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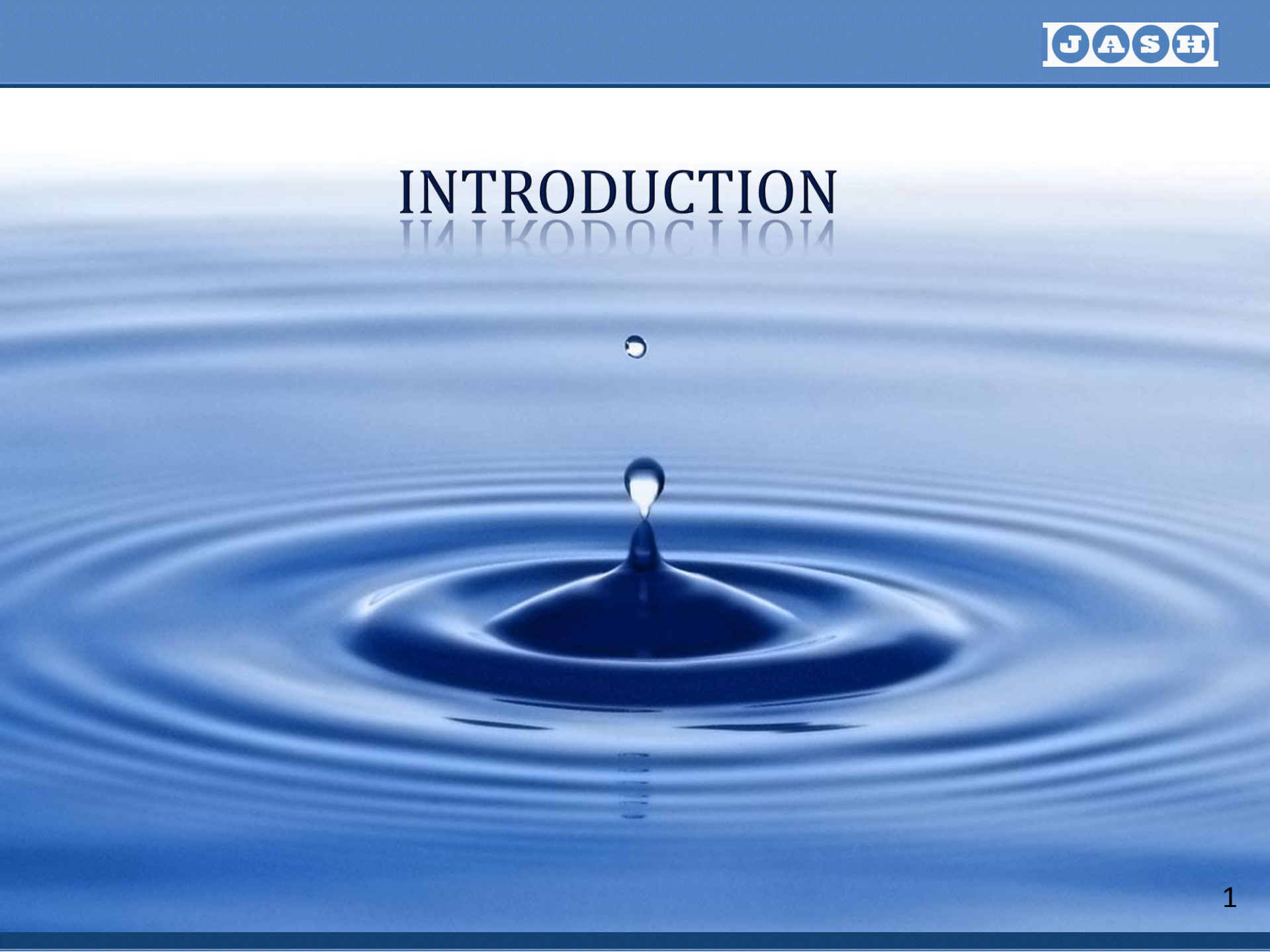
TRAINING PROGRAMME ON KNIFE GATE VALVES

- Introduction
- Why KGV is being preferred over sluice valves ?
- Usage & Specifications of KGV
- Selection Procedure
- Product Details
- Application in Pumping Station

INTRODUCTION



DEVELOPMENT & USE OF SLUICE VALVE

Sluice valves were developed for high pressure isolation application in water transmission lines. Sluice valve design incorporates two disc each having seating face corresponding to matching seat face on valve body. The disc are assembled in V shape groove provided in body. This two disc design enables a sluice valve to suit bi-directional application as well as offer very low leakage even in high pressure application.

Initially sluice valves were available in PN6 pressure rating for low pressure application. However with a view to reduce inventory and variations PN6 rated valves were discontinued and now sluice valve starts with minimum PN10 pressure rating.

Easy availability of this valve made it’s use popular even in those applications for which the valve was not designed. Use in sewage application is one such example.

DEVELOPMENT & USE OF KNIFE GATE VALVE

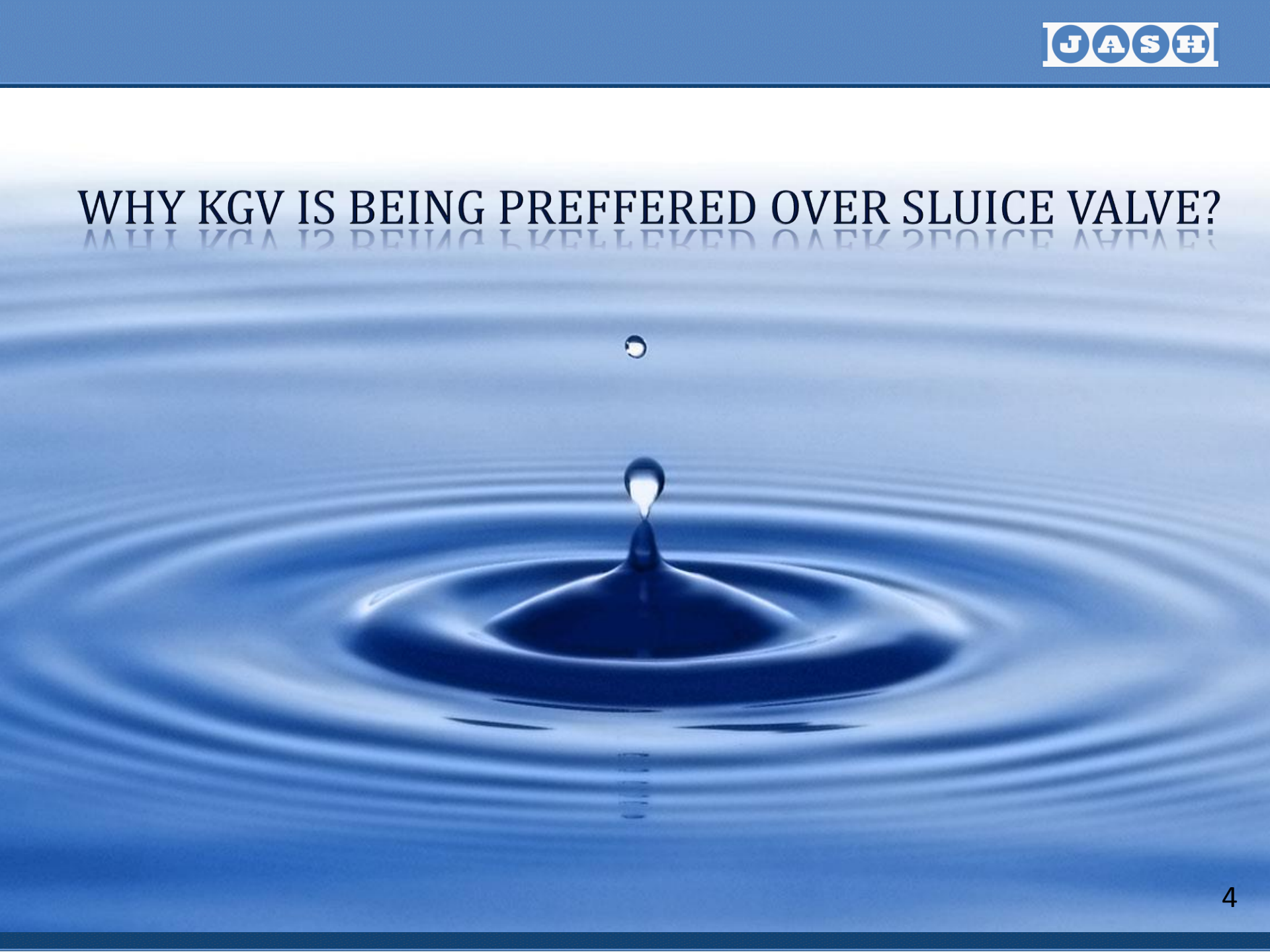
Knife gate valves were developed for isolation of pulp in paper industry where water contains large amount of solids in form of fibrous pulp. The gate of this valve was given a narrow edge at its bottom to enables it cut through settled pulp and achieve full closure of valve.

This capability to achieve full closure by cutting through settled solids made knife gate valves very popular in mining, ash slurry handling, dry material handling etc i.e. in application having solid-liquid mixes or having dry bulk solids.

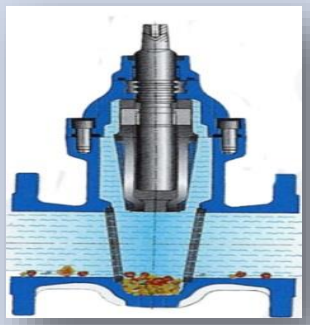
In most of these applications, the operating pressure is low and sealing is required only from one direction and so most conventional knife gate valves designs were made to suit this requirement.

Since sewage also has solids (suspended as well as floating) and these solids were creating problems in sluice valve operation, knife gate valves started replacing sluice valves in sewage Industry. Today knife gate have become preferred valve for isolation requirements in sewage industry world wide.

WHY KGV IS BEING PREFFERED OVER SLUICE VALVE?



WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
1	**Full Closure:** Internal construction of housing allows sand, sludge and other impurities to get accumulated in the belly / sump of valve body. The gate due to its wedge type design is very wide at the bottom. This wide bottomed gate is not able to penetrate the sludge / solids that gets accumulated in belly of body. Hence full closure of gate at all times cannot be ensured while handling solids /semi solids. This results into severe leakage accompanied with wear of body, gate and seat ring . 	The gate of this valve is made of stainless steel and is provided with a Knife-edge at the bottom. This knife edged gate is able to cut through sludge / solids settlement and achieve full closure. Hence positive shut off is always ensured even when handling slurries and sewage. 

WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
2	**Spindle-nut breakage & maintenance** Accumulation of solids in belly of the valve body does not allow gate closure and leads to over-torque while closing of valve. This results into breakage of spindle -spindle nut connection. Possibility of crushing of settled particles between seat rings of gate and body remains because of which the seat rings can get damaged. Both these problems results into major maintenance since the complete valve has to be removed from the line to attend to this problem. Also this maintenance needs higher skills and is not easy to carry out at site.	There is remote possibility of breakage in spindle - nut connection as well as remote possibility of damage to seating face. Hence maintenance on account of this is not required. Knife gate valves are available with varied sealing configuration which ensure that future seal maintenance is easy and can be done at site with low skills.

WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
3	**Torque requirement** Torque requirement for opening of this valve is comparatively very high due to wedging action and weight of gate. Higher torque requirement leads to higher gear ratios and thereby time required for opening and closing is comparatively very high. Higher thrust requirement also results into use of bigger size electric actuator or pneumatic cylinders thereby increasing the capital cost.	Torque requirement for opening of this valve is low since weight of gate is low. Lower torque requirement leads to lower gear ratios and thereby time required for opening and closing is very low. Lower thrust requirement also results into use of smaller size electric actuator or pneumatic cylinders thereby reducing the capital cost..

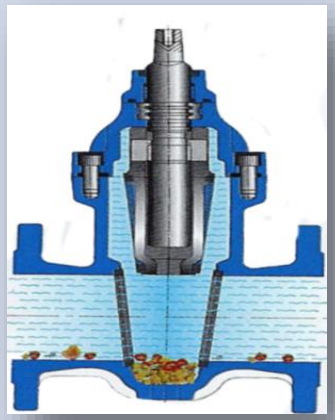
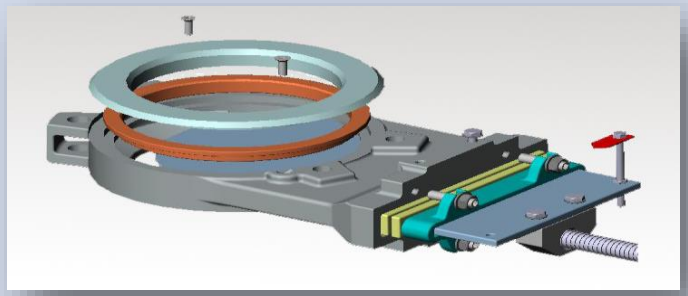
WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
4	**Weight** Size Weight (Approx) DN300 280 kgs DN600 1030 kgs DN900 2486 kgs DN1200 4500 kgs This valve is more than two times heavier in weight when compared to knife gate valve. Hence strong base is required for mounting and mounting / dismounting is comparatively difficult. Higher weight results into higher transportation & installation cost.	Size Weight (Approx) DN300 90 kgs DN600 420 kgs DN900 1200 kgs DN1200 1700 kgs This valve is light in weight. Hence no base required in medium sized valves and mounting / dismounting is easier. Lower weight results in to lower transportation & installation cost.

WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
5	**Flange to flange distance** Size F/F Dist. (Approx) DN300 380 mm DN600 575 mm DN900 800 mm DN1200 1692 mm The flange to flange distance is very high. In Pumping Station 1 valve is placed before and 1 is placed after the pump. So complete length of assembly comprising of 1 pump,1 check valve & 2 sluice valve becomes very long. This results into higher space requirement and so higher cost of land ,higher cost of excavation and higher cost of civil construction.	Size F/F Dist. (Approx) DN300 78 mm DN600 114 mm DN900 130 mm DN1200 135 mm The flange to flange distance is less. Hence use of knife gate valves in pumping stations results into lower area requirement, lower excavation & lower civil cost.

WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
6	**Replacement Cost** Complete valve is required to be replaced upon erosion of housing. Seat wear results into major maintenance due to requirement of precision lapping of seat rings and involves high cost as well as skilled technicians to do the job. 	This valve can be provided with replaceable resilient seal encased in a replaceable seal retainer ring. Provision of this type of sealing avoids wearing of valve housing due to erosion and also enables easy replacement of seal at minimum cost and with low skill upon its wear. 

WHY KNIFE GATE VALVE IS BEING PREFERED OVER SLUICE VALVE IN SEWERAGE INDUSTRY?

Sr. No.	Sluice Gate Valve	Knife Gate Valve
7	**Conclusion** High in overall capital cost, higher cost of maintenance & replacement and unsuitable for sewage application.	Low in overall capital cost, low in maintenance cost & replacement cost, lower area requirement and suitable for sewage application since applicable pressure is generally low.

USAGE & SPECIFICATIONS OF KGV

USAGE OF KNIFE GATE VALVE IN SEWAGE APPLICATION

Presently Knife gate valves are being preferred and widely used for isolation solutions in water / waste water treatment plant & pumping stations. Knife gate valves are also preferred for use in suction and delivery side of pumps as well as in branch lines in sludge handling application.

Internationally knife gate valves have replaced sluice valves in sewage application due to various technical advantages that these valves offer and also because knife gate valves are comparatively economical. Singapore has installed Ø 3600 mm Knife gate valve at its Changi Influent pumping station and Hong Kong has installed Ø 3000 mm Knife gate valve at its HATS II Project.

Use of knife gate valves in sewage application is also becoming popular even in India. In India **MCGM** (Municipal Corporation of Mumbai) is using Knife gate valves up to Ø 2000 mm since last 20years in their sewage treatment plants and pumping stations. Recently **BWSSB, CMWSSB, HMWSSB, SMC, AMC, IMC, DJB, PMC, NMC** etc. have started use of knife gate valves in their sewage treatment plants and pumping stations.

However improper understanding of specification & application results into specifying knife gate valve which may not offer the desired technical & economical advantage.

SPECIFICATIONS : MISTAKES & REASONS FOR THE SAME

Knife gate valves are a recent introduction to waste water industry and so clients and consultants are not very clear about its use and specifications. This leads to specifications which are : a) technically not correct and inappropriate to application b) based on non-relevant standards and c) resulting into increased product cost.

The general mistakes being made are as under:

1) Specifying high pressure rating for Knife gate valves whereas the actual pressure acting on valve is quite low. This happens because of the following reasons:-

   a. Clients / consultants refer to pressure rating of sluice valve used in past and sluice valves starts with PN10 pressure rating.

   b. They specify the pressure rating for valve to be same as that for pipeline flange requirement. So if Pipe line flange is suitable for PN10 then the valve pressure rating is also mentioned the same.

SPECIFICATIONS : MISTAKES & REASONS FOR THE SAME

2) Specifying bi-directional pressure requirement for all Knife gate valves whereas the actual pressure acting on over 98% of the valves in “closed condition” is unidirectional.

   a. This happens because Clients / consultants have Sluice valves specification in mind while using knife gate valves as replacement.
   b. All Sluice valve have seat on upstream as well as downstream side making them suitable for bi-directional application whereas standard knife gate valves have seat on one side only because of which standard knife gate valves are not suitable for equal pressure requirement from both sides.

3) Specifying flanged valves for smaller sizes and low head application since all sluice valves are flanged.

4) Specifying inner liner of stainless steel on Cast Iron / Ductile Iron valves in line with the old MSS SP81 standards even in water / waste water application where this is not relevant. This happens because clients / consultants refer to Knife gate valves used in process industry as per MSS SP-81 standard which specifies use of SS liner to withstand the corrosive effect of fluid used in that particular industry.

SPECIFICATIONS : MISTAKES & REASONS FOR THE SAME

5) Specifying high hardness on seat and gate to withstand abrasion resistance even in water / waste water application where this is not relevant. This happens because client / consultants refer to Knife gate valves which are used in ash and coal handling application where abrasion resistance is an essential requirement.

Once wrong specifications comes in, it is a difficult task to get them amended. As a result manufacturers are finally forced to offer non standard knife gate valves which are expensive and in the process the economical advantage of using knife gate valves get defeated.

SPECIFICATIONS : WHAT IS THE SOLUTION?

In absence of information of Knife gate valves and its specification, clients/ consultants are mostly guided by old MSS-SP81 standards when preparing knife gate valves standard.

In fact few clients / consultants are aware about AWWA C520-10 standard for Knife gate valves since this is a relatively recent standard in comparison to the MSS SP81 standard. This AWWA-C520 standard was published in year 2010 and covers the valve size from DN50 to DN2400. The valve up to DN600 size are specified for minimum design pressure 10 bar (150psig) and valve above DN600 size up to DN2400 size are specified for minimum design pressure of 1.72 bar (25 psig), 5.17 bar (75 psig), 10 bar (150 psig) respectively.

This is a comprehensive standard prepared from the perspective of water industry and so is most relevant for application in water industry. It is a matter of time when it would be commonly specified by all users.

Once this happens more & more manufacturers will make knife gate valves as per this standard and this would result into production of valves in enough volume to make these extremely competitive and thereby common. This standard will put to rest most of the issues faced when knife gate valves were specified as per MSS-SP81 standard.

SELECTION PROCEDURE

SELECTION PROCESS FOR KNIFE GATE VALVES:

The aim of the client should be to arrive at the correct configuration required for his requirement of valve without sacrificing the performance and ease in maintenance but at the same time ensuring that the selected product is economical.

Type of valve to be used and features required to be incorporated in a valve varies from location to location in the same plant. To arrive at the final configuration of the valve to be used, client should follow the procedure as given hereunder:

S. No.	Selection Basis	Importance
1.	Application	Based on application, decide the most appropriate type of valve.
2.	Sealing	Based on the leakage & maintenance requirement decide the type of sealing (metal seated / resilient seated)
3.	End style	Based on the mounting requirement decide the type of end style (two lug / Full lug / Full flanged)
4.	Fluid	Based on fluid to be handled, decide various principal material of construction options that can be considered.
5.	Specific Features	Decide the specific features to be provided based on individual valve requirements
6.	Operating arrangement	Selecting the type of operating arrangement which is most appropriate for each location.

