Indian J.Sci.Res. 20(2): 238-250, 2018
ISSN: 0976-2876 (Print)
ISSN: 2250-0138(Online)

STUDY OF CENTRIFUGAL PUMPS USED TO HANDLE TWO PHASE MIXTURE IN VARIOUS INDUSTRIAL APPLICATIONS

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ABSTRACT

The Study of the centrifugal pump has been done to characterize the working guideline of taking care of two stage or three stage blend operation. The two-stage stream is a stream in which two distinctive total conditions of a substance or of two unique substances are all the while display. The two-stage mix incorporates strong/fluid, and three stage blend incorporates strong/fluid/gas. The ability of a divergent pump to pass on a two stage or three stage blend relies upon whether gas and fluid structures a homogenous blend or what degree two-stage independent. Modern offices utilize strong taking care of pumps to dispose of slime, rough slurries, sewage, and other mechanical waste coming about because of an assembling procedure. The pumps are ordinarily intended to deal with squander containing a high level of suspended and non-suspended solids and can be utilized as a part of an assortment of wastewater applications. For pumping two stage blends application revisions of the attributes are vital. Molecule following is one of the applications in the two-stage stream. This paper tells how radiating pump functions with these conditions in different mechanical applications. It additionally manages the market examination which tells which sorts of pumps are regularly utilized as a part of wastewater treatment, synthetic treatment, and dairy businesses and which industry utilize which sort pump and the opposition in ventures.

KEYWORDS:

These days, the outward pumps turned out to be extremely prevalent due to late improvement of rapid electric engines, steam turbines etc. Centrifugal pumps can be single-organize or might be multistage pumps. It relies on the quantity of impellers utilized as a part of the pump. Single stage direct comprises of just a single impeller while in multistage pumps the impellers are mounted in the arrangement in pumps. The multiphase divergent pump working depends on the kind of impeller. The determination of impeller is the most imperative process. The principal distinction between a radiating sewage pump impeller and those of its unmistakable water cousins is its capacity to pass strong material that would typically obstruct the last mentioned. Despite the fact that the arithmetic that characterizes the operation of an impeller can be mind-boggling (it is the stuff of Bernoulli and Euler), its motivation is straightforward. An impeller is intended to bestow vitality to a liquid with the goal that it will stream or, in the event that it is as of now streaming, experience some expansion in its height or weight. It fulfills this by expanding the liquid's speed as it goes through its vanes from the their driving edges, situated at the eye to their ways out at the outskirts. The consistently expanding sweep of the vanes brings about an expanding rotational speed that achieves some greatest at the fringe. The subsequent straight speed of the liquid, at the vane exit, is then changed over to weight in the volute. Albeit many elements add to an impeller's capacity to pass solids without stopping up, one of the more imperative is its throughlet measure. The throughlet is characterized as the open inside section through the impeller that, eventually, decides the biggest breadth strong that can be passed. All impellers paying little heed to their plan have some most extreme throughlet estimate. The different individuals from the spiral stream impeller family incorporate the shut, open, and semiopen outlines. Contingent on limit, each outline may fuse from one to four vanes. The vanes are not straight, but rather portray a smooth bend that starts at the impeller's eye and reaches out to its outskirts. Various attributes of the slurry and of the framework must be known to have the capacity to choose a slurry pump correctly. When choosing a slurry pump, it is important to know certain parameters. So this paper depicts process and choice of multiphase diffusive pumps and how it is utilized as a part of enterprises for different applications. It likewise tells what are the progressions required in the pump to make the procedure more effective under agreeable cost.

LITERATURE REVIEW

Though extensive research work has been reported in the field of Two-phase flow only few researchers talked about components and selection. This paper explains about the selection of centrifugal pump for handling slurries and

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the factors to be considered for selecting a slurry pump. Informations about problems faced by industry because of a slurry pump and why it is caused is discussed. After reading this paper we will be able to select the slurry pump with the required condition and can analyze when the pump gets a failure. On the off chance that we take a gander at the case study for the slurry pump they told about the failure of a pump and replacement of that pump. They didn't give the data about the explanation behind the failure and difference between the failed pump and replaced pump in a proper way. This paper begins with a case study and will explain to the motivation behind why the procedure came into the contextual investigation and from that point we begin breaking down parts and factors to be considered while choosing the pump for taking care of slurry.

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Review of Past Articles and Conference Papers

Case Study

The BJM pumps [1] in their case study told that replacement of the self priming centrifugal pump with submersible agitator pump is due to the reduced life time. The reason for getting better life time with new submersible agitator pump. In an another case study Jeff Pratt [2], article on food packager solves processing issues with new shredder pumps which is about problem due to shallow pump and replacing it with shredder pumps in food packaging industry. Apart from the article this paper will explain why the old pump got failed inside limited capacity to focus life time and the difference between failed pump and replaced pump.

Pump Impeller and Casing

The basic consideration for selecting an impeller is the type of slurry, slurry particle size and according to that have to select the type of impeller. Metso handbook [3] deals about types of impellers and compare the basic impellers like open, closed, semi-open and vortex impellers which are required for handling slurries. This will provide an clear idea about how to select impeller for the particular slurry. After this, the paper deals with vane design and types of vanes forward curved vane, radial vane, backward curved vane. This will provide details about selecting the vane type and no of vanes. Function of the casing is to get the stream originating from the whole periphery of the impeller, changing over it into an alluring stream design and guiding it to the pump outlet. Another critical capacity is to diminish the stream speed and change over its dynamic vitality to weight vitality.

