ABS
COST-EFFECTIVE PUMPING

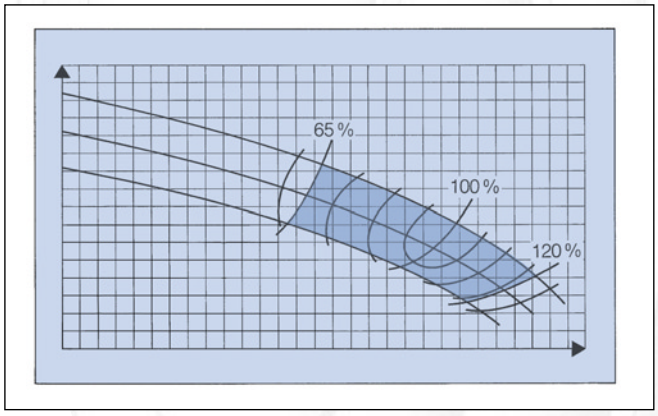
ABS Fan Pumps

Series NB, BA and Z22

- Widest range on the market
- For all sizes of paper machines
- Low pressure pulsation guarantee
- Craftmanship in every detail resulting in high paper quality

The Perfect Fan Pumps

The development of our low pulsation fan pumps started in the 1950's and pulsation measurements on double-suction pumps were commenced in 1962. More than 500 tests have been carried out using different pump geometry variables. In addition, field trials have been undertaken in collaboration with leading paper machine manufacturers. As a result, the first fan pumps with guaranteed pressure pulsation values were delivered.



Preferred operation area for fan pumps is 65% to 120% of best efficiency flow.

Z22-pumps are of the split casing and double suction impeller type. The perfect fan pumps for large paper machines.

From 1972, similar tests were made on end-suction pumps, and many such fan pumps have been supplied, using the patended ESDF™ – End Suction Double Flow – impeller.

Individual Selection for Each Application

The pump specification must be made uniquely for each paper machine to achieve optimum production conditions. To minimize pressure pulsations, the fan pump should ideally be run at its point of best efficiency. In practise, the flow should be limited to the capacity area between 65 and 120% of the best efficiency point. Outside this range, pulsations tend to increase.

Bearing this in mind, a wide range of pump sizes supplemented for most sizes with several different impellers is therefore important. Thanks to this possibility of selection, we can offer an excellent fan pump for each application.

Series Z22 for Large Capacities

The Z22-pumps, with split casings and double suction impellers, are the best selection for large flowrates. High efficiencies, low NPSH, steep curves and steady flows are features, which make the Z22-pumps a superior choice for fan pump duties.

Series NB and BA for Small and Medium Machines and Dilution Systems

The traditional concept of a fan pump has been a split casing and double suction impeller. The patended ABS ESDF™ – End Suction Double Flow – impeller in end-suction pumps has changed this situation.

Apart from the pulsation advantages of this type of impeller, these pumps have a short, straight inlet promoting high efficiency and low NPSH requirement. In addition, being part of the ABS Modular System™, the pumps offer the considerable advantage of simplified maintenance.

For small and medium machines, therefore, these pumps present the best choice for fan pump applications.

To enhance the paper quality even more, sometimes a dilution pump is asked for. Our BA and NB pumps suit these low flow applications excellent.

When used as Fan pumps, BA- and NB pumps feature the patended ESDF™ impellers.

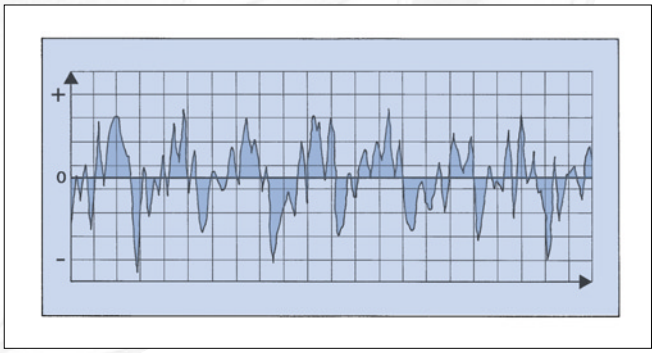
Low Pulsation Pumps from Design Excellence and Manufacturing Precision

Low pulsation amplitudes have been achieved by advanced design combined with high manufacturing precision.

