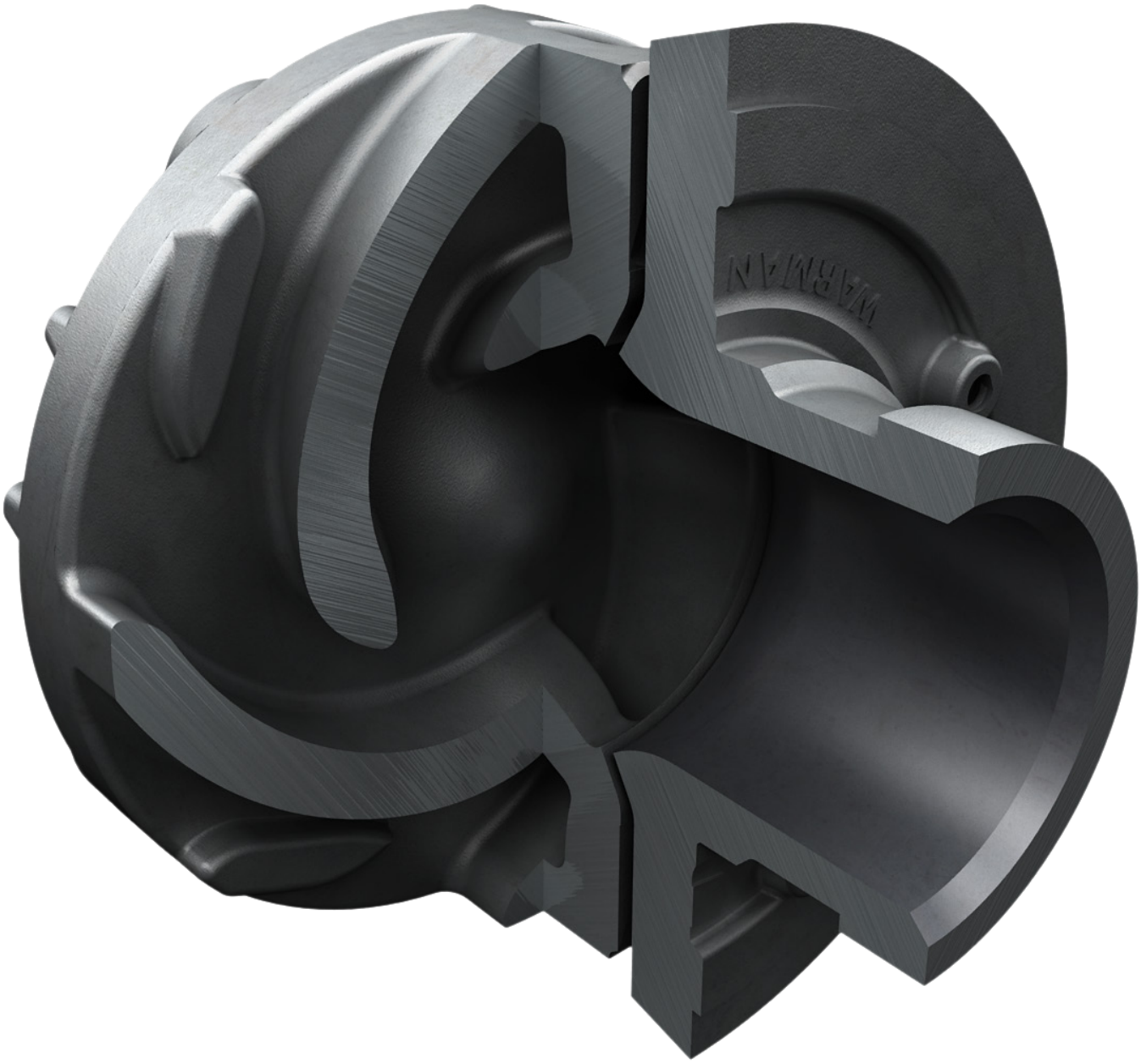
Minerals

WARMAN® Centrifugal Slurry Pumps

WRT® Impellers and Throatbushes



The Warman® WRT® impeller and throatbush combination is a superior upgrade for your existing Warman® AH® pump designed to enhance efficiency and improve wear performance

Background

In line with our commitment to reduce total cost of ownership on the range of products supplied by Weir Minerals, an extensive research and development program, initiated by Weir engineers, aimed at better understanding the wear characteristics at the inlet and outlet of centrifugal slurry pump impellers was undertaken. The culmination of the project resulted in a totally new impeller and matching throatbush design which provides Warman® AH® pump users with significant advantages.