Wear Protection

Wear occurs under three condition. The three conditions are abrasion, erosion, and corrosion. Abrasion occurs by crushing, grinding and low stress. Abrasion rate is reliant on molecule size and hardness. In slurry pumps, we have for the most part pounding and low-push scraped spot. Disintegration is the overwhelming wear in slurry pumps. The reason is that particles in the slurry hit the material surface at different focuses. There are three major types of erosion. They are sliding bed, low angular impact and high angular impact. Kaushal K. et. al., article on Erosion Wear Investigation of HVOF Sprayed WC-10Co4Cr Coating on Slurry Pipeline Materials deals about the impact of rotational Speed/Velocity all things considered disintegration wear. This will help us to understand how material speed, weight, time duration and weighted mean diameter changes when erosion wear occurs. Consumption of the wet parts in a Slurry Pump which is a mind boggling marvel both for metal and elastomer material is clarified at the end.

Specific and Suction Specific Speed

Specific Speed is a dimensionless number which is utilized to relate the water powered execution of a pump to the shape and physical properties of its impeller. This will also describe how impeller shape changes with specific speed. Allan R. Budris[5] in his article about specific speed and suction specific speed explained how impellers classified according to specific speed and their ranges which helps me to carry this topic in more efficient way. Radial flow impeller has a specific speed below 4200. Mixed flow impeller have a particular speed in the vicinity of 4200 and 9000. Axial flow impeller has particular speed over 9000. Suction specific speed which is a run down number which demonstrates the suction characteristics of the pump. Through broad industry experience and research, it has been resolved that the ideal suction conditions exist at the particular speed below 8500. Upper rotational speed can be calculated at both specific speed and suction specific speed by rearranging the equation. Stable operating window under which suction specific speed is selected.

Bearings

The pump heading bolster the pressure driven burdens forced on the impeller, the mass of impeller and shaft, and the heaps because of the pole coupling or belt drive. Pump orientation keep the pole hub end development and horizontal redirection inside satisfactory breaking points for the impeller and shaft seal.

The powers on the impeller are streamlined into two segments: radial load and axial load. The water driven outspread load is because of the unequal speed of the liquid coursing through the packaging. The unequal liquid speed brings about a non-uniform dispersion of weight following up on the circuit of the impeller. Radial loads are controlled by single volute, twofold volute, volute diffuser, round volute. Pivotal water driven push is the summation of uneven impeller powers acting in the hub course. Vasant Godbole, Rajashri Patil, S.S. Gavade [6] on 15th International Conference on Experimental Mechanic PAPER REF: 2977 on AXIAL THRUST IN CENTRIFUGAL PUMPS - EXPERIMENTAL deals with the methods to control axial thrust in bearings and it will help us to increase the life time of bearings. Hub Thrust in a diffusive pump emerges because of symmetry. The clearances between packaging spread and impeller cover, packaging and impeller front cover are loaded with fluid at conveyance pressure. There are numerous techniques to control hub stack here we will see about draw out vanes and adjust openings. Under bearing area, this paper will cover all these processes in detail.

Material Selection

In the event that we didn't choose the right kind of material the pump won't deal with the grating and destructive slurry under any condition and will cause erosion, wear and will impact distinctive parts of the pump. An article posted by slurry pumps on Libra pumps website [7] about material selection. In that article they told that essential information required to make a choice of the sort of material is:

a. the particle measuring of the solids to be pumped

b. the shape and hardness of these solids.

c. the ruinous properties of the "liquid" fragment of the slurry to be pumped.

The material determination for the pump liners and impellers is produced using two essential sorts of materials:

a. elastomers

b. wear/erosion resistant cast alloys.

This material selection part will discuss elastomers and wear/erosion resistant cast alloys in detail.

Pump Curves

The performance of a slurry pump is normally illustrated by the use of clear water performance curves. An article about slurry pump basic by Marcos Romero [8] tells clearly about the basic curve for performance which is the Head / Capacity (HQ) curve, showing the relation between the discharge head of the slurry and the capacity (volume flow) at constant impeller speed. The article deals with the affinity laws for fixed impeller and fixed diameter. This affinity law will be accurate until 10 percent of the impeller trimming.

Calculation of Slurry

With the help of an article about Centrifugal Pump Fundamental posted by Jide Zubair[9] we can be ready to unravel and find how slurry shows variation on duty points like discharge and head. This is the final part. It will explain how to calculate power, head, flow and efficiency of the slurry when it comes into contact with liquid. It is done by step by step using the graph and finally we got B.H.P value higher for slurry. The pump require more power when slurry acts. So these are all the process covered in this paper in a brief way. I have experienced through many research and journal papers they have told about generally about the slurry pump and its process. In case studies also they just explained about exchanging slurry pump with the failed pump but the information about why the pump gets failed before and the difference between old pump and exchanged pump is not provided and this paper explained those missing information. The ultimate aim of this paper is to provide a good knowledge and idea about how slurry pump differs from the other normal centrifugal pump and how to select the right pump with the required conditions.

CASE STUDY OF CENTRIFUGAL PUMPS

Sand Fine Reclamation Becomes Cost Effective with Submersible Agitator Pumps

The sand and rock wash plant at first took a stab at utilizing a 2-inch self-preparing diffusive pump from an outstanding producer, yet because of the high abrasiveness of the procedure slurry, the 2-inch self-preparing outward pump flopped after just 245 hours of operation.