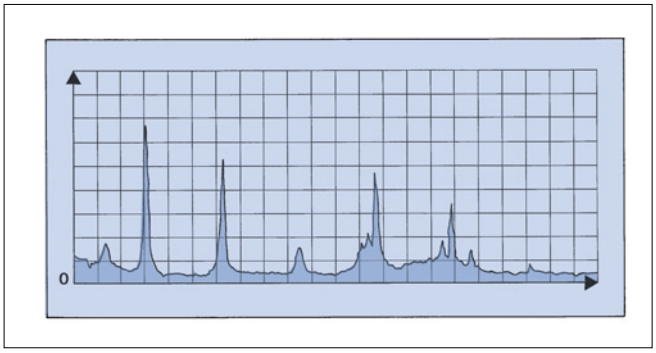
In a good quality standard pump there are a number of sources for pulsation, which cannot be accepted in a fan pump. Taken individually, any of these factors may contribute very little to the general pulsation level and characteristics of the pump, whereas a combination of several factors can easily result in pulsations exceeding tolerable limits.

It is therefore important that all details of the pump design and fabrication, that may generate pulsations, are either eliminated or kept under tight quality control.

Fan pumps with pressure pulsation guarantee are manufactured according to a special Quality Instruction.



Pulsation measurement of the headbox feed system.

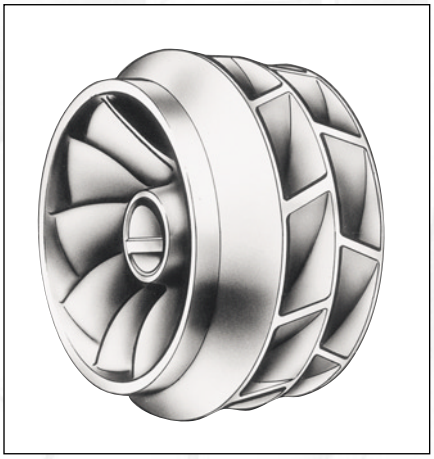


Spectral analysis of pulsations of the headbox feed system.

Design Features

Around the periphery of a centrifugal pump impeller, pressure differences always exist between the pressure and the suction side of the vanes, resulting in a non-uniform velocity distribution across the vane duct.

With a larger number of vanes, these differences will be reduced along with the resulting duct pulse apmplitude. In addition, the basic vane pulse frequency – number of vanes x shaft revolutions per second – will be higher. It will thereby be more easily dampened out in the system. Too many vanes, however, will have a negative effect on the efficiency and NPSH characteristics.



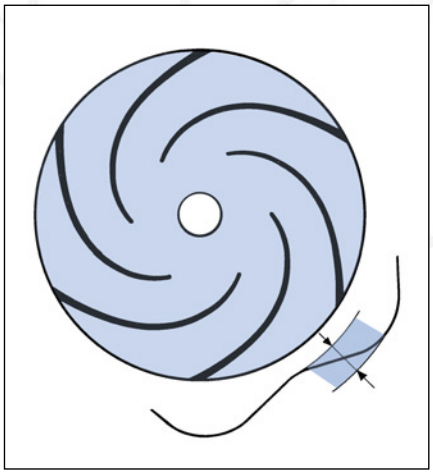
The fan pump impellers of Z22-pumps have staggered and skewed vanes to minimise pulsations.