The above process would lead you to arrive at the most appropriate technical and economical solution for each location of installation.

I. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON APPLICATION :

1. For **Uni - directional Isolation of fluid flow in between the pipeline**. Isolation means either complete closing of an opening or for fully open condition. Most of the valve designs are suitable for this application.

2. For **Bi - directional Isolation of fluid flow in between the pipeline**. In bi-directional isolation the valve should be able to withstand full pressure from both sides. Not all valve designs are suitable for this requirement. Standard valve design has to be modified to meet this requirement.

3. For **Uni - directional Isolation of fluid flow in between the pipeline with small Bi-directional flow**. Some valve designs are not suitable for this application. Ask the manufacturers to specify what bi-directional pressure their valve can withstand.

4. For **Uni - directional Isolation of fluid flow at the end of the pipeline**. Valves having semi-lugged design are not suitable for this application. Valves should be full lugged / full flanged for this application.

5. For **Modulation / Regulation / Control of flow** ie for partial closing / opening or throttling in a pipeline. Not all valve designs are suitable for this requirement. Standard valve design has to be modified to meet this requirement.

II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

The leakage performance & lifetime cost (inclusive of maintenance cost and replacement cost) of a knife gate valve is dependent on the type of sealing configuration selected. The varied sealing configuration offered by the industry and their relative advantage / disadvantage is given below so as to enable clients understand the best option for their particular application.

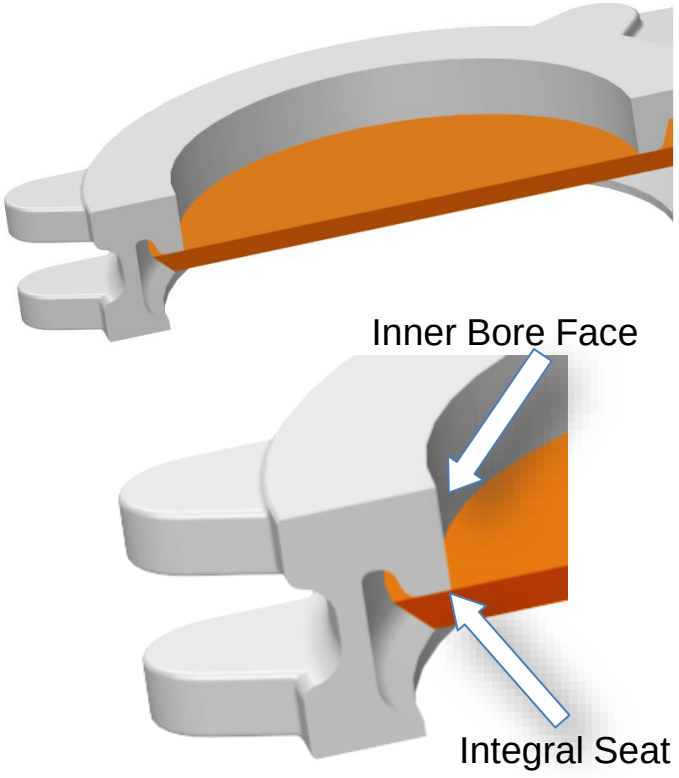
1. Integral metal seated.
2. Non integral metal seated
3. Resilient seal seat retained with replaceable retainer ring:
4. Resilient seal seat retained by metallic strip / band:

II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

1. Integral Metal Seated :

Description:

In this configuration a seat face is provided on the edge of the inner bore face of valve housing and this raised seat face acts as an integral metal seat.



Application:

Valves with this type of sealing configuration are suitable for isolation requirements where media has high contents of solid and where slight leakage is not critical. This type of sealing configuration is also preferred for applications where temperature is greater than 250 deg C.

Permissible Leakage:

As per AWWA C-520 / As per MSS-SP81 (40 cc/min/inch) for valves up to DN900

II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

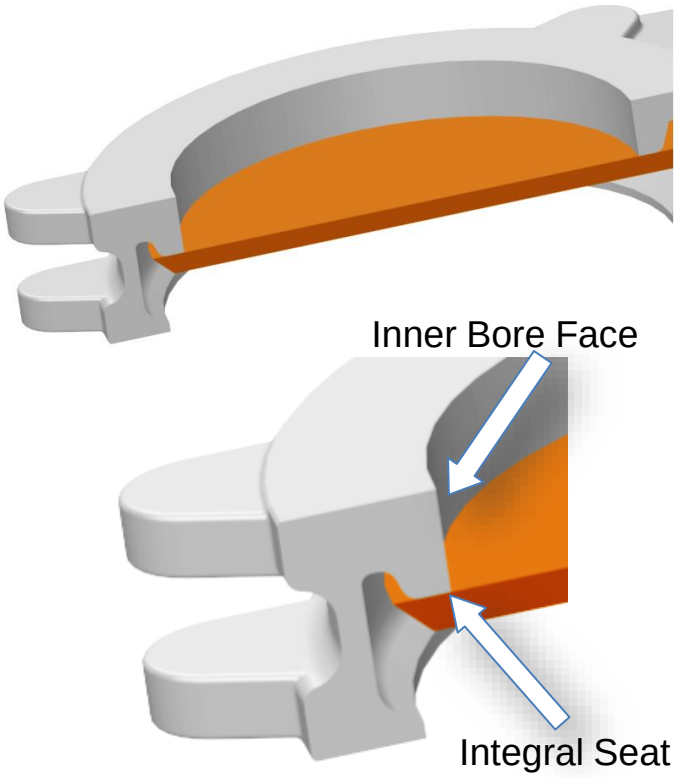
1. Integral Metal Seated :

Advantage:

Initial cost of valve with this seal configuration is the lowest and also seat leakage rate is slightly lower when compared to Non Integral Metal Seated valves.

Disadvantage:

In this type of sealing configuration the whole housing needs to be replaced when the valve seat face gets damaged or worn out due to erosion of inner bore face of valve on account of material flow. Also it is not possible to re-assemble the valve using replacement housing at site and so the whole valve has to be replaced at a high replacement cost in future.

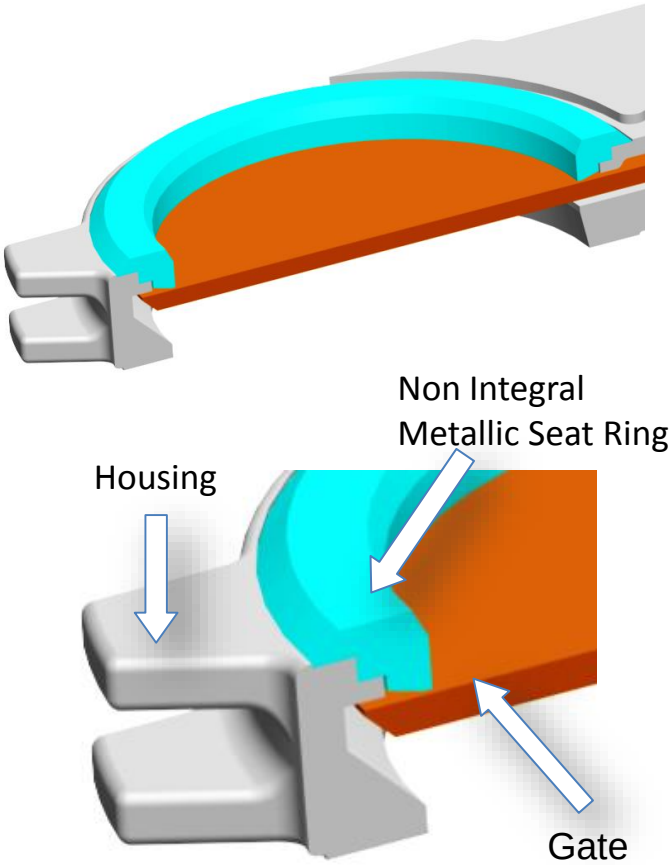


II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

2. Non-Integral Metal Seated :

Description:

In this configuration a separate metallic seal is provided and this replaceable metal seal is bolted to the valve housing by fasteners.



Application:

Valves with this type of sealing configuration are suitable for isolation requirements where media has high contents of solid and where slight leakage is not critical. This type of sealing configuration is also preferred for applications where temperature is greater than 250 deg C.

Permissible Leakage:

As per AWWA C-520 / As per MSS-SP81 (40 cc/min/inch) for valves upto DN600

II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

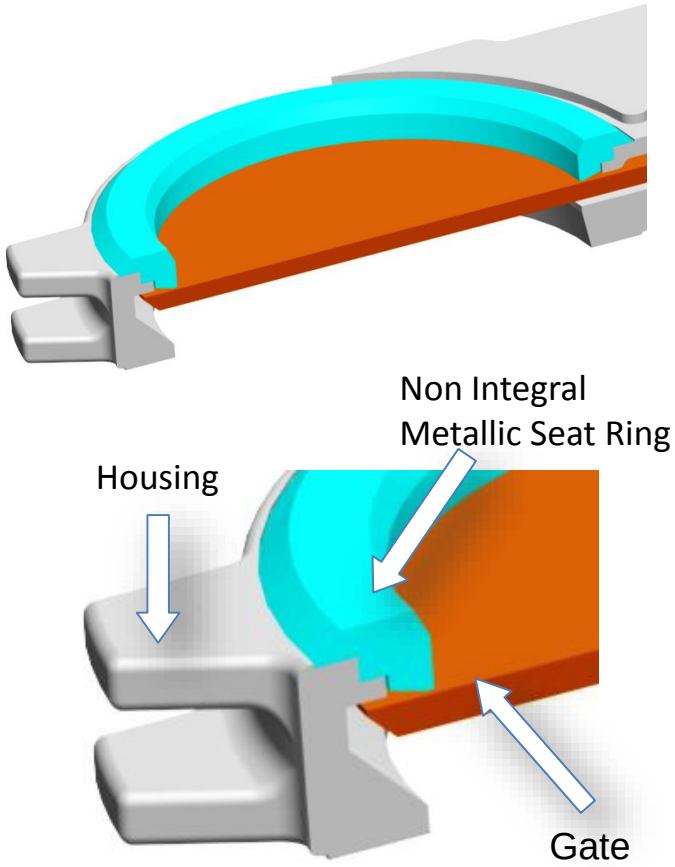
2. Non-Integral Metal Seated :

Advantage:

There is no need to replace the complete valve in event of valve seat damage or in event of erosion of inner bore face of valve due to material flow. The replaceable metal seat can be changed easily at the site using the same valve housing without dismantling other valve parts.