Replacing Self Priming Centrifugal Pump with Submersible Agitator Pump

While rough applications wreck pumps after some time, the normal run-time of the Submersible instigator Pump in this particular slurry application is essentially superior to anything the run time of the self-preparing outward pumps. The Submersible fomenter Pump dependably pumped the sand slurry for 800 hours (around 4 months) before being pulled and modified. IESS got input from the sand and rock wash plant that the pump-related cost of sand fine recuperation is presently $1.06 every hour of operation when contrasted with the $11.43 every hour cost when utilizing the self-preparing outward pumps. The new procedure and submersible instigator pump have influenced the plant's sand to fine recovery process all the more financially beneficial.

Figure 3.1 Egger Submersible agitator pump

Figure 3.2 Sand reclamation process

PUMP IMPELLER AND CASING – THE KEY COMPONENTS OF ALL SLURRY PUMPS

1. The draw execution of all slurry pumps is administered by the impeller and packaging plan.

2. Other mechanical segments serve to seal, bolster and secure this pressure driven arrangement of impeller and packaging.

Types of Impellers

According to construction

Figure 4.1 Egger EO open impeller

Figure 4.2 Semi open impeller

According to suction configuration

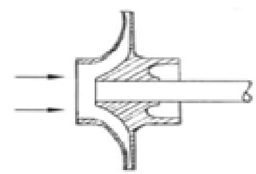

Figure 4.3 single suction impeller design

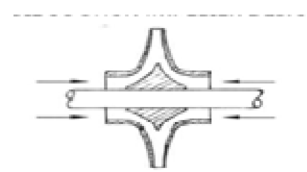

Figure 4.4 Double suction impeller design

Vane Designs

External Vanes

These vanes otherwise called draw out or ousting vanes are shallow and situated outwardly of the impeller covers. These vanes help pump fixing and effectiveness.

Internal Vanes

Otherwise called the fundamental vanes. They really pump the slurry. Ordinarily we utilize two sorts of principle vane.

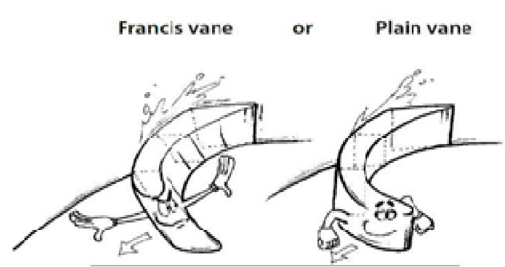

Figure 4.5 Francis vane and plain vane

Types of Casing

Figure 4.6 Single volute casing

Figure 4.7 Double volute casing

Figure 4.8 Diffuser casing

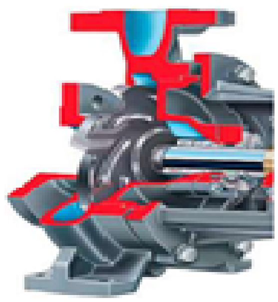

Figure 4.9 Single casing pump

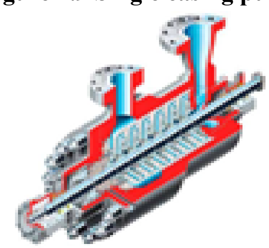

Figure 4.10 Double casing pump

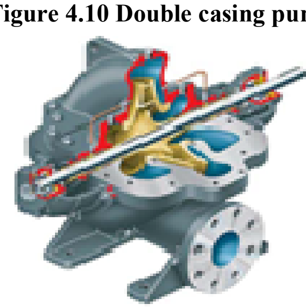

Figure 4.11 Axially split casing

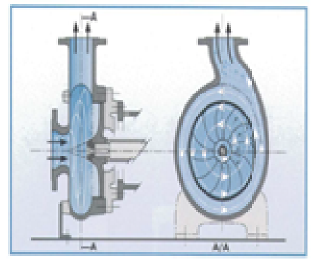

Figure 4.12 Egger Vortex casing

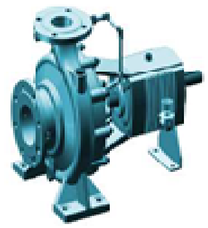

Figure 4.13 Foot mounted casing

WEAR PROTECTION

There are three different conditions that create wear in a slurry pump:

1.Abrasion

2.Erosion

3.Corrosion

Abrasion

There are three major types of abrasion:

1.Crushing

2.Grinding

3.Low Stress

In slurry pumps we have principally crushing and low anxiety scraped spot.

Scraped area rate is subject to molecule size and hardness.

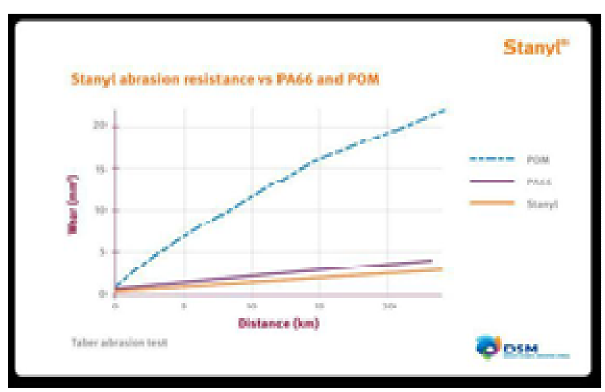

Figure 5.1 showing graph of wear Vs distance

Erosion

This is the prevailing wear in slurry pumps. The reason is that particles in the slurry hit the material surface at various edges.

To conquer this issue vortex casing which contains recessed impeller where just 15 percent of solid comes into contact so the material surfaces can't be harmed much and erosion issue can be evaded. Egger pumps is the significant producer of Vortex casing.