The Double Suction Impeller

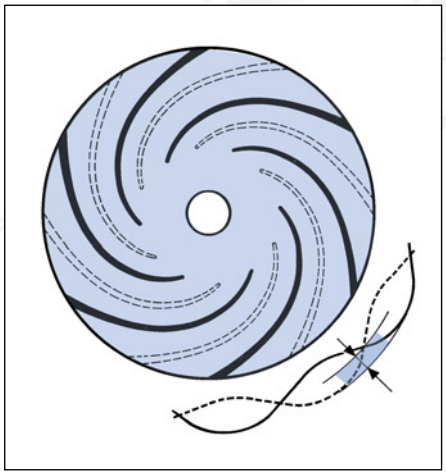
Fan pump impellers in the Z22-pumps have between eight and twelve vanes in each impeller half, the exact number depending on the impeller size. The vanes of one half is staggered in relation to those of the other, thus doubling the vane pulse frequency without affecting efficiency or NPSH.

Centrifugal pumps also produce vane pass pulses, which are generated every time a vane passes the volute cut-water. See figure on next page. The vane pass pulses are reduced by having a large distance between the impeller periphery and the cut-water.

In addition, all our fan pump impellers are made with skewed vane outlet edges, because this configuration also diminishes the vane pass pulse.



Pulse frequency for impeller without staggered vanes.



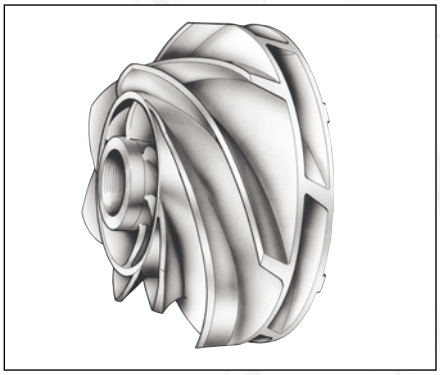
Staggered vanes double the pulse frequency and lower the pulse amplitude.

The ESDF™ Impeller

For a conventional end-suction impeller, duct pass amplitude will be larger than for a double suction impeller of corresponding size. This is because of the larger vane duct areas in an end-suction impeller.

However, the patended ABS ESDF™ – End Suction Double Flow – impeller has overcome this problem. In the same way as a double suction impeller is equivalent to two single suction impellers mounted back to back, the ESDF™ impeller can be regarded as two impellers – the inner a closed type and the outer semi-open – as shown in the figure to the right.

The intermediate wall between the two impellers, forming the shroud of the inner impeller and backplate of the outer, guides and even flow through the impeller. It also reduces the vane duct areas and therefore the duct pulse amplitude. The pulse frequency is doubled by staggered vanes, which are skewed at the outlet.

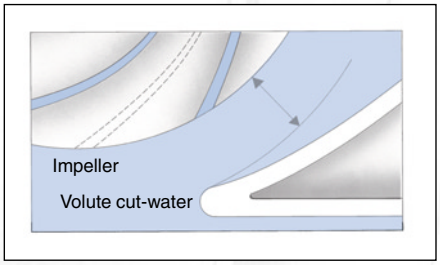


The ESDF™ impeller can be regarded as two impellers.

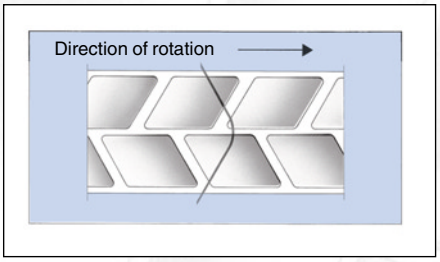
The Pump Casing

The casings of our fan pumps are designed for a large distance between volute cut-water and impeller, thus reducing the vane pass pulse. See figure to the right.

On the Z22-pumps, the cut-water is V-shaped to make the can passage less distinct at any instant and thereby further reducing the vane pulse.



To reduce the vane pass pulse, the distance between the cut-water and impeller is increased.