The Design

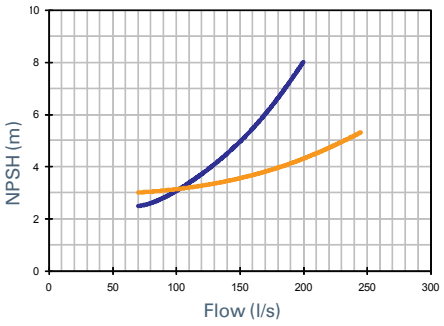
Years of actual wear data on the popular Warman® AH® pump design has enabled our design engineers to use a novel integrated design approach, comparing this "real world" data with our Computational Fluid Dynamics (CFD) simulation to obtain the correlation between predicted and actual results for the standard five vane slurry impellers.

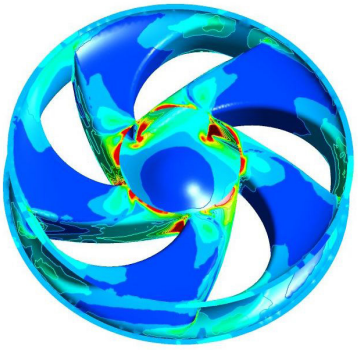
CFD Software Simulation

CFD software used to predict hydraulic performance was employed to simulate wear hot spots and develop the new WRT® impeller and throatbush combination.

The data has resulted in the introduction of Warman® WRT® impeller and throatbush design. The new impeller design incorporates a unique vanelet on the back shroud which streamlines the flow through the impeller outlet. This new combination provides significant improved wear life, with rigorous field testing showing increases in wear life of up to 50% on the previous design. This improvement over the previous design also gives higher efficiency and therefore lower absorbed power and improvements in the net positive suction head (NPSH) performance.

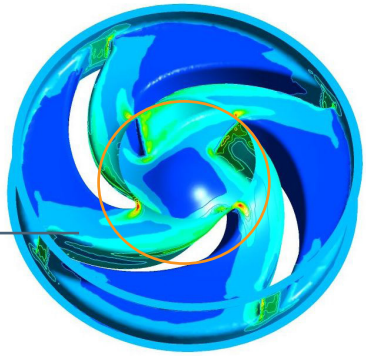
Warman® AH® 8/6 pump NPSH test comparison- standard vs WRT® impeller