For reasons that are not surely knew, disintegration wear can likewise increment drastically if the pump is permitted to work on "wheeze"; that is, taking air into the gulf pipe.

It has been recommended this might be caused by cavitation, because of the pump surfaces vibrating as the wind currents over them. This is, be that as it may, hard to acknowledge as air bubbles for the most part stifle cavitation by moving to fill the vapor.

Figure 5.2 Component gets completely eroded.

There are three major types of erosion:

1. Sliding bed
2. Low angular impact
3. High angular impact

Effect of Erosion on Pump Components

Impeller

The impeller is liable to affect wear (high and low) chiefly in the eye, on the organ side cover , when the stream turns 90deg. On the main edge of the vane .

Sliding quaint little inn precise effect happen along the vanes between the impeller covers.

Figure 5.3 Impeller gets completely eroded

Side Liners (Inlet and Back Liners)

Side liners are liable to sliding quaint little inn and crushing scraped spot.

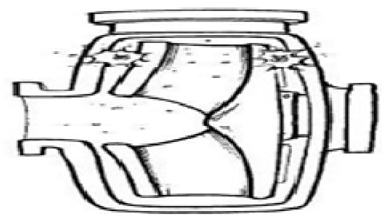

Figure 5.4 Indicating the sideliners

Corrosion

The consumption (and synthetic assaults) of the wet parts in a Slurry Pump is a perplexing wonder both for metal and elastomer material.

For direction, synthetic protection tables for metals and elastomer material are given on Chemical Resistance Tables.

Table 5.1 Shows synthetic protection tables for elastomer material

Material	Physical Properties		Chemical Properties			Thermal Properties
	Max. Impeller Tip Speed (m/s)	Wear resistance	Hot water, diluted acids	Strong and oxidising acids	Oils, hydro carbons	Highest service temp. (^{0}C) Continuously Occasionally
Natural rubbers	27	Very good	Excellent	Fair	Bad	(-50) to 65 100
Chloroprene 452	27	Good	Excellent	Fair	Good	90 120
EPDM 016	30	Good	Excellent	Good	Bad	100 130
Butyl	30	Fair	Excellent	Good	Bad	100 130
Polyurethane	30	Very good	Fair	Bad	Good	(-15)45-50 65

SPECIFIC SPEED

Specific Speed is a dimensionless number which is used to relate the hydraulic performance of a pump.

Impeller Vs Specific Speed

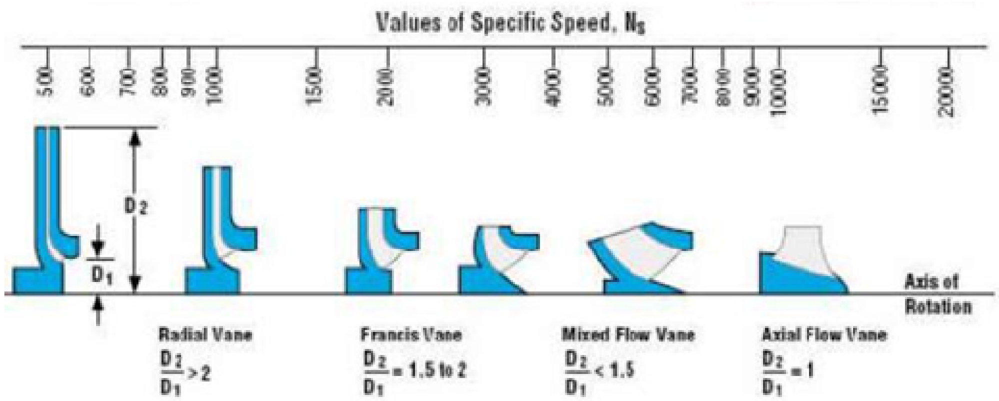

Figure 6.1 shows how impeller vanes classified according to specific speed

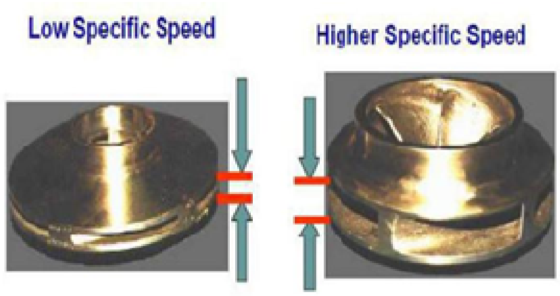

Figure 6.2 shows width of vane for low and high specific speed

Specific Speed and Hydraulic Efficiency

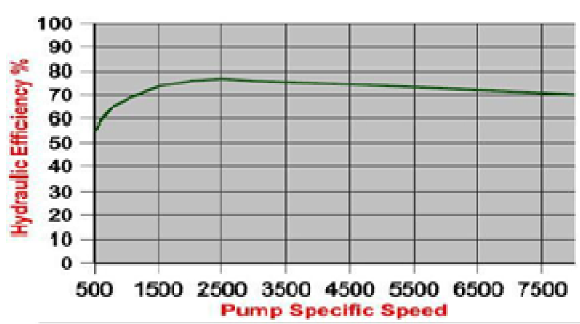

Figure 6.3 Specific speed Vs hydraulic efficiency

Radial Flow Impeller

1. In pumps of this sort, the fluid enters the impeller at the center point and streams to the fringe.

2. Pumps of this sort with single delta impellers generally have a particular speed underneath 4,200.

3. Little size end suction pumps will typically have Radial stream impellers.

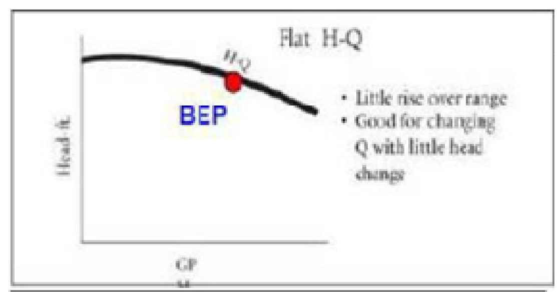

Figure 6.4 curve for radial flow impeller

Figure 6.5 Radial flow impeller

Figure 6.6 Radial flow

Mixed Flow Impeller

Capacities to 70,000 gpm with moderate heads

1. This kind of pump has a solitary channel impeller with the stream entering pivotally and releasing in a hub and spiral course.