Disadvantage:

Initial cost of valve with this seal configuration is higher than integral metal seated valves and valves with non integral metal seat may have slightly higher seat leakage rate in comparison to integral metal seated valve.



II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

3. Resilient Seal Seat Retained With Replaceable Retainer Ring :

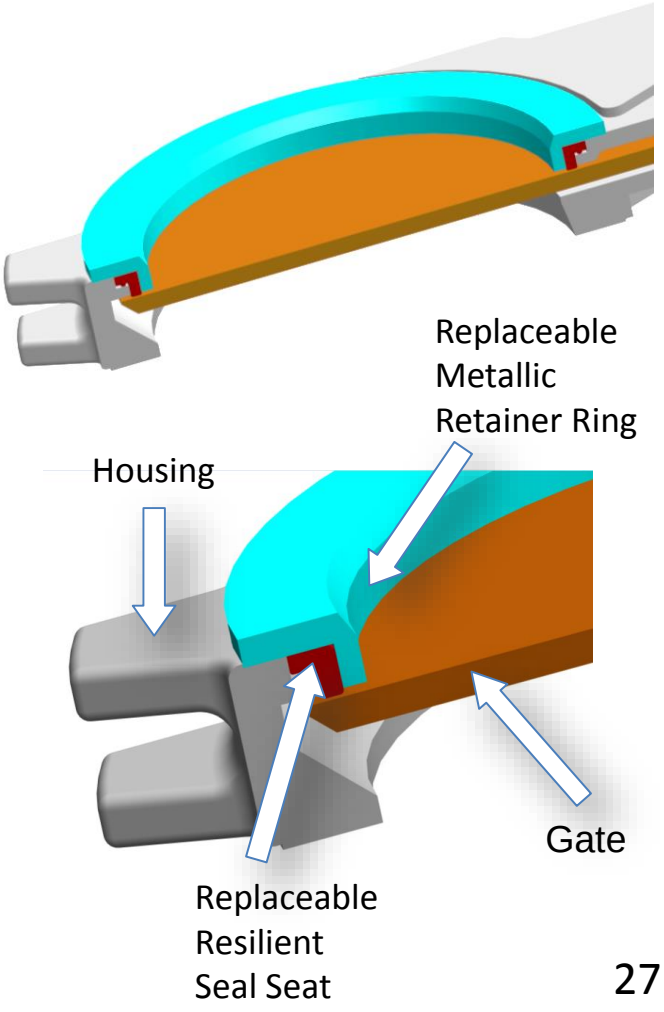
Description:

In this configuration a replaceable resilient seal seat is retained within a replaceable metallic retainer ring bolted to the valve housing by fasteners.

Application:

Valves with this type of sealing configuration are suitable for isolation requirements needing leak tight shut-off and where media has high contents of abrasive or erosive solids. This type of sealing configuration cannot be used in applications where temperature is greater than 250 deg C.

Permissible Leakage: Zero leakage



II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

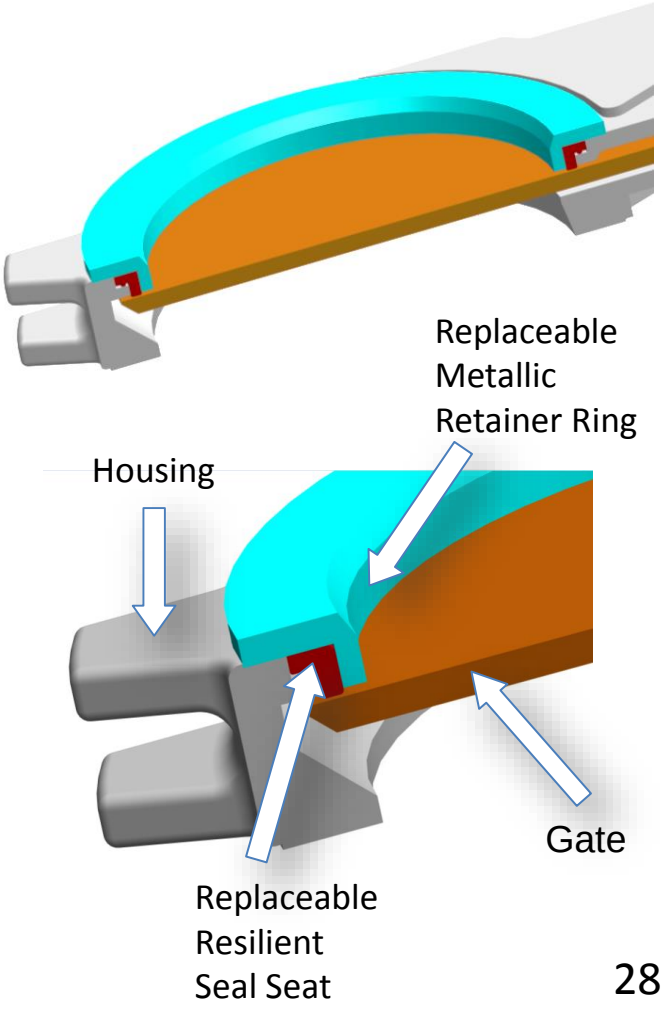
3. Resilient Seal Seat Retained With Replaceable Retainer Ring :

Advantage:

There is no need to replace the complete valve in event of damage to the resilient seal seat or in case of erosion of inner bore face of valve due to material flow. The replaceable resilient seal as well as the metallic retainer ring can be changed at the site using the. same valve housing without dismantling other valve parts. Replacements of these parts do not need any expertise and is very easy.

Disadvantage:

Initial cost of valve with this seal configuration is the highest.

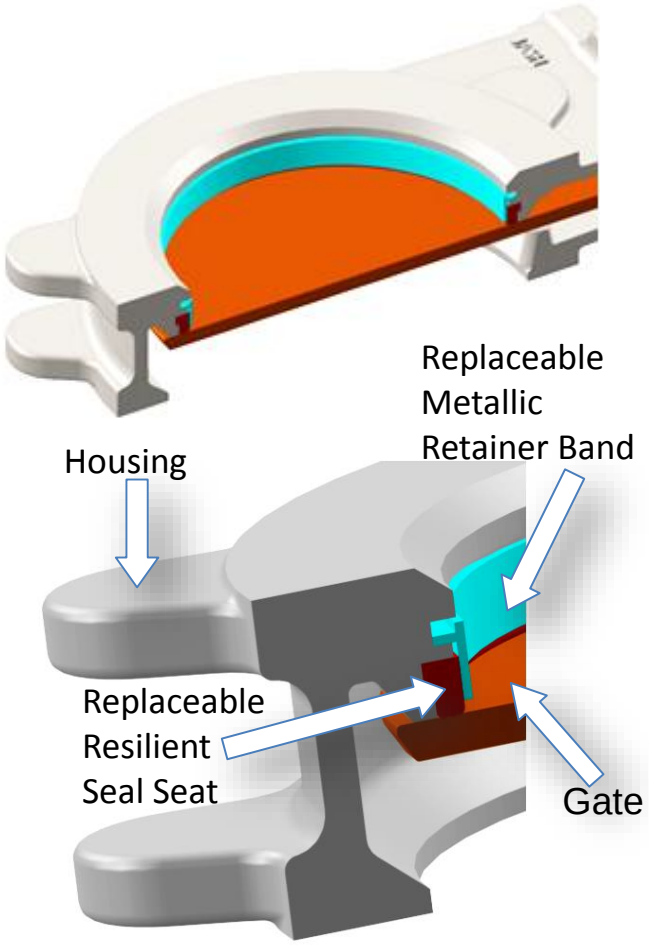


II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

4. Resilient Seal Seat Retained By Metal Strip / Band :

Description:

In this configuration a replaceable resilient seal seat is retained in the housing using a thin 1–2 mm thick stainless steel metallic band / strip located on the inner face of the valve. The seal remains in place because of outward radial pressure exerted by the thin metal band located on the inner bore face.



Application:

Valves with this type of sealing configuration are suitable for isolation requirements needing leak tight shut-off. This type of seating configuration cannot be used in applications where temperature is greater than 250 deg C.

Permissible Leakage: Zero Leakage

II. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON SEALING :

4. Resilient Seal Seat Retained By Metal Strip / Band :

Advantage:

Valves with this sealing configuration are less expensive than valves having replaceable resilient seal encased in replaceable metallic retainer ring. In this case also there is no need to replace the complete valve in event of damage to the resilient seal seat

Disadvantage:

The replacement of seal as well as the metallic strip / band needs dis-assembly of complete valve and special expertise is required in re-fixing the metallic strip / band. Also whenever the resilient seal has to be replaced then the metallic strip / band used to retain the resilient seal has to be replaced as well. So replacement of seals when retained by metallic strip / strip is not as easy as in case of resilient seal retained by a retainer ring. More ever in case of abrasive or erosive media, the thin metallic band/strip located on the inner bore face and in path of flow will be subjected to erosion and so may be required to be frequently replaced irrespective of whether the resilient seal is required to be replaced or not. In worst case scenario, if the inner bore of the valve housing gets eroded on account of material flow, then the whole valve needs to be replaced.

III. TYPE OF KNIFE GATE VALVE REQUIRED BASED ON END STYLE :

The choice of end connections for connecting the valve to its associated pipework is an important aspect while selecting the valve. The types of end connection in general use are as follows:

a. Two lug (semi lug) design valve: Suitable for mounting between pipe flanges (sandwich position)

b. Full lug design valve: Suitable for mounting between pipe flanges (sandwich position) as well as at the end of pipe line without the need of additional flange.

c. Full flanged design valve : Suitable for mounting between pipe flanges (sandwich position) as well as at the end of pipe line without the need of additional flange. This type of end connection is usually preferred for the higher size valve subjected to higher pressure application.