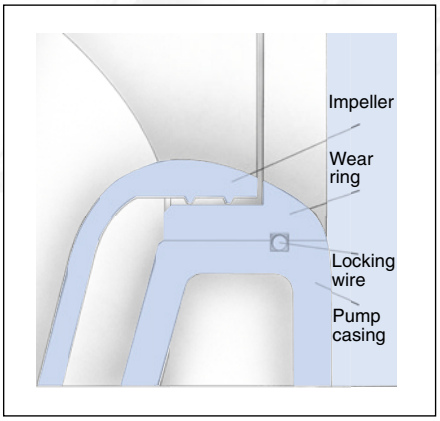
The vane pass pulse is reduced by V-shaped cut-water skewed vane edges.

The Wear Rings

Z22-pumps have replaceable wear rings, providing consistent pump efficiency. BA-pumps are equipped with a wear disc.

The inner diameter of the Z22 wear rings matches the impeller inlet diameter, which produces undisturbed flow conditions. The flow into a BA-pump is similarly arranged to be smooth and free from unnecessary disturbance.

On the Z22-pumps, the cylindrical clearance between impeller and wear ring is of a special design which reliability and effectiveness have beeen well proven. It has two or three close-contact surfaces between impeller and ring. Leakage is therefore limited, which ensures high efficiency and no fibres trapped in the clearance.



The special design of the impeller contact surface gives high efficiency and no trapping of fibres.

Precision Manufacturing

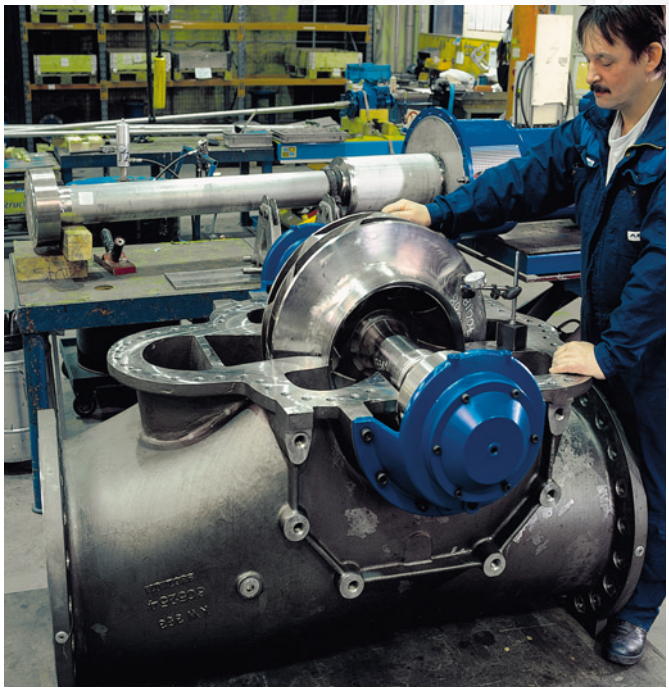
Manufacturing irregularities may generate pulsations at shaft speed frequency. They are usually of low frequency and therefore highly undesirable for paper machines. Long experience has taught us how to minimize such irregularities. Special emphasis is placed on the following items.

Dynamic Balance of Rotor

Unbalance of a high quality fan pump rotor should be less than 30% of what is permissible in a good quality pump located in other parts of a stock preparation or paper machine system. The impellers of our fan pumps are dynamically balanced to exacting specifications as stated in a special Quality Instruction.

Concentricity and Run-out

A high degree of impeller periphery concentricity is important, as well as concentricity of inlet and outlet vane edges. We employ manufacturing methods to guarantee very close concentricity and run-out tolerances. The result is checked on the complete rotor during pump assembly. When requested, records are filed for future comparative inspections.



Precision manufacturing is one important factor for minimizing pressure pulsations.

Uniformity of Vane Lengths and Ducts

The relative velocities out of all vane ducts of a fan pump impeller must be identical. To achieve this, the duct volumes must be identical. These volumes are carefully measured to ensure that variations are within very close tolerances.

Pressure Pulsation Guarantee

A pressure pulsation guarantee is of practical value only if it applies to the pump as installed in the headbox feed system. Consequently, our guarantee is given for data measured in the pump installation. The measurements are carried out under the conditions for which the pump was specified and with appropriate measuring points, methods and equipment.