2. Pumps of this sort normally have a particular speed of 4,200 to 9,000.

3. Stream created in both pivotal and spiral headings.

4. Abilities to 70,000 gpm with direct heads.

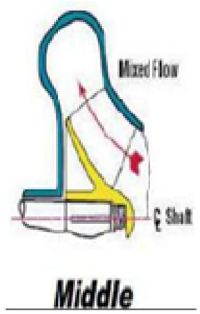

Figure 6.7: Mixed flow

Figure 6.8 Mixed flow impeller

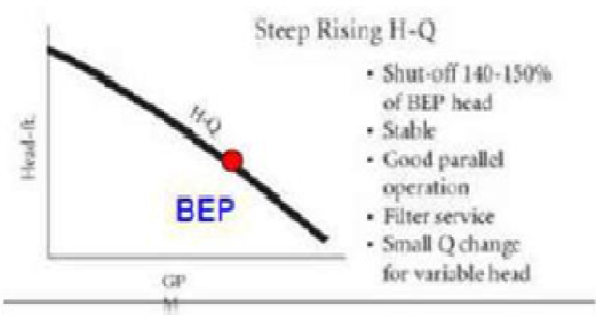

Figure 6.9 Curve for mixed flow impeller

Axial Flow Impeller

Pumps of this sort more often than not have a particular speed over 9,000.

Stream parallels the hub of revolution.

High stream (200,000 gpm+), low head abilities.

Utilized for storm water, water system, blending, disturbance.

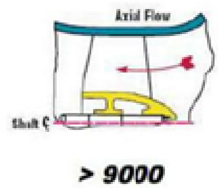

Figure 6.10 Axial flow

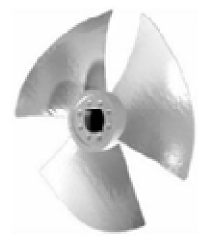

Figure 6.11 Axial flow impeller

BEARINGS

The pump orientation bolster the water driven burdens forced on the impeller, the mass of impeller and shaft, and the heaps because of the pole coupling or belt drive. Pump orientation keep the pole pivotal end development and horizontal redirection inside worthy breaking points for the impeller and shaft seal.

The water powered burdens include hydro-static and energy powers from the liquid. The powers on the impeller are disentangled into two parts: pivotal load and outspread load.

Radial Load

The water driven outspread load is because of the unequal speed of the liquid coursing through the packaging. The unequal liquid speed brings about a non-uniform appropriation of weight following up on the circuit of the impeller.

Minimum Radial burdens are at the Best Efficiency Point (BEP) with the operation to one side or right BEP delivering higher spiral burdens. Diffuser configuration is favored for high-weight pump which will have least outspread burdens.

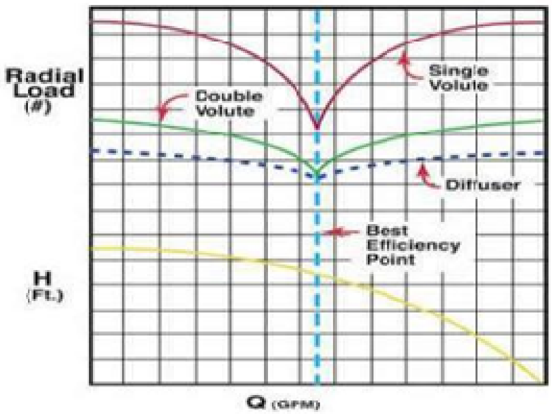

Figure 7.1 Radial load

The single volute packaging is ordinarily utilized as a part of little process pumps. The diffuser and roundabout volutes are additionally regularly utilized and, attributable to their diffuser vanes or more open outline, have more uniform speed dispersion around the impeller and thusly have bring down spiral impeller loads. The outspread load in a round volute is least at direct close off (zero stream) and is most extreme close to the BEP.

Twofold volute housings are usually utilized as a part of bigger pumps when this development is conceivable. A twofold volute packaging has two cutwaters which radially adjust the two coming about and contradicting pressure driven powers. This essentially diminishes the water powered spiral load on the impeller.

Axial Load

Hub water driven push is the summation of uneven impeller powers acting the pivotal way. Hub Thrust in a radial pump emerges because of symmetry. The clearances between packaging spread and impeller cover, packaging and impeller front cover are loaded with fluid at conveyance weight.

Power following up on front cover because of fluid of conveyance weight captured between pump packaging and front cover. (F1)

Power following up on back cover because of fluid of conveyance weight entangled between packaging spread and back cover. (F2)

Balancing of Axial Load

Impeller pump-out vanes and adjust openings are utilized to adjust the hub stack.

