

EXPERTISE IN MATERIALS FOR WEAR RESISTANT PUMPS

POLYMERCARBID
PE 1000R



RHEINHÜTTE PUMPEN

As a pump manufacturer in demand on an international level, RHEINHÜTTE Pumpen is the expert for challenging pumping tasks.

Experience in the design of pumps for conveying abrasive, corrosive and toxic media and materials expertise when it comes to metals, plastics and ceramics ensure that chemical centrifugal pumps are a reliable component on an international level in many major plants in the process industry, metallurgy and environmental engineering.

Even media which encourage wear can be conveyed efficiently through the combination of innovative materials and proven pump designs.

CASE STUDY VESUVIUS, Borken, Germany

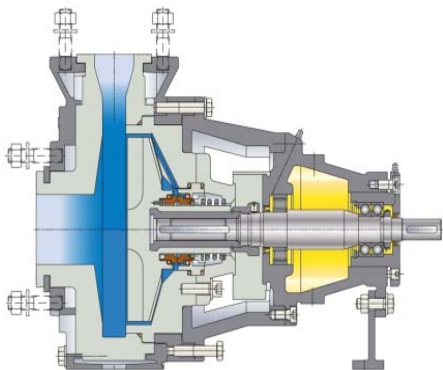
Challenge: Efficient pump operation for conveying extremely abrasive media with a high solid material content

Solution: RHEINHÜTTE Pumpen develops wear-resistant pumps made of PE 1000R and Polymercarbide

Result: Significantly longer service lives and, as a result, a reduction in operating costs

WEAR RESISTANT PUMPS FOR VESUVIUS

Close cooperation between Nomig GmbH and RHEINHÜTTE Pumpen GmbH led to the development of a wear pump made of solid Polymercarbid on the basis of the RHEINHÜTTE CPRF and RCFKu free flow series. The connection dimensions of these series correspond to EN 22858/ ISO 2858 and therefore permit easy replacement of existing standardised chemical pumps with wear problems. When compared to simple coatings or thin-walled plastic inserts, solid volute casings provide a considerably greater material reserve against wear.



INNOVATIVE MATERIALS FOR SOLID SUSPENSIONS

A trial run with extremely abrasive media confirmed the suitability of Polymercarbid and PE 1000R (a special polyethylene) for use in even the most difficult applications. Both materials were tested in 2016 at Vesuvius, a company in Borken/

Germany with extremely impressive results. Vesuvius is the global market leader in the production of foundry accessories and, for example, manufactures riser and filter systems for metal foundries under the brand name Foseco. Two type CPRF free flow pumps of the same size, but different material versions, were tested at two different Vesuvius GmbH locations.

Location 1

At the first location, the centrifugal pump conveys a solid suspension into a tank at a higher level. Moulds are then configured there. This procedure takes about two minutes and occurs every ten minutes. The result is 5 switching cycles an hour and 40 cycles per shift. The mineral suspension components are extremely abrasive. Other components, in particular cellulose fibres, can lead to troublesome deposits on the seal.

all hydraulic parts inspected. Only minor effects of wear were determined on the hydraulic parts in this inspection. In addition, the use of a suitable mechanical seal achieved a sustained reduction in product leaks.

A future minimum pump service life of approx. 18-24 months can be assumed, thus almost doubling the service life achieved with the metallic pump previously used. A very good success rate for the use in this difficult application.



CPRF impeller made of PE 1000R after 7 months

RHEINHÜTTE Pumpen closes the gap between plastic and ceramics and provides wear-resistant pumps made of PE 1000R and Polymercarbid for a longer service life.

A CPRF free flow pump was installed at this position in January 2016 with components in contact with media made of PE 1000R material. A type Allpac S single-acting, stationary seal was used as a mechanical seal, this design being particularly suitable for media containing solids. After 7 months of trouble-free operation, the pump was opened and

Location 2

A similar suspension is pumped directly into special moulds here. In contrast to case 1, the suspension has a higher solids content and a significantly higher viscosity. Moreover, the switching cycles are considerably more frequent. The machine switches on every two minutes for about 25 to 60 seconds, depending on the

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moulding. This means that more than 150 switching cycles can occur in an 8-hour shift. During this time, the pump fills the moulds directly, whereby the counter-pressure increases continuously until it reaches the maximum pumping pressure of the pump. The medium only circulates within the volute casing at this time with all the solids, causing an increase in the wear attack.

Exponentially large wear is especially encountered when operating a centrifugal pump in the partial load or overload ranges with unsuitable materials and media containing solids, a remarkable challenge for the pump.

The metal pump which had been used previously only withstood this challenge for about 6 months before the worn impeller had to be replaced. The volute casing often only achieved a service life of one year.

The second CPRF free flow pump was used at this position in May 2016. All parts in contact with the medium are made of the highly wear-resistant Polymercarbide. This machine is also equipped with a single-acting, stationary mechanical seal. The pump was dismantled after four months of operation in September 2016 and examined together with the custo-



CPRF Impeller made of Polymercarbide after 4 months

mer. Only slight mechanical erosion of the resin coating was seen on the surface. Parts in contact with the medium made of Polymercarbide have achieved the normal service life of the machine without significant wear.

Due to the large material reserves of the CPRF pump series, an initial estimate is that a service life of at least 24 months may be assumed (i.e. twofold the previous service life). Through the use of RHEINHÜTTE free flow CPRF and RCFKu pumps with the Polymercarbide material, repair costs for this position can be significantly reduced.

PE 1000R AND POLYMERCARBID - TWO STABLE PARTNERS

The special polyethylene **PE 1000R** offers up to 30% higher resistance than conventional PE 1000, due to a wear-reducing additive. Use of PE 1000R means a significant improvement in service life and, consequently, maintenance and repair intervals in wear applications. PE 1000R is available for all PE 1000 pump types from RHEINHÜTTE Pumpen GmbH.

The new multi-component material **Polymercarbide** is significantly more resistant to wear. Developed by Nomig GmbH in Reken/Germany, it has been used successfully under the designation of polymeric cast for many years for coating metallic pipelines and scrubber pumps.

The secret of this material lies in the combination of an extremely hard silicon carbide as a wear layer with a vinyl ester resin as a binder. The hardened material reaches a Mohs hardness of 9.7, thus almost achieving the hardness level of diamond.

WEAR RESISTANT PUMPS FOR THE MOST DIFFICULT APPLICATIONS

Corrosion resistance and wear resistance – two material properties which are increasingly required in modern applications for centrifugal pumps, but which cannot always be optimally combined. Metallic materials can be adapted very flexibly in terms of corrosion or wear resistance by means of tempering and alloying adjustments. However, options for the combination of both are often limited. Plastics have a very high resistance to inorganic acids and alkalis, but in general exhibit only low wear resistance. Due to their complex production, extremely corrosion and wear-resistant ceramic pumps made of FRIALIT-F99.7® are only economical usable for very special applications.

RHEINHÜTTE Pumpen closes this gap between plastic and ceramics with two outstanding materials. The exceptional resistance of these materials enables the achievement of a longer service life and makes the operation of centrifugal pumps more effective in abrasive media. A trial run in a difficult application confirms the suitability of the materials under even the extremely demanding conditions.

***O* Aliaxis**
UTILITIES & INDUSTRY

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