Finish of Liquid Contact Surfaces

When it comes to surface quality, the fan pump must be compatible with other components of the paper machine feed system, such as headbox, screens and cleaners.

Depending on the requirements for particular applications, we offer various degrees of surface finish:

- ☐ Grinding and polishing of liquid contact surfaces to meet the demands for ”cotton ball test”: When moved over the polished surface, a cotton ball must not leave any fibres on the surface.

  Should extremely smooth surfaces be required, the liquid contact surfaces can be ground and polished to a specified R_a value.

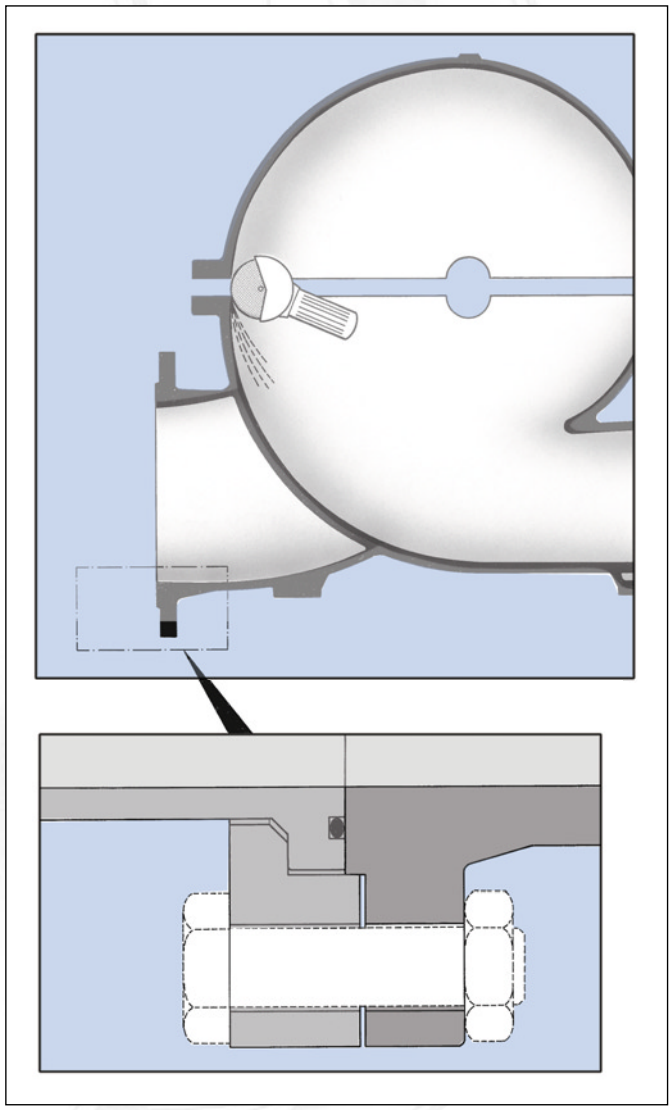
- ☐ Flush grinding of upper and lower pump casing halves.

- ☐ Contour grinding of vent plugs. Filling and grinding of core supports and other surface blemishes and indentations.