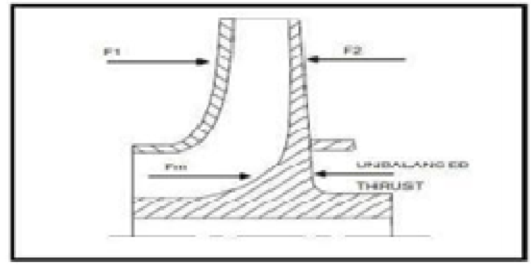

Figure 7.2 Axial load

Pump-out vanes

Pump-out vanes (likewise got back to vanes) are little outspread vanes on the center point cover used to expand the speed of the liquid between the center point cover and the packaging divider. This decreases the weight of the liquid and results in diminished hub stack on the impeller.

The capacity of pump-out vanes to lessen pivotal load is subject to their freedom with the back packaging surface.

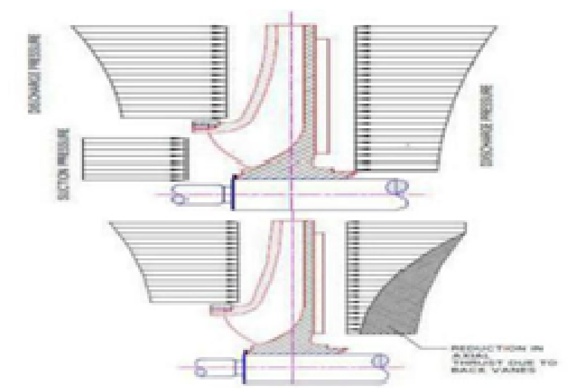

Figure 7.3 Pump out vanes

Balance Holes

Parity openings are gaps in the center cover used to even out (adjust) the weight behind the impeller with that of the pump suction. Parity gaps help to adjust the two hydrostatic powers acting in inverse ways on the impeller cover surfaces.

From the chart, the impeller without adjust openings has more prominent hub stack than the impeller with adjust gaps.

The hub stack in twofold suction impeller pumps is adjusted aside from conceivable awkwardness in liquid course through the two impeller parts. In multistage pumps, impellers are orchestrated couple and consecutive to adjust the pivotal load.

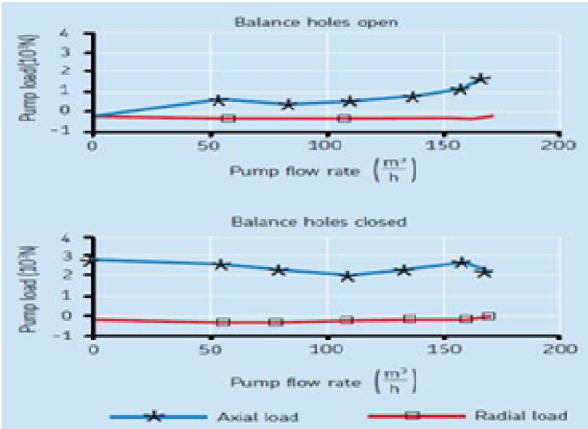

Figure 7.4 Balancing holes

MATERIAL SELECTION

The fundamental information required to make a determination of the sort of material is:

a. the molecule measuring of the solids to be pumped.

b. the shape and hardness of these solids.

c. the destructive properties of the "fluid" part of the slurry to be pumped.

The material choice for the pump liners and impellers is produced using two fundamental sorts of materials:

a. elastomers

b. wear/disintegration safe cast amalgams

Elastomers

The criteria for selection of the three elastomers commonly used are:

Natural Rubber

i Excellent disintegration protection for liners (against solids up to 15mm size), yet restricted to particles of 5mm size for impellers.

ii May not be reasonable for sharp edged solids.

iii May be harmed by larger than usual solids or waste.

iv Impeller fringe speed ought to be under 27.5 m/s, to maintain a strategic distance from the warm breakdown of the liner, nearby the external edge of the impeller. (Unique details are accessible to permit accelerates to 32 m/s in specific cases).

v Unsuitable for oils, solvents or solid acids.

vi Unsuitable for temperatures in overabundance of 77℃

Polyurethane

i. Used for pump side liners, where the fringe speed of the impeller is higher than 27.5 m/s, (and blocking the utilization of standard elastic) and utilized for impellers where infrequent junk may harm an elastic impeller.

ii. Erosion protection is more prominent where disintegration is of a sliding bed sort as opposed to one of directional effect.

iii. Has less disintegration protection from fine solids than normal elastic. Has more noteworthy disintegration protection from coarse sharp edged particles than common elastic, in a few conditions.

iv. Unsuitable for temperatures surpassing 70℃ and for concentrated acids and alkalies, ketone, esters, chlorinated and nitro hydrocarbons.

Synthetic Elastomers: Neoprene, Butyl, Hypalon, Viton A and others.

i. Not as disintegration safe as regular elastic.

ii. Have a more noteworthy compound protection than characteristic elastic or polyurethane.

iii. Generally permits higher working temperature than regular elastic or polyurethane.

WEAR/EROSION RESISTANT CAST ALLOYS

Wear safe cast composites are utilized for slurry pump liners and impellers where conditions are not suited to elastic, for example, with coarse or sharp edged particles, or on obligations having high impeller fringe speeds or high working temperatures.

PUMP CURVES

The execution of a slurry pump is ordinarily delineated by the utilization of clear water execution bends.

The fundamental bend for execution is the Head/Capacity (HQ) bend, demonstrating the connection between the release leader of the slurry and the limit (volume stream) at steady impeller speed.