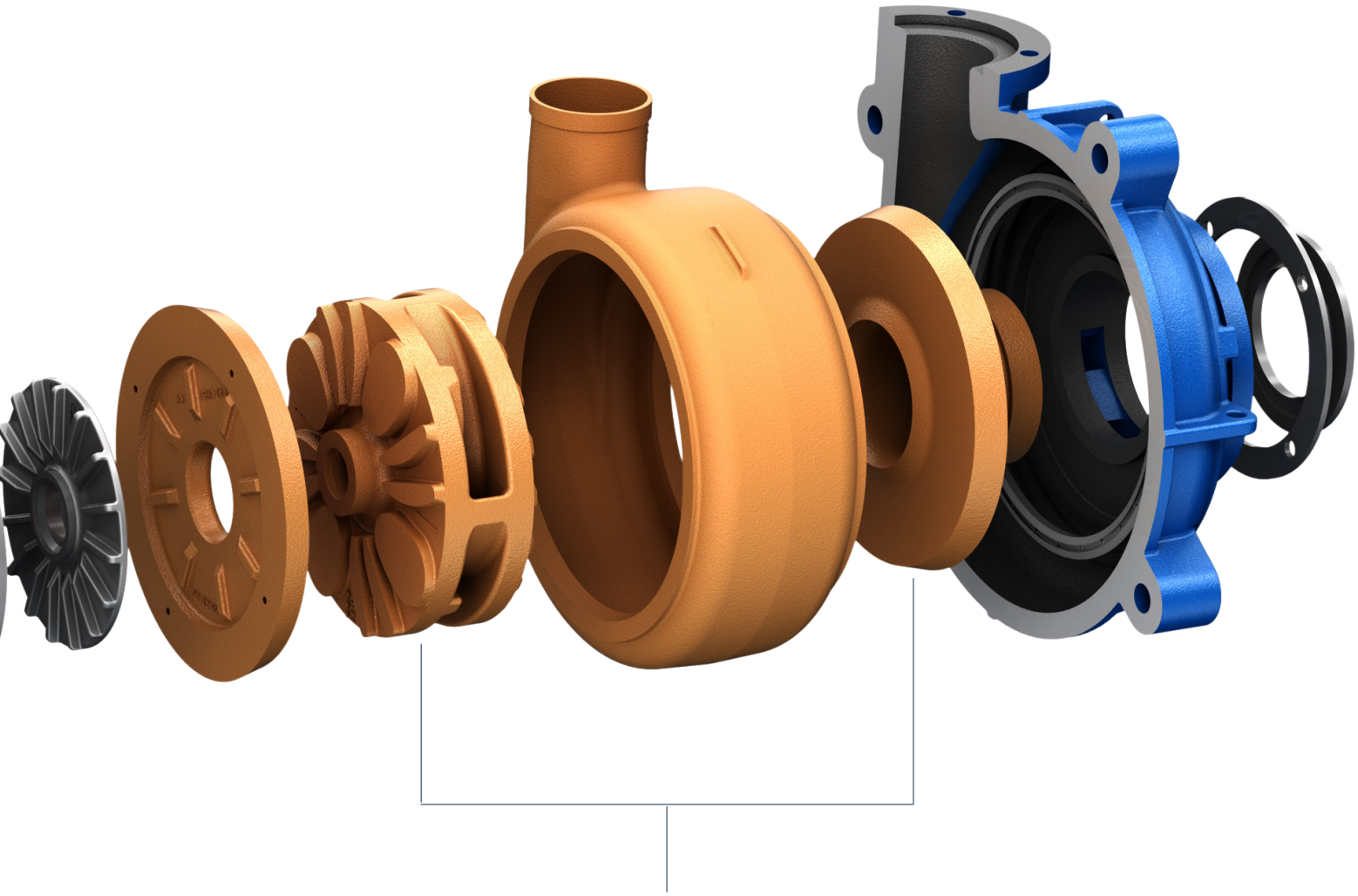


Warman® 5 vane design

Noticeable hot spot reduction with WRT® design



WRT® design



The WRT® impeller and throatbush combination with improved hydraulic profiles, reduced turbulence, extended wear performance and lowered power consumption.

Warman® WRT® advanced technology

- Increased wear life – the WRT® impeller and throatbush combination is designed to increase wear life between 30% and 50%*
- Power savings – lower pump power consumption*
- Cost reduction – higher pump efficiency sustained over a longer pumping operation time*
- Retrofit – new design parts retrofit to your current Warman® AH® pump
- Lower NPSH requirements – results in enhanced hydraulic performance and extended wear life*
- Material combinations – rubber or metal part combinations available

*Compared to the standard Warman® AH® pump impeller and throatbush combination

New four vane impeller and matching throatbush design improve wear performance, assisting our customers in reducing their total ownership cost*

