



## Supply of six upgraded cartridges for CUP-BB5 pumps

**Industry:** Oil + Gas - upstream oil  
**Region:** Africa  
**Territory:** Algeria  
**Category:** Hydraulic re-rate  
**API Type:** BB5

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 hydraulic re-rate of the CUP-BB5 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.

*Image left: CUP-BB5 Pump*

### Situation

The scope of the project was to supply six new pump cartridges for the CUP-BB5 units as part of an upgrade plan for our customer in Algeria.

The customer indicated that a new duty was required and requested that ClydeUnion Pumps, an SPX Brand, upgrade the current hydraulic design to meet the new duty requirements.

### Challenge

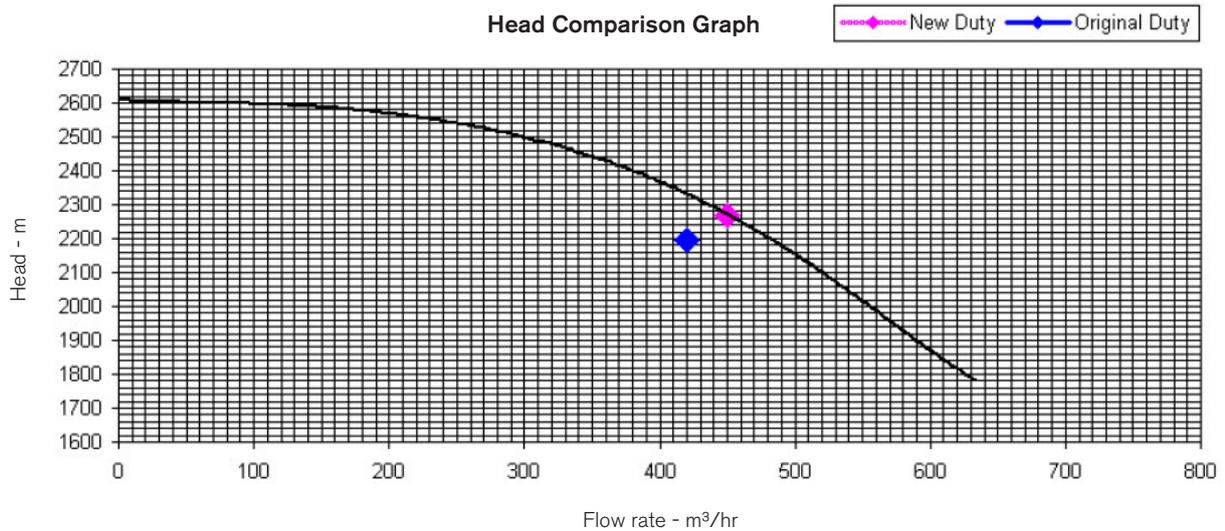
To meet the proposed new duty requirements an increase in impeller diameter would be required. The proposed solution was to provide six complete pump cartridges with increased diameter impellers to replace the originals. The reasoning for proposing new cartridges as opposed to only new impellers, is detailed below:

- Time taken to replace an existing pump cartridge with a new cartridge is typically 3 to 4 days compared with 3 to 4 weeks to remove, strip the cartridge, replace the impellers, cut the diffusers, rebuild and replace the cartridge.
- Once the cartridges are stripped on-site and the impellers replaced it is likely that replacement of wearing parts will be required to achieve the new duty. This again would be time consuming. The proposed new cartridges have new wearing parts and this will remove the need for any maintenance on the unit at this time.
- As it is a nine stage pump it requires dynamic balancing of the rotating element. New cartridges supplied would contain a full rotating element dynamically balanced by ClydeUnion Pumps in our Cathcart works in Glasgow, Scotland.
- Diffusers require to be recut and dressed to incorporate the increased impeller diameter, this cannot be achieved at site.



**Duty comparison between the original pumpset and proposed upgrade:**

	CURRENT	PROPOSED	% CHANGE
Speed	2969 rpm	2969 rpm	0 %
Head	2196 m	2270 m	+ 3.37%
Flow	420 m <sup>3</sup> /hr	450 m <sup>3</sup> /hr	+ 7.14 %
Power	3787 kW	4080 kW	+ 7.74 %
Head (Closed Valve)	2455 m	2609 m	+ 6.27 %



## Solution

ClydeUnion Pumps carried out the necessary hydraulic design and manufactured and assembled the six new cartridges which included the following components:

- Nine increased diameter impellers and efficiency diffusers to meet increased capacity
- Nine ring sections (designed to fit in the existing barrel)
- Shaft, balance drum, end covers, bearings and seals

Upon installation on-site, a ClydeUnion Pumps engineer carried a full performance test to within ISO 9906 Grade 2 tolerances and acceptance criteria. Since re-installation and start-up, the pump has operated to the upgrade requirements, with no failures to date.

## Financial illustration

- Pump operating at 420 m<sup>3</sup>/hr is capable of producing 2641 barrels of oil per hour. Assuming output is 100% oil, the total value of oil, which can be extracted in one hour's operation, is US\$198,075, based on an oil barrel value of US\$75.
- Pump running with upgraded cartridges with new flow rate of 450 m<sup>3</sup>/hr is capable of producing 2830 barrels per hour. Assuming output is 100% oil, the total value of oil, which can be extracted in one hour's operation is US\$212,250, based on an oil barrel value of US\$75.
- This equates to approximately a 7% increase in hourly production.



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