IV. MATERIAL OF CONSTRUCTION OPTIONS BASED ON FLUID TO BE HANDLED:

Type of Fluid / Application	Materials			
	Cast Iron / Ductile Iron	Stainless Steel (304/316)	Stainless Steel Duplex / Super Duplex	Carbon Steel
Raw Water	Suitable with paint coat	Suitable	Suitable	Suitable with paint coat
Drinking / Chlorinated Water	Suitable with NSF approved paint coat	SS-316 L grade stainless steel preferred	SS-316L grade stainless steel preferred	Suitable with paint coat
Sewage	Suitable with epoxy coat	Suitable	Suitable	Suitable with paint coat
Sea Water	C.I with 2% Ni coated with special paint	Duplex steel is suitable	Duplex steel is suitable	Not Suitable
Aggressive Sea Water	High Ni alloy with special paint can be used	Super Duplex steel of PREN value above 40 can be used	Super Duplex steel of PREN value above 40 can be used	Not Suitable

V. SPECIFIC FEATURES TO BE PROVIDED BASED ON INDIVIDUAL VALVE REQUIRMENTS:

S. No.	Special Feature	Why required ?
1.	Bidirectional Seating	Depending upon application some valves are subjected to full applicable pressure from both directions. Such valves are provided with sealing arrangement on either side of gate to achieve bi-directional shut-off.
2.	Deflection Cone	Deflection cone is put in the material flow area to prevent erosion of valve housing in abrasive application. When a deflection cone is not used, the valve housing will get eroded and it is very expensive to replace valve housing in comparison to replacement of deflection cone. Deflection cones are available in Ni-Hard/Alloy Cast Iron construction.
3.	Flush / Purging Ports	Purging / flush ports are provided for cleaning of material trapped in the body cavity. Purge ports are typically placed on the valve chest and bottom of the valve or as required.

V. SPECIFIC FEATURES TO BE PROVIDED BASED ON INDIVIDUAL VALVE REQUIRMENTS:

S. No.	Special Feature	Why required ?
4.	V-Port Design	V-port design valves are used to control the flow of media. This design is offered for throttling applications and incorporates a V notch welded in the material flow area.
5.	Hardening on Seat & Gate	Depending upon application and service conditions, valve components can go through additional processes to increase their life. Processes like hard stellite facing on flow bore area and gate edge is done to prevent surface erosion from the abrasive media. Similarly nitriding, galvanizing, hard chrome plating, nylon coating etc. can be provided on gate plate to prolong its life.
6	Bolt on Bonnet	Non bonneted valves can be provided with provision of bolt on casted or fabricated bonnet to ensure tight sealing to atmosphere.

V. SPECIFIC FEATURES TO BE PROVIDED BASED ON INDIVIDUAL VALVE REQUIRMENTS:

S. No.	Special Feature	Why required ?
7	Protection Cover for Pneumatic / Hydraulic actuated valves.	Non bonneted valves can be provided with gate safety guards to prevent any accidental injury due to the fast moving gate in pneumatically and hydraulically actuated valve.
8	Extended Spindle Arrangement	Extended spindle allows the operator to open or close the valve from a distance. Extended spindle arrangement includes couplings, stem guide bracket, pillars and necessary fasteners.
9	Pipe Hood for Stem	Pipe hood arrangement can be provided to prevent accidental injury due to rising spindle / stem and to cover the spindle threads for protection against damage, dirt, dust, water etc. Pipe hood can be made of transparent fracture resistant polycarbonate material / metallic pipe / plastic pipe.

VI. CHOOSE THE TYPE OF OPERATING ARRANGEMENT FOR SELECTED EQUIPMENT:

Factors influencing selection of operating arrangement	Type of Operating arrangement			
	Manual	Electric	Pneumatic	Hydraulic
Hoisting Capacity	Moderate (upto 35,000 kgs)	High (upto 125,000 kgs)	Low (upto 5,000 kgs)	Virtually Unlimited
Opening / Closing time or speed	From few minutes to few hours or from 10 to 100 mm /minute depending upon height of opening and head.	From few minutes to 15 minutes or from 275 to 400 mm /minute depending upon height of opening and head.	From few seconds to 1 minute minutes or from 2000 to 6000 mm /minute depending upon height of opening.	From few seconds to few minutes or from 275 to 1000 mm /minute depending upon height of opening.
Frequency of Operation	Low	Low / Medium /High	Low / Medium /High	Low / Medium /High

VI. CHOOSE THE TYPE OF OPERATING ARRANGEMENT FOR SELECTED EQUIPMENT:

Factors influencing selection of operating arrangement	Type of Operating arrangement			
	Manual	Electric	Pneumatic	Hydraulic
Manpower requirement	At least 1 to 2 per valve depending upon height of opening and head.	At most 1 for few valves or none in case of remote operation	At most 1 for few valves or none in case of remote operation High	At most 1 for few valves or none in case of remote operation
Emergency Override facility	Portable electric / portable engine driven operator can be given for emergency or faster operation	Manual override available as standard, Portable electric / portable engine driven operator can be given for emergency operation	Manual override can be given for emergency operation	Nitrogen accumulators can be given for emergency operation

VI. CHOOSE THE TYPE OF OPERATING ARRANGEMENT FOR SELECTED EQUIPMENT:

Factors influencing selection of operating arrangement	Type of Operating arrangement			
	Manual	Electric	Pneumatic	Hydraulic
End Position (Open / Close) feedback	Possible with limit switches	Integral with operating system	Possible with limit switches or reed switches	Possible with limit switches
Positioning feedback	Not possible	Possible. Requires moderate additional cost to implement.	Possible. Requires expensive position sensing and precise valving to implement.	Possible. Requires expensive position sensing and precise electro-hydraulic valving to implement.

VI. CHOOSE THE TYPE OF OPERATING ARRANGEMENT FOR SELECTED EQUIPMENT:

Factors influencing selection of operating arrangement	Type of Operating arrangement			
	Manual	Electric	Pneumatic	Hydraulic
Installation ease	Simple installation requiring lesser accuracy	Simple installation requiring good accuracy. All electric operation requires simple wiring.	Simple installation requiring good accuracy.	Critical installation requiring high accuracy. Requires expensive plumbing, filtering, pumps etc.
Maintenance	Practically no maintenance required.	Little maintenance required.	Little maintenance required.	Diligent maintenance required.
Operating Life	High	Up to thousands of cycles at rated load.	Dependent on design and seal wear, usually good.	Dependent on design and seal wear, usually good.

PRODUCT DETAILS

I. KNIFE GATE VALVE TYPE MONO SERIES :

The MONO series Knife gate valves are manufactured by us under collaboration with WECO Armaturen GmbH, Germany. The MONO series valves are bonneted, gland less, low operating torque Knife gate valve for leak tight application from the preferred direction of flow at full applicable pressure and at low pressure from non preferred direction of flow.

These can be installed in any position (Vertical, horizontal, inclined) including in upside down position in clear liquid application. The MONO series Knife gate valve can be used for clear liquids as well as solid liquid mixes and are provided with full bore opening which do not restrict the flow in pipe line.

I. KNIFE GATE VALVE TYPE MONO SERIES :

Salient Features :

a. A lug type wafer design of sleek construction having low face to face distance for mounting in compact installations.

b. Varied sealing configurations such as resilient seal seat retained with replaceable retainer ring and Non integral metal seated.

c. Resilient seated valves offered with replaceable resilient “O” ring seal housed in replaceable metallic seal retainer ring for easy and quick replacement at site.

d. Metal seated valves offered with replaceable metallic seat ring for easy and quick replacement at site.

e. Easy & quick conversion of resilient seated valve to metal seated valve & vice versa by replacing the metallic seal retainer ring.

f. Floating gate design that ensures that the gate does not slide on the seal during opening & closing. At the last millimeters of the closing process the gate is pushed up by wedging so as to achieve face sealing with the full periphery of seal. As a result of this feature the life of resilient seal is much more than any conventional knife gate valve.

I. KNIFE GATE VALVE TYPE MONO SERIES :

Salient Features :

g. Gate having beveled knife-edge at the periphery to cut through solid particles settled at bottom of body and achieve full closure.

h. Gland less design which eliminates the possibility of any leakage from the gland packing area.

i. Provided with purging holes to purge the material retained in valve housing.

j. Very low valve operating torque compared to conventional knife gate valves. Operating torque as low as 1 Kg-m enabling fast operation using single finger up to DN 300 size.

k. Rising spindle or non rising spindle as per requirement.

l. Manual / Pneumatic / Electric actuator / Hydraulic operation as per requirement.

I. KNIFE GATE VALVE TYPE MONO SERIES :

Different Variant of MONO Valves :

- **MONO-A** – MONO-A: PN 10 rated valves in Ductile Iron construction. Valve offered with full lugged design for end of line mounting..
- **MONO-T** – PN 10 rated valves in Cast Stainless Steel construction. Valve offered with full lugged design for end of line mounting..
- **MONO-C** – Cast Iron construction valve for low pressure requirements of 5 bar / 75 PSI CWP. Valve up to DN 300 offered with semi-lugged design for mounting between flanges and valves above DN 300 offered with full lugged design for end of line mounting.

I. KNIFE GATE VALVE TYPE MONO SERIES :

Different Variant of MONO Valves : MONO-A

The MONO-A version Knife gate valves are bonneted, full Lug, gland less valve in Ductile Iron construction complying with AWWA C 520-10 standard. Full lug design enable end of line mounting without the need of additional flange. Mono-A version is having a single piece design up to DN 600 and split body design for higher sized valves.

Standard Technical specifications:

Manufacturer Standards	: As per AWWA C520-10
Lug / flange provision	: Full Lugged up to DN 600
Flange drilling	: Suitable for DIN PN 10 / IS 1538 / BS 4504 as well as ANSI 150 B 16.5
Sealing configuration	: Resilient seal seat retained with replaceable retainer ring as standard, non integral metal seated optional
Pressure rating	: PN 10 up to DN 600
Nominal Size	: DN 80 – DN 600 as standard, higher sizes on request

I. KNIFE GATE VALVE TYPE MONO SERIES :

Different Variant of MONO Valves : MONO-T

The MONO-T version Knife gate valve is bonneted, full lug, glandless valve in Cast Stainless Steel construction complying with AWWA C 520-10 and TAPPI standard. Mono-T version is having a single piece design up to DN150 and split body design above DN150.