Types of H/Q pump curves

1. Rising curve to shut valve.

2. Dropping curve to shut valve

3. Steep curve

4. Flat curve

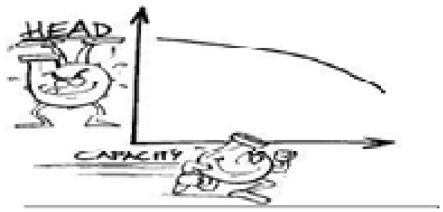

Figure 9.1 Rising curve to shut valve

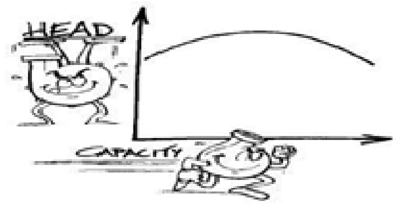

Figure 9.2 Dropping curve to shut valve

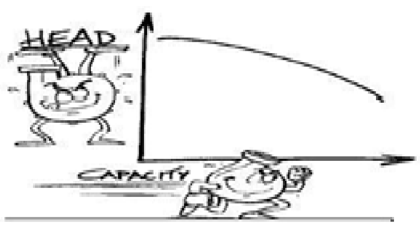

Figure 9.3 Steep curve

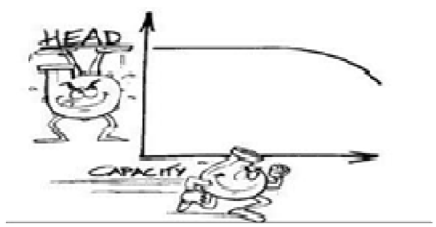

Figure 9.4 Flat curve

Hydraulic performance – what curves are needed?

1. Differential head of the pump as function of the flow (HQ curve).

2. Efficiency curve as function of the flow.

3. Power (input) as function of the flow.

4. Cavitation characteristics as function of the flow (NPSH).

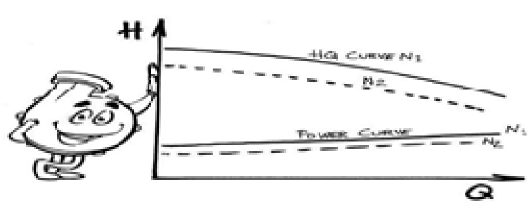

Figure 9.5 Head Vs Flow curve with respect to Speed

PROBLEM

Given that a 4 inch horizontal end suction pump delivers at its best efficiency point l000 gpm water at 100 ft total head at 68 percent efficiency (BHP = 37.1), what will the equivalent performance be when handling a fine coal/water slurry with the following characteristics: Ss = 1.5, Cw = 53 percent. Particle size distribution (Tyler) cumulative percent passing 20 percent (325) 80 percent (200) 100 percent (IOO)

Step 1 : Determine d50 from the graph 1.

From distribution plot d50 = 0.058 mm

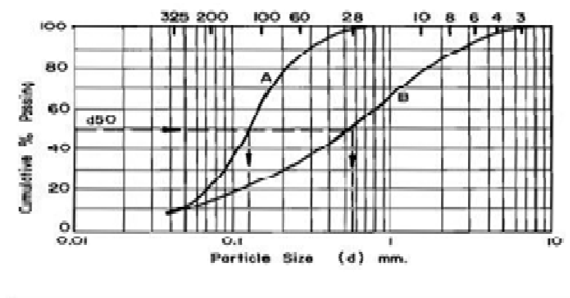

Figure 10.1 showing graph to find d50 value

Step 2 : Determine slurry type from graph 2.

At d50 = 0.058, Ss = 1.5; therefore, slurry is non-settling.

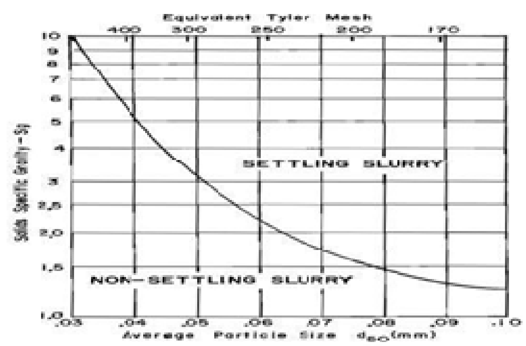

Figure 10.2 showing graph to find whether the slurry is settling or non-settling

Step 3 : Determine Sm and Cv from graph 3.

Cw=0.053, Ss = 1.5; therefore, Cv = 0.43 and Sm= 1.22.

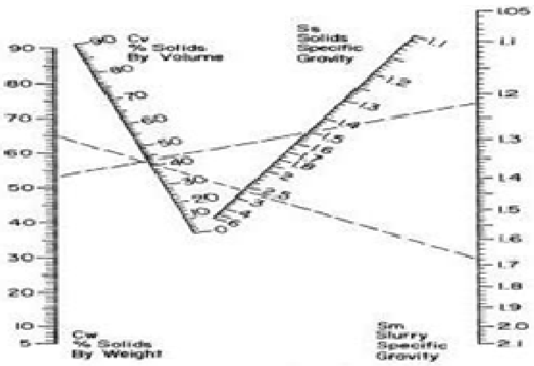

Figure 10.3 shows graph to determine Sm and Cv

Step 4: Determine apparent viscosity from graph 4. Cv = 0.43; therefore, C3 = 0.85