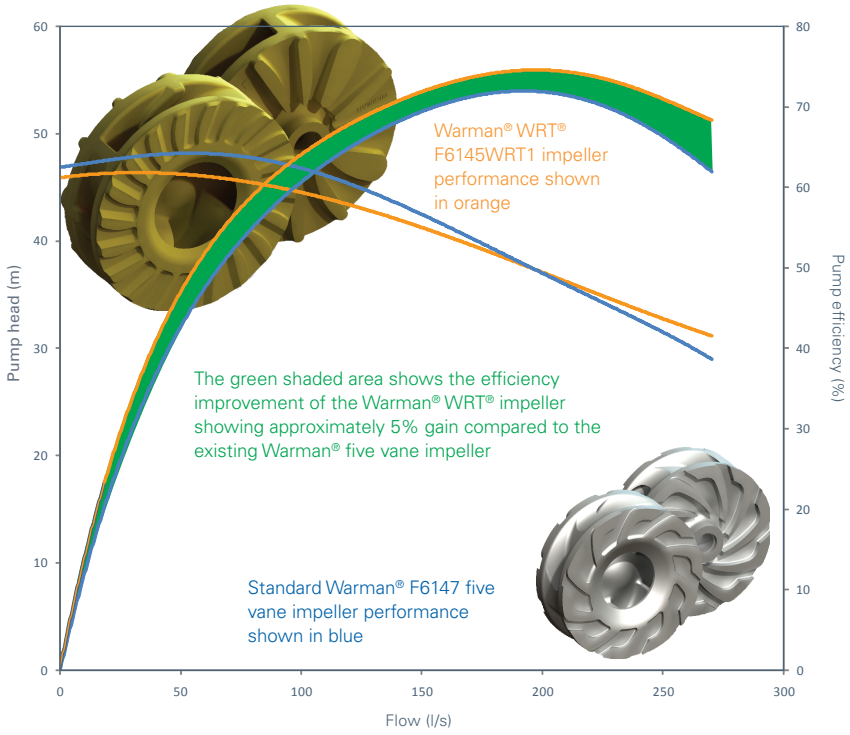
Impeller design

The five vane impellers in the Warman® AH® pump range were for many years considered to be the industry 'standard'. However, in order to improve upon one or more of the performance parameters, Weir Minerals started out by using a range of four vane impellers developed for the Warman® pumps.

The latest WRT® impeller designs maintain the four vane's advantages, but improved on all of the performance parameters - efficiency, wear and cavitation performance by improving the fluid guidance through the impeller with streamlined main pumping vanes, streamlined inlet as well as vanelets at the impeller outlet.

Due to these improvements in performance, the WRT® impellers represent a step change improvement compared to the older style five vane impeller design.

Impeller performance test data



*Compared to the standard Warman® AH® pump impeller and throatbush combination

Case Study

Location:
New Zealand gold mine

Duty:
Mill Discharge

Standard Impeller F6147-A05

After 1300 hours

WRT® Impeller F6145WRT1-A05

After 2000 hours

The range of WRT® parts is interchangeable and retrofitable into all current AH® pumps.

Interchangeability and performance

Parts are retrofitable in the Warman® AH® range of pumps. This is provided that the mating parts are genuine Warman® original equipment as manufactured and supplied to customers from our manufacturing centres across the world. To ensure that the true benefit of the WRT® parts are realised, all parts that are associated and interact with this retrofit, must meet the latest Weir Minerals material specifications.

New part numbers

New impellers and throatbushes are characterised by a "WRT1" suffix after the basic Warman® part number.

What requires replacement

To take advantage of the WRT® technology, two parts require replacement. These are the Warman® impeller and throatbush (smaller sizes 3/2 and 4/3 require replacement of the metal volute because it contains the throatbush). Standard part numbers are designated by 145 and 083.

During a normal maintenance shutdown, the two standard parts will be removed and the Warman® WRT® parts installed. All setups, fitment and general maintenance remain as is. No speed change will be required, nor are any specialised tools for fitment.

Your nearest Weir Minerals Service Centre or support office is able to provide you with all the technical data relating to these impellers retrofit kits, as well as the full set of clear water performance curves.

WRT® impeller and throatbush combination can also replace specialty impellers currently used in Warman® AH® pumps

WRT® impeller replacement for standard Warman® five vane closed impellers

WRT® impeller part no.	Standard Warman® impeller part no.
D3145WRT1A05	D3147A05
E4145WRT1A05	E4147A05
E4145WRT1BFA05	E4147BFA05
FAM10145WRT1A05	FAM10147A05
FAM8145WRTBFA05	FAM8147BFA05
FAM8145WRT1A05	FAM8147A05
F6145WRT1A05	F6147A05
F6145WRT1BFA05	F6147BFA05
G10145WRT1A05	G10147A05
G12145WRT1A05	G12147A05
G8145WRT1A05	G8147A05

Review performance requirements for applicability or contact your local Weir Minerals representative.

Warman® WRT® impeller and throatbush combination field trial comparison

Background

Operational wear life of the customer's Warman® AH® pumps in magnetic separator tailings service was falling short of the desired maintenance cycle. The existing pumps were upgraded with the Warman® WRT® impeller and throatbush combination to improve wear life to match planned maintenance intervals.