Standard Technical specifications:

Manufacturer Standards	: As per AWWA C520-10 / TAPPI
Lug / flange provision	: Full Lugged up to DN 600
Flange drilling	: Suitable for DIN PN 10 / IS 1538 / BS 4504 as well as ANSI 150 B 16.5
Sealing configuration	: Resilient seal seat retained with replaceable retainer ring as standard, non integral metal seated optional
Pressure rating	: PN 10 up to DN 600
Nominal Size	: DN 80 – DN 600 as standard, higher sizes on request

I. KNIFE GATE VALVE TYPE MONO SERIES :

Different Variant of MONO Valves : MONO-C

The MONO-C version Knife gate valves are bonneted, gland less valve in Cast Iron construction designed for low pressure requirements. Mono-C version is having a single piece design up to DN 600 and split body design for higher sized valves.

Standard Technical specifications:

Manufacturer Standards	:	As per JASH standard
Lug / flange provision	:	Full Lugged / Semi lugged up to DN 300, full lugged above DN 300.
Flange drilling	:	Suitable for DIN PN 10 / IS 1538 / BS 4504 as well as 4504 as well as ANSI 150 B 16.5
Sealing configuration	:	Resilient seal seat retained with replaceable retainer ring as standard, non integral metal seated optional
Pressure rating	:	5 Bar / 75 PSI CWP up to DN 600
Nominal Size	:	DN 80 – DN 600 as standard, higher sizes on request

II. KNIFE GATE VALVE TYPE ZFI SERIES :

ZFI series knife gate valves are manufactured by us under collaboration with Schütte Industrieservice Gmbh, Germany. The ZFI series valves are bonnet less Knife gate valves having glands to seal the rear opening in the housing. These valves are suitable for unidirectional application and are leak tight in case of resilient seat valves. Metal seated valves offer leakage within permissible limits as per MSS-SP 81 standards.

These can be installed in vertical / horizontal as well as in inclined position. The ZFI series Knife gate valve can be used for Liquid, solid-liquid mixes / slurries and for dry bulk solids. These are provided with 90% bore opening which minimizes / offers restriction to flow in pipe line.

II. KNIFE GATE VALVE TYPE ZFI SERIES :

Salient Features :

a. A lug type wafer design of sleek construction having low face to face dimension for mounting in compact installation.

b. Varied sealing configurations such as Integral metal seated, resilient seal seat retained with replaceable retainer ring & resilient seal seat retained by metallic band.

c. Sealing achieved by means of integrally cast/welded jams pushing the gate on to the seat for a full face contact between gate and seat.

d. Gate having beveled knife-edge at its front to cut through solid particles settled at bottom of body and achieve full closure.

e. Self lubricated packing for closure of rear opening in the housing.

f. Packing glands provided with pushing arrangement to tighten on the gate and stop the leakage taking place from the rear opening in the housing due to frequent gate operation.

g. Provided with purging holes to purge the material retained in valve housing.

h. Rising spindle or non rising spindle as per requirement.

i. Manual / Pneumatic / Electric actuator / Hydraulic operation as per requirement.

II. KNIFE GATE VALVE TYPE ZFI SERIES :

Different Variant of ZFI Valves :

- **ZFI-M**– Integral metal seated
- **ZFI-S** – Resilient seal seat retained by metallic strip / band.
- **ZFI-SRR** – Resilient seal seat retained with replaceable retainer ring.

II. KNIFE GATE VALVE TYPE ZFI SERIES :

Standard Technical Specifications of ZFI Series:

Manufacturer Standards	: As per MSS SP-81 standard
Lug / flange provision	: Semi lugged up to DN 600, full flanged above DN 600
Flange drilling	: Suitable for DIN PN 10 / IS 1538 / BS 4504 as well as ANSI 150 B 16.5
Sealing Configuration	• Integral metal seated in “ZFI-M” variant. • Resilient seal seat retained with replaceable retainer ring in “ZFI-SRR” variant. • Resilient seal seat retained by metallic strip / band in “ZFI-S” variant. • Non integral metal seated option available on request.
Pressure rating	• For valves with body in Cast Iron - 10 bar CWP up to DN300 and 5 bar CWP for size higher than DN300 up to DN600. • For valves with body in Stainless steel / Cast Ductile iron / Special alloys - 10 bar CWP up to DN600.
Nominal Size	: DN 80 – DN 600 as standard, higher sizes on request

SELECTION OF TYPE OF VALVE BASED ON SPECIFIC FEATURES DESIRED:

Variation	Type of Valve					
	MONO-C	MONO-A	MONO-T	ZFI-M	ZFI-S	ZFI-SRR
Size	Up to DN600	Up to DN600	Up to DN600	Up to DN3000	Up to DN600	Above DN600 to DN3000
Material of Construction	Cast Iron FG260	Ductile Iron	Stainless Steel	Cast Iron Ductile Iron Stainless Steel Cast Steel	Cast Iron Ductile Iron Stainless Steel Cast Steel	Cast Iron Ductile Iron Stainless Steel Cast Steel
Type of Pressure • Unidirectional Pressure	6 bar up to DN600	10 bar up to DN600	10 bar up to DN600	6 bar up to DN600	6 bar up to DN600	6 bar up to DN600 and above DN600 as actual applicable
• Small Bi-directional	3 bar up to DN300	3 bar up to DN300	3 bar up to DN300	Not Possible	Not Possible	Not Possible

SELECTION OF TYPE OF VALVE BASED ON SPECIFIC FEATURES DESIRED:

Variation	Type of Valve					
	MONO-C	MONO-A	MONO-T	ZFI-M	ZFI-S	ZFI-SRR
Type of sealing arrangement						
• Integral Metal Seated	✗	✗	✗	✓	✗	✗
• Non Integral Metal Seated with Replaceable Retainer Ring	✓	✓	✓	✗	✗	✗
• Integral Soft seated	✗	✗	✗	✗	✓	✗
• Non Integral Soft seated with Replaceable Retainer Ring	✓	✓	✓	✗	✗	✓

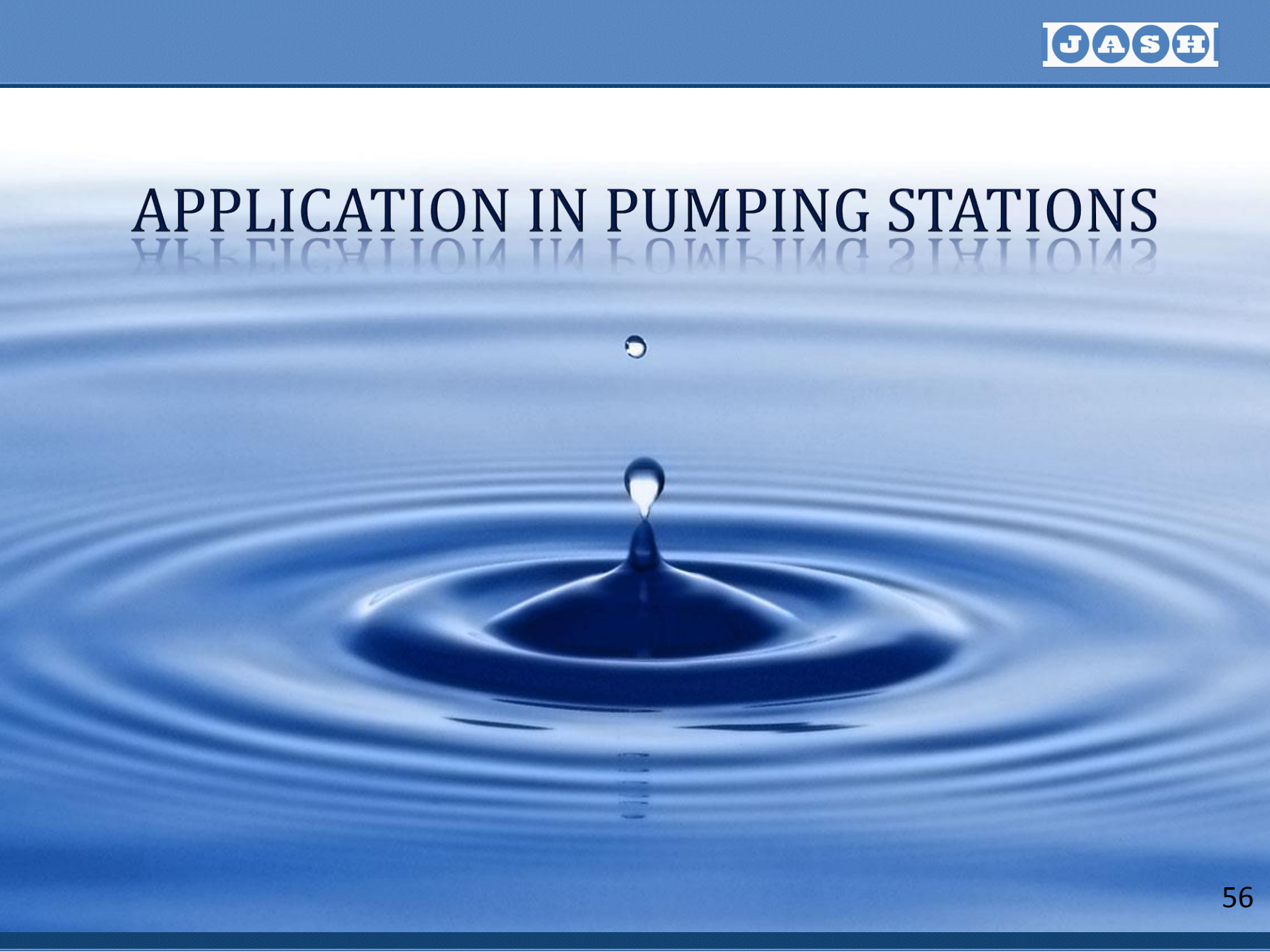
SELECTION OF TYPE OF VALVE BASED ON SPECIFIC FEATURES DESIRED:

Variation	Type of Valve					
	MONO-C	MONO-A	MONO-T	ZFI-M	ZFI-S	ZFI-SRR
• Full bidirectional pressure	Not Possible	Not Possible	Not Possible	Possible with modification	Possible with modification	Possible with modification
Provision of Gland	Glandless can be installed upside down	Glandless can be installed upside down	Glandless can be installed upside down	With Gland	With Gland	With Gland
Operating Torque	Very low finger operated	Very low finger operated	Very low finger operated	High, required two hands to operate	High, required two hands to operate	High, required two hands to operate