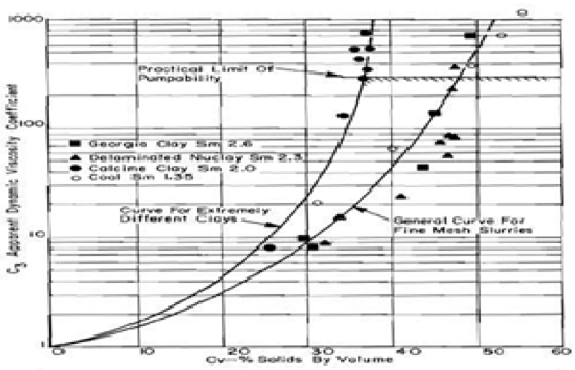

Figure 10.4 shows graph to determine Cv and C3 value

Step 5: Determine performance corrections from figure 10.6 vm = 69.6 centistokes

Hw =100 feet, Qw =1000 gpm, Qr = 1, Hr =0.96, Er = 0.80

Qm=l000 x 1= 1000 gpm, Hm = 100 x 0.96 = 96 feet, Em=0.68 x 0.80 = 0.544

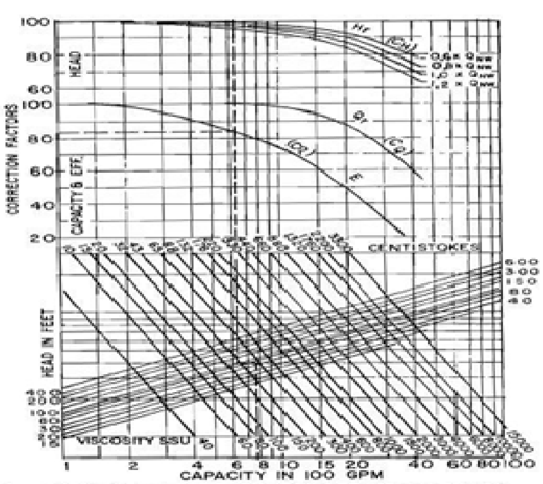

Figure 10.5 Graph to determine Qr, Hr and Er value

Step 6: Determine BHP on slurry

$BHP_m = (Q_m*H_m*S_m)/(3960*E_m)$

BHP = (1000*96*1.22)/(3960*0.544)

BHP = 54.36

RESULTS AND DISCUSSION

From the contextual investigation 1, we comprehended that the self-preparing because of the high abrasiveness of the fluid. The issue is they didn't choose the correct pump as indicated by the required condition like what size of strong that pump can deal with for required head and stream conditions, and as indicated by that they should choose the segments lastly the pump. They didn't choose the pump as per the required condition and because of the absence of specialized learning from the organization, so just in the main case, they moved toward the help master from different regions. The last after effect of this examination is whether they would have taken after by choosing right parts from the begin until the end the pump wouldn't have flopped inside the points of confinement. So this investigation covers totally about how every part gets influenced and how to choose the segment deliberately to avoid disappointment of the pump. The computation of stream head and power prerequisites assumes a noteworthy part when slurry comes into contact. This examination totally clarifies the computation part moreover.

CONCLUSION

1. From the above issue itself, we comprehended pump can be taken care of proficiently easily unless slurry it pumps just water. After strong comes into contact with water each issue happens and the lifetime of the parts of pump gets diminished. For dealing with, this issue vortex impeller was found where just 15 percent of strong comes into contact with the impeller and Egger pumps is the significant producer of Vortex impeller. The efficiency of the vortex casing is less yet in any case, our definitive point is to deal with solids proficiently without affecting the components of the pump. It can deal with both solid and shear sensitive solid.

2. After this examination now on the off chance that we are given points of interest of slurry and we can choose the pump in the wake of dissecting and figuring every one of the variables like sort of slurry, weight, slurry dia, head, effectiveness, engine control and so on. Subsequent to investigating every one of the variables we can have the capacity to choose the right segments as per the

accomplished condition for the pump lastly pump is planned and chosen.

3. In the wake of choosing the pump the pump will get fizzled in light of the fact that they may have committed error while choosing pump or choosing segments of the pump. The pump will likewise get into basic condition if obligation state of the pump figured isn't right. This slip-up is made because of the absence of learning for the modern individual. So this examination gets an unmistakable thought regarding two-stage slurry pump.

ACKNOWLEDGEMENTS

It’s my pleasure and duty to express my indebtedness to Mr. Ramakrishnan Ramamoorthy, CEO & Managing Director at Egger Pumps India Pvt Ltd for allowing me to undergo my project work at Egger Pumps India.

I take this opportunity to express my sincere thanks to my supervisor Mr. Santosh Kurre (Asst. Prof. Sel. Grade), Mechanical Engineering, UPES Dehradun, for his guidance and support.

I also express my gratitude to external guide Mr K.Raghunath, National Manager-Sales and Business development and S.Satheesh Senior Sales Engineer at Egger Pumps India Pvt Ltd. It was a privilege working under them.

My sincere thanks to Mr. Ashok Kumar, Assistant Professor, Course Coordinator of M-Tech Rotating Equipment Engineering, UPES Dehradun, for providing me this Internship in this organisation, without him today was a distant dream.

I also thank Mr. Shyam Pandey, Head of the Department, M-Tech Rotating Equipment, UPES Dehradun, for permitting me to do this project and for his constant encouragement and support throughout the project.

I am very much thankful to the University of Petroleum and Energy Studies (UPES), Dehradun, for providing me this opportunity of pursuing M-Tech - Rotating Equipment Engineering in a peaceful environment with ample resources.

I also express my gratitude to my Faculties of UPES Dehradun, and Employees of Egger Pumps India Pvt Ltd for their constant guidance.

In the end, I would like to acknowledge My Parents, Family Members. Without their support, this work would not have been possible.

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