Duty information

Flow (m^3/h)	436
TH (m)	44
Slurry (SG)	1.23
Solid (SG)	5.2
Percent solids (Cw)	25-40
Solids d50 (mm)	0.3
Max particle size (mm)	6.0

Pump information

Model	AH® 8/6 F pump
Pump speed	983 rpm
Absorbed power	96 kW
Motor power	150 kW

Field trial operational results

- The trial resulted in improved wear life to match planned shutdown intervals
- Wear life extended by 948 hours on average using the WRT® impeller and throatbush combination
- Further improvements in WRT® impeller and throatbush combination can be achieved with monitored throatbush adjustment. During the trial no adjustments were carried out
- WRT® impeller and throatbush combination design yielded a 44% higher wear life in this field trial

Financial results

The WRT® impeller and throatbush combination trial resulted in savings on wear components and downtime — savings realised by allowing the customer to purchase fewer components annually and better match their efforts to regularly scheduled maintenance intervals.

Summary

The Warman® AH® pump fitted with the WRT® impeller and throatbush combination demonstrated improved wear life in this customer's tailings service as compared to a pump fitted with standard AH® impeller and throatbush components.

Average wear life (hrs)

Standard Warman® throatbush	2,145
WRT® throatbush	3,093
Standard Warman® impeller	2,145
WRT® impeller	3,093

The top two photographs illustrate the difference in wear rate of the impeller vanes. The photographs on the left show the WRT® impeller exhibiting minimal wear when extracted for inspection at 2,088 hours when compared to the photographs on the right, showing the standard AH® impeller with no more allowable life at 2,145 hours. The WRT® impeller was returned to service for an additional 1,005 hours before being replaced.

F6145WRT1A05 Impeller
2,088 hours inspection

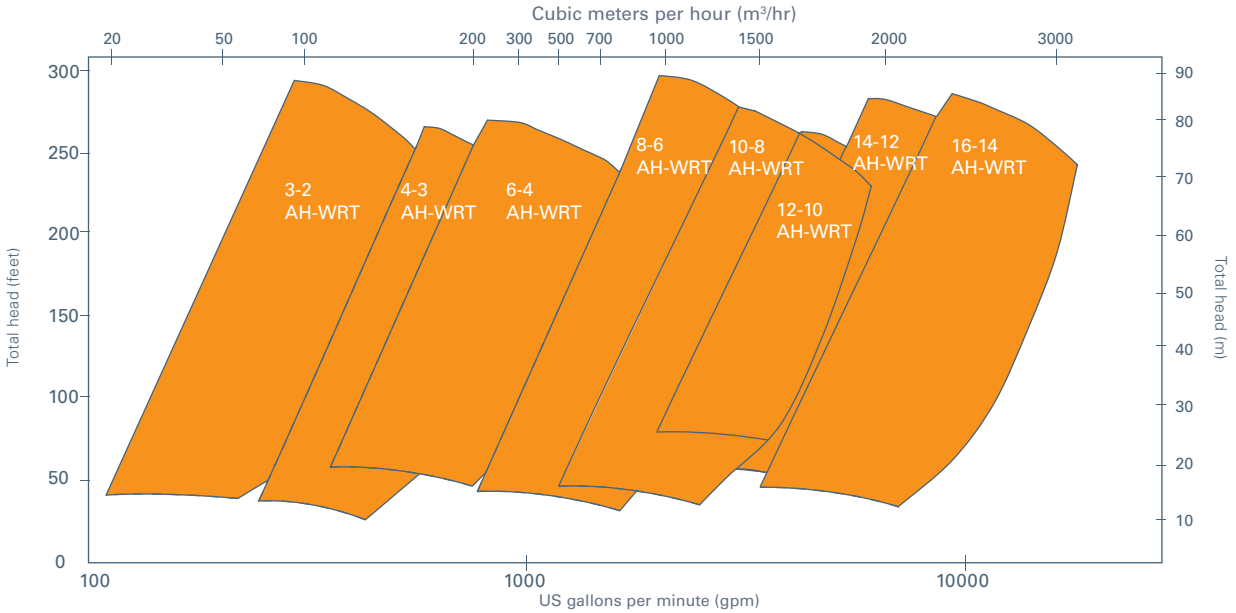
F6147A05 Impeller (standard)
2,145 hours inspection

F6145WRT1A05 Impeller
2,088 hours inspection

F6147A05 Impeller (standard)
2,145 hours inspection

Warman® WRT® slurry pump - quick selection guide

Approximate clear water performance - to be used for preliminary selection only.



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www.minerals.weir
warman@mail.weir