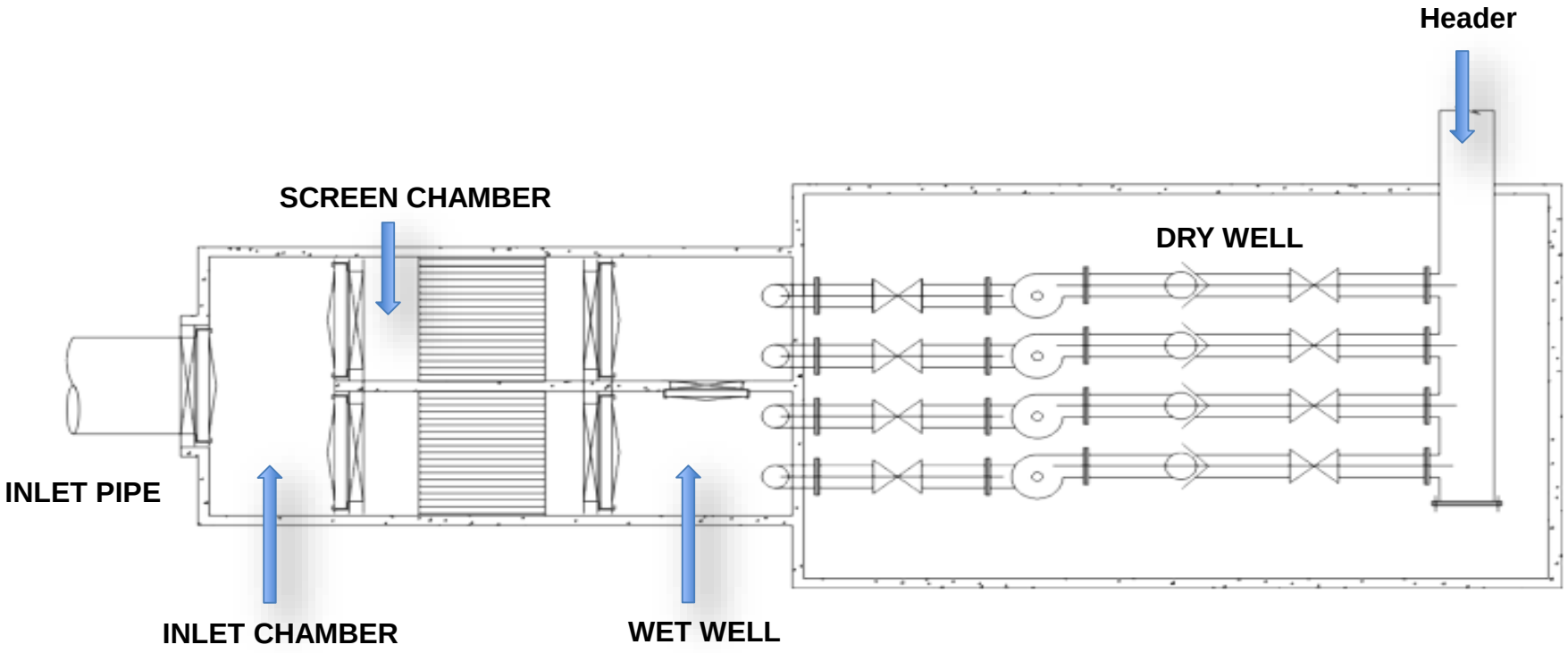
SELECTION OF TYPE OF VALVE BASED ON SPECIFIC FEATURES DESIRED:

Variation	Type of Valve					
	MONO-C	MONO-A	MONO-T	ZFI-M	ZFI-S	ZFI-SRR
Type of Spindle Movement						
• Rising Spindle	✓	✓	✓	✓	✓	✓
• Non Rising Spindle	✓	✓	✓	✓	✓	✓
Mounting Position						
• Thrust on valve	✓	✓	✓	✓	✓	✓
• Thrust on platform	✓	✓	✓	✓	✓	✓

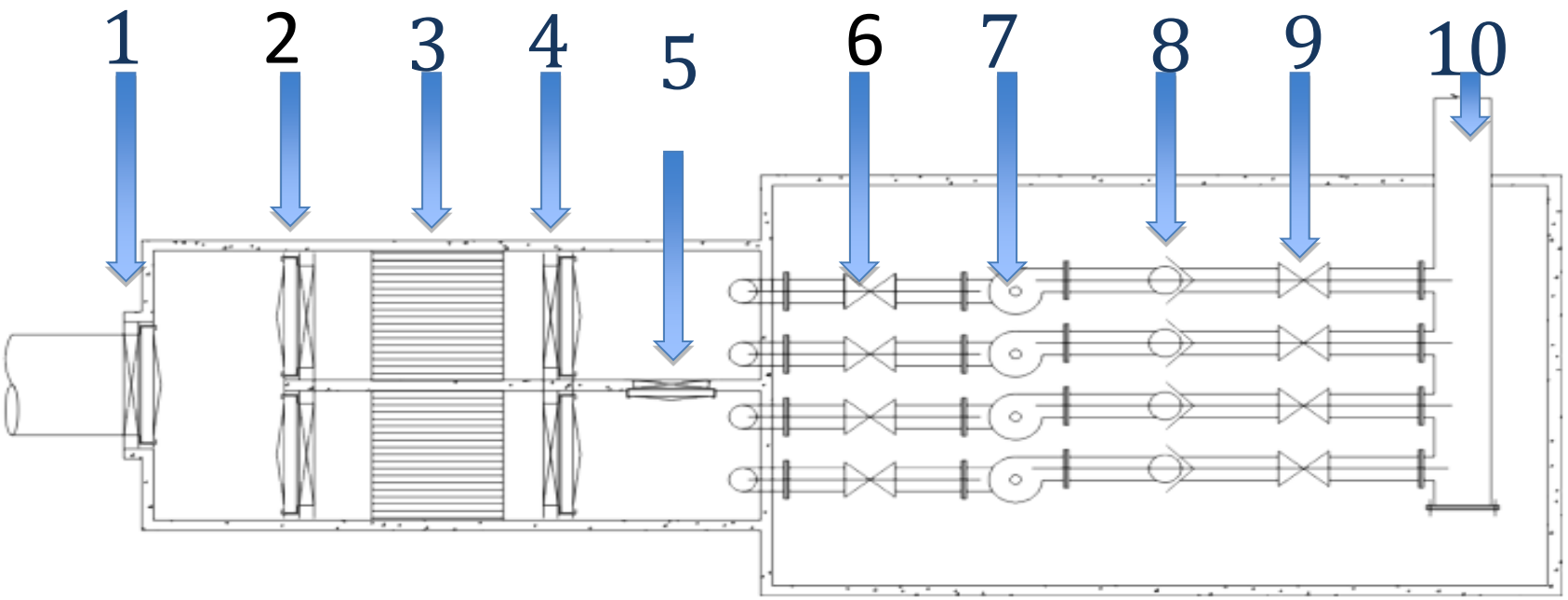
APPLICATION IN PUMPING STATIONS



TYPICAL LAYOUT OF PUMPING STATION



TYPICAL LAYOUT OF PUMPING STATION



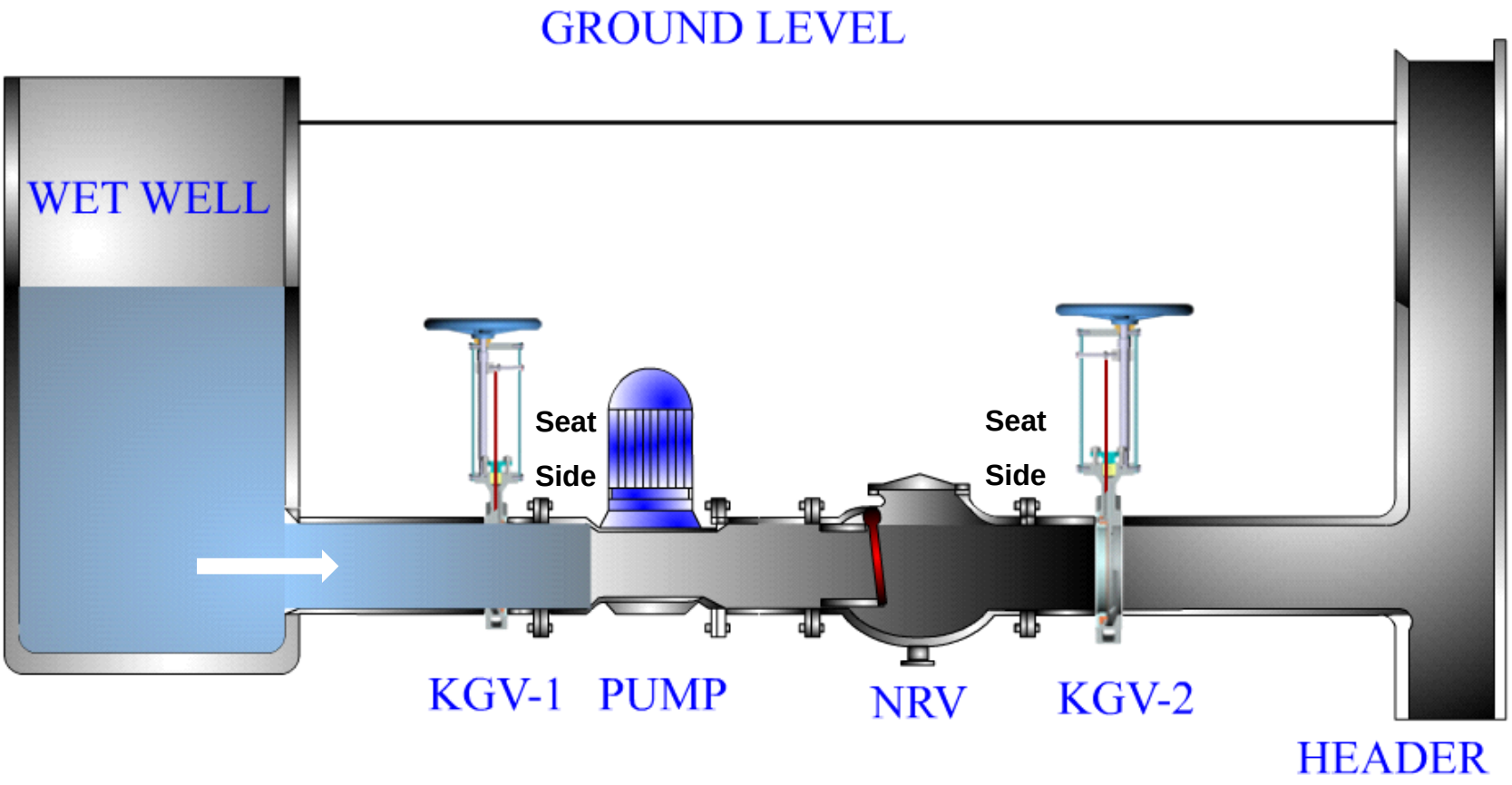
01. INLET GATE (UNSEATING HEAD)
02. SCREEN CHAMBER INLET GATE (SEATING HEAD)
03. COARSE SCREEN
04. SCREEN CHAMBER OUTLET GATE (SEATING HEAD)
05. WET WELL GATE DIVIDING (SEATING HEAD)
06. KNIFE GATE VALVE-1 (SEATING PRESSURE)
07. PUMP
08. NON RETURN VALVE (CHECK VALVE)
09. KNIFE GATE VALVE-2 (SEATING PRESSURE)
10. HEADER

NORMAL WORKING CONDITION

During the normal operation, the pump is running and in this condition the knife gate valve in front of pump, the non return valve after the pump and the Knife gate valves after the non return valve is open.

