effective and reliable solution within the bounds of the project’s scope. By optimizing the pump curve, Westpower produced a pump solution that worked for the Client’s operating conditions and requirements rather than the Client having to adapt to a rigid pump specification and accept inefficient operations. The Client now achieves the required flow by running one pump instead of the two pumps that were previously required.

**FIGURE 4 | Pump Performance Before and After Re-Rate.** Compares the performance of the crude charge pump before and after the re-rate relative to the published pump curves. The actual performance of the re-rated pump is within 1% the published curve.



**FIGURE 3 | Before and After Vibration at Various Pump Flow Rates.** Vibration level of the crude charge pump as a function of flow rate. After the re-rate, the pump has been operating at historically low vibration levels, around 1675 gpm.

