CELEROS™ FLOW TECHNOLOGY

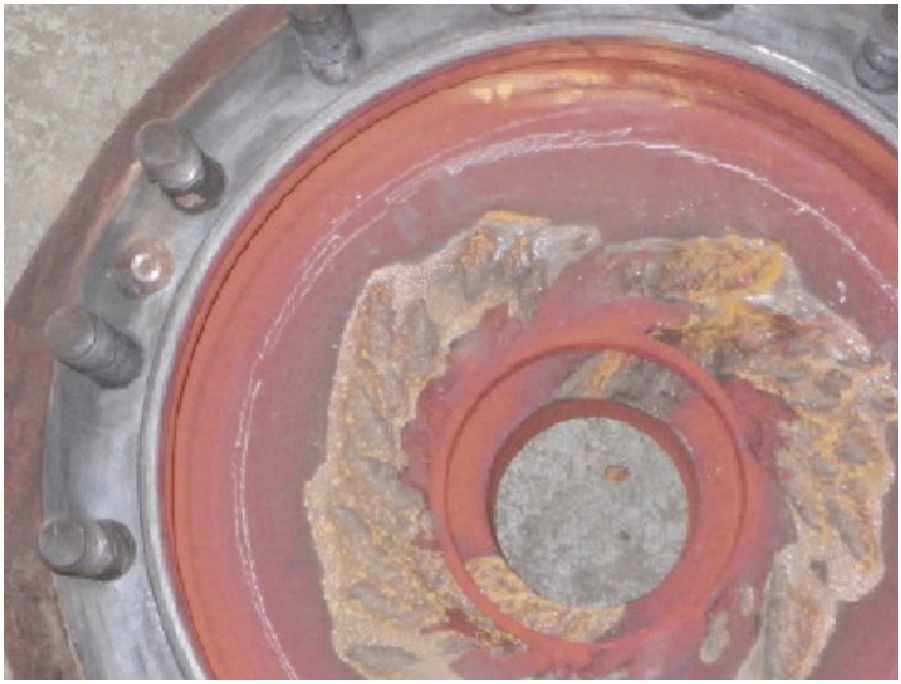
CASE STUDY

# MATERIALS UPGRADE TO BOILER FEED PUMP DELIVERS ROI WITHIN 1 YEAR

Close-up view of wear ring area

CLYDEUNION® PUMPS

- Cause of pump damage identified
- Recommended materials upgrade implemented
- Estimated payback is less than one year



Damaged casing

**Industry:** Oil & Gas - downstream

**Region:** Americas

**Category:** Materials upgrade

**API Type:** OH2

ClydeUnion Pumps Aftermarket Technical Services team has experience across a range of services on critical rotating and reciprocating equipment to improve operational safety, reliability and efficiency. The drop-in replacement of two original Bryron Jackson pumps for the oil and gas market is one of our success stories documented in our library of case studies. These case studies highlight the requirement from the customer, how we achieved the goal and the process we followed to deliver the improvements.

## CHALLENGE

A North American refinery was experiencing repeated failures of casings and casing covers on ClydeUnion Pumps CUP-OH2 pumps in boiler feed water service. The damage was to random areas of the casing and cover and limited to cast steel (ASTM A216-WCB) components only.

ClydeUnion Pumps aftermarket engineering team was asked to evaluate the failed components and make recommendations to prevent future damage.

## SOLUTION

In order to determine the root cause of the failure, the operating parameters of the pump were investigated. Particular emphasis was placed on the temperature and conductivity of the water, with key properties of interest as follows:

- Temperature – 269°F
- Conductivity – 11 µmho/cm
- pH - 9

Inspection of the failed components revealed damage consistent with the use of carbon steel in hot, low conductivity water service. The type and random nature of the damage along with service conditions were key factors in making this determination, which was later supported by an independent metallurgical examination.

This failure mechanism involves erosion and corrosion of the metal, where the protective oxide scale at the surface is dissolved, and the underlying metal is removed due to the velocity of the water. Generally speaking, carbon steel casings must be avoided in boiler feed applications where the water temperature is greater than 200°F, and the conductivity of the water is less than 20 µmohs/cm. In these cases, damage will occur primarily in high velocity areas.

For this boiler feed water application ClydeUnion Pumps recommended the replacement of the carbon steel components with 12% chrome (CA-6NM), 316 stainless, and 400 series stainless steels (CA-6NM and CA-15), which are not affected by this failure mechanism.

## OUTCOMES

Replacement pump casing and casing covers were provided in upgraded materials. ClydeUnion Pumps estimates that the one-off cost of the materials upgrade is approximately one third of the annual maintenance cost of replacing or repairing the carbon steel pump casings – so this represents a significant reduction in ongoing maintenance costs and a much-improved Mean Time Between Outages (MTBO) for the customer.

## FINANCIAL ILLUSTRATION

Replacement casing and casing covers were provided in upgraded materials with no additional reported failures.

Annual replacement cost for original metallurgy estimated at US$80,000 for parts and labour.

One time replacement cost for upgraded materials US$30,000 including parts and labour.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