In this condition the sewage is being transferred from wet well to the sewage treatment plant.

NORMAL WORKING CONDITION

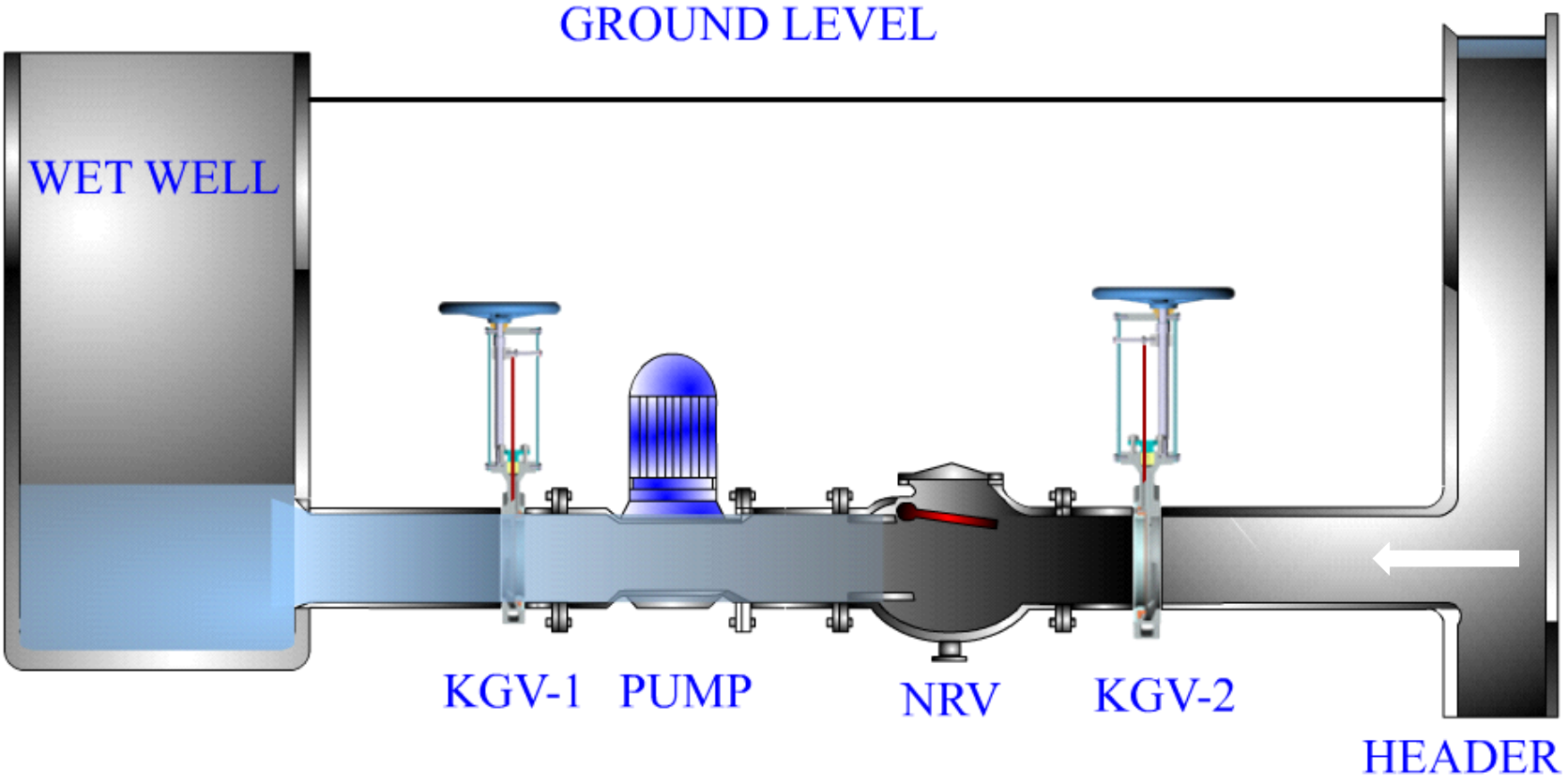


CONDITION -1 (NORMAL WORKING CONDITION)

DURING SWITCH OFF / ABRUPT BREAK DOWN OF PUMP

When the pump is switched off or shuts down due to abrupt breakdown, the Non return (Swing check) valve immediately closes due to the backflow of water available in header.

DURING SWITCH OFF / ABRUPT BREAK DOWN OF PUMP



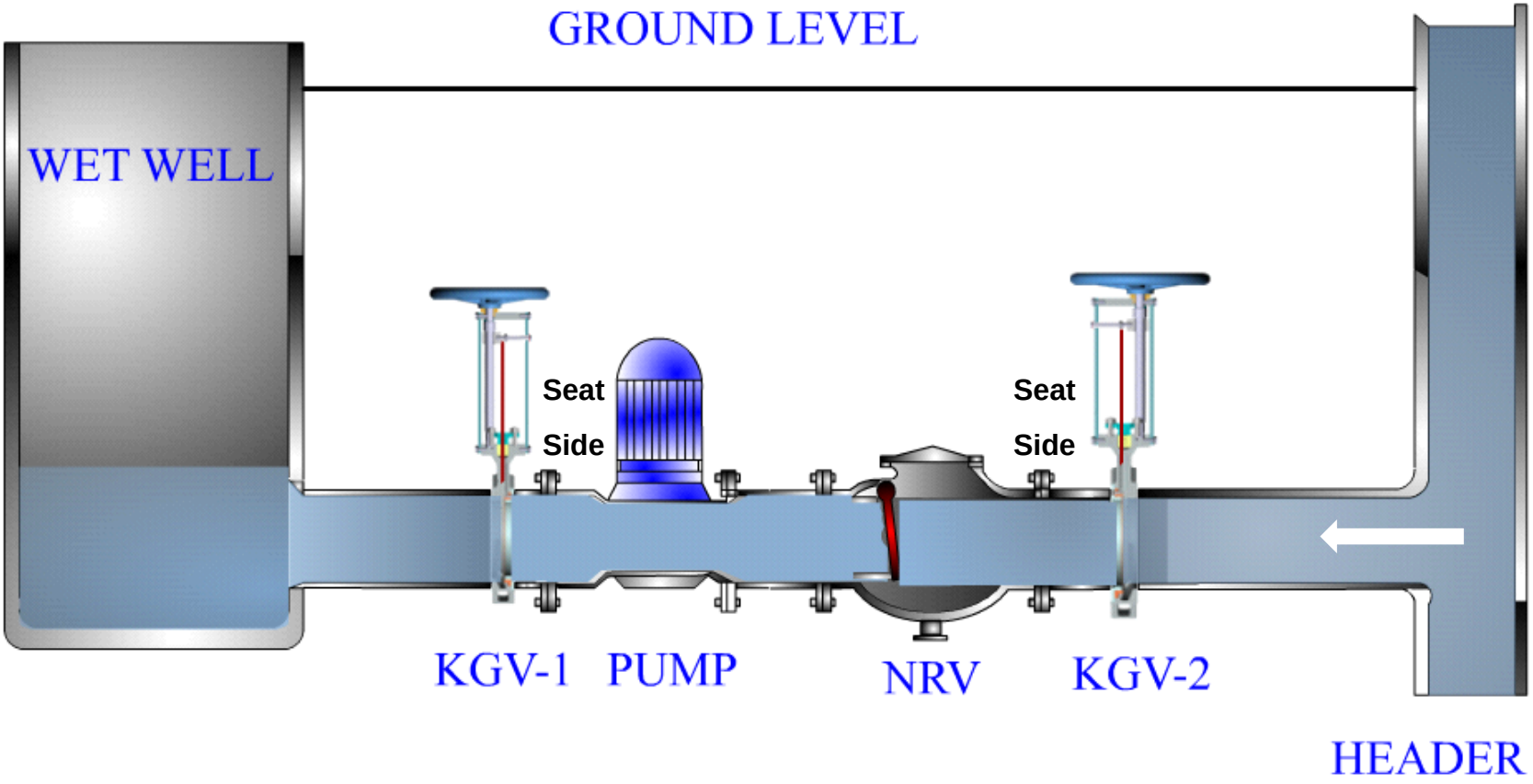
CONDITION -2 (BACK FLOW CONDITION)

DURING MAINTENANCE

The Pump may stop due to breakdown or planned maintenance. As soon as the pump stops, due to the water available in the header, the non-return (swing check) valve shall immediately close.

Thereafter the knife gate valve in front of the pump is closed to isolate the pump from the water coming from wet well and the knife gate valves installed after the non return valve is closed to isolate the non return valve / swing check valve and pump from the water in the header.. Once the pump is isolated the water in it can be removed / drained and the pump can be taken for maintenance.

DURING MAINTENANCE



CONDITION -3 (DURING MAINTENANCE)

We are pleased to support – Contact us !

Thank You

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