Pipe Connections

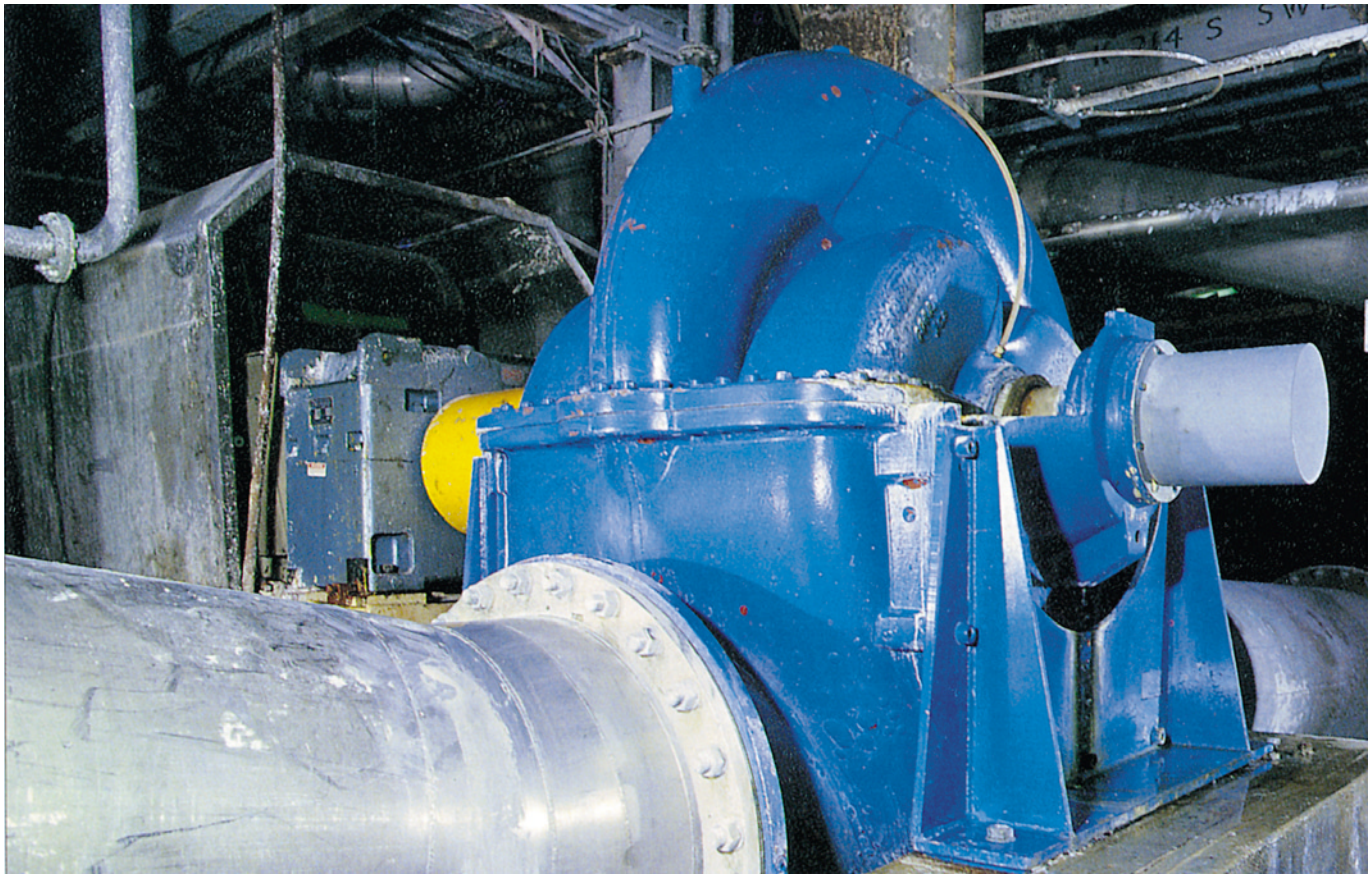
As an option to our standard flanges, the pumps can be supplied with machined inner cylindrical surfaces to connect to guided matching flanges. Connections will be metal to metal with O-ring seal.

As an alternative to the standard male to female flange joints, we can offer a flat face joint with a backup pipe flange. This design allows the pump casing to be removed without changing the position of the discharge and suction pipes.



When using flat force joints with o-rings the casing can be removed without disturbing the pipe positions.

Fan Pumps



Fan pumps must meet high demands for smooth flows with low pressure pulsations to make the paper perfect. This Z22 900/800-90 feeds a paper machine in the Kemsley Mill of New Thames Paper Co in the South of England. The capacity is 7400m³/h and the drive power 630 kW.

ABS reserves the right to alter specifications due to technical developments.

ABS
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