Phone +91-11- 514 3474, 513 3021 | Fax: +91-11-514 6900, 540 5799
e-mail: contact@acmealloys.com | http://www.acmealloys.com

Pump Parts
Right Impellers for Cost Effective and Reliable Operations

Pumps are negative turbo-machines as they consume energy (power) to perform work (pump fluids), unlike turbines, which generate energy and are positive turbo-machines. The geometry of the impellers is vital to the sustained performance of any type of pump or turbine. The pump parts such as casings, impellers, sleeves, shafts, suction heads, reducers etc. should be made of heat, wear, abrasion or corrosion resistant alloys to withstand the duty requirements in a specific operating media and environment.

For reliable functioning and energy saving operation of plant or a pumping operation, the correct selection of pump impeller and corresponding compatible pump casing geometry is vital. However, equally paramount is selecting the best suited; wear, abrasion, heat, pressure or corrosion resistant-alloy for the manufacturing different pump parts.

Impeller Forms

Since no one type of impeller is equally suitable for all applications there are a range of **free-flow**, **single-vane** and **multi-channel impellers** as well as **axial propellers** and ***mixed flow impellers*** to make a choice. The form of an impeller is prominently dictated by the specific speed of the pump. A variety of different arrangements of blades can be produced within a particular form, a main classification being whether the impeller is ***shrouded*** **(closed)** or **un-shrouded (open**). **Closed impellers** are common to centrifugal pumps (and some mixed-flow pumps), with shrouds rigidly attached on both sides to enclose the liquid passage. However, for the handling fibrous materials in suspension in the liquid, the impeller may be **semi-open** (i.e. with a shroud on only one side) or **fully open**, or a **skeleton impeller** rotating between stationary discs. The use of *semi-open or open impellers* in conjunction with modifications of blade profiles can make the centrifugal pump suitable for handling contaminated rather than clean fluids.

Impeller design may further be modified by the method which the liquid enters the impeller. Changing the number of blades, or the form/profile of blades, will affect the performance characteristics. Increasing the number of blades will tend to flatten the head (H)-discharge (Q) curve or vice-versa. For a given number of blades, increasing the curvature of the blades will tend to further steeper the H-Q curve, and vice-versa. Decreasing the width of an impeller will also tend to steeper the H-Q curve, and increasing the width, to flatten it.

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These effects are general characteristics only and will be partly modified by changes in specific speed, which may result. They indicate that with the considerable variation possible in the blade profile and number, the resulting H-Q characteristics are essentially individual to that particular design of pump.

Example: For Handling of

Sewage and Water Plant	Industrial, Process, Effluent Treatment & Power Station Plant
- Untreated sewage containing solids and long-fibrous admixtures - Unscreened mixed water - Screened mixed water - Pre-screened sewage - Mechanically (biologically) treated sewage - Raw and digested sludge - Activated sludge - Unscreened rain water - Screened rain water - Unscreened surface, rain and river water - Screened surface, rain and river water - Untreated, pure and potable water	- Untreated sewage containing solids and long-fibrous admixtures - Effluent, chemically aggressive - Effluent, abrasive - Industrial sludge's - Unscreened surface and rain water - Screened surface and rain water - Cooling and process water - Pure and potable water - Heating water or hot water up to 90°C

a particular type of impeller is scientifically proven to be best suited for a specific application, to effect efficient, economical and reliable performance.

Impeller	Fields of application
Free-Flow Impeller	For liquids with coarse solids and long fibrous admixtures as well as gas and air pockets. - Untreated sewage - Raw and digested sludge
Single-Vane Impeller	Liquids containing solid and long fibrous admixtures - Untreated sewage - Raw sludge - Circulating and heating sludge
Closed Non-Clogging Impeller	For contaminated, non-gassing, sludgy liquids containing solids - Trickling filters - Activated sludge - Surplus sludge
Cutter	For faecal matter, domestic sewage and effluents containing fibrous admixtures
Open Multi-Vane Impeller or **O-Impeller**	For slightly contaminated water containing solids with a grain size of maximum 7 mm, however with cut long fibrous or stringy admixtures
Axial Propeller	For slightly contaminated liquids containing solids not tending to entwine - Rain water - Mechanically screened sewage - Activated sludge
Closed Mixed Flow Impeller	For slightly contaminated liquids containing admixtures not tending to entwine - Rain water - Mechanically screened sewage - Activated sludge
Open Mixed Flow Impeller	For slightly contaminated liquids containing admixtures not tending to entwine - Rain water - Mechanically screened sewage - Activated sludge

For more information on development of pumps and pump parts, please feel free to contact Vishal Kumar at **vishal@acmealloys.com**