

KNIFE GATE VALVE-

for isolation of flow in Sewage pumping stations and treatment plants

Knife gate valves were developed for isolation application in paper and pulp industry and for handling slurry in mining industry. Gradually these valves became popular for use in all those applications where solid liquid mixes were involved.

Knife gate valves are now extensively used in Sewage handling due to its containing silt, grit and floating waste products. Europe and other developed countries adopted these valves for sewage application more than 20 years back but in India these valves did not become popular due to various reasons as under:

- **Lack of knowledge of alternate solution due to lack of awareness regarding suitability, availability and specification of knife gate valves among the consultants and users.**
- Quantum of valves required in sewage industry is very less in comparison to paper pulp, mining, ash and coal handling, sugar industry etc. As a result manufacturers of Knife gate valves focused on the larger market and

did not take due interest in creating awareness and promoting knife gate valves for sewage application.

- Sluice valves are widely used and are very popular in Raw water application and since the water industry is conversant with Sluice valves they prefer to use sluice valves even for sewage applications.
- Most of the clients and consultants specify pressure rating of 10 bars or above for valves required in sewage application since this is the standard pressure rating in sluice valves. Standard Knife gate valves are generally manufactured for lower pressure rating and can be easily used in sewage pumping and treatment application where pressure rarely exceeds 3 bars.

Because of above reasons use of knife gate valves did not become popular in India even though technically these are superior and commercially they are economical in comparison to sluice valves.

How Knife gate valves are superior over Sluice valves:

The superiority of Knife Gate valve can be better established by comparing construction of Sluice valve with the Knife gate valve as described below:

1. Internal construction of the body:

The construction of the body of Sluice valve housing is such that sand, sludge and other impurities get accumulated in the belly / sump.

In case of Knife gate valve, construction of body (housing) is so designed that it avoids accumulation of sludge at the bottom.

2. Construction of the gate:

The gate of Sluice valve is made from cast iron and due to the wedge type design it is very wide at the bottom. Such wide bottomed gate is not able to penetrate the sludge / solids accumulated in belly of body. Hence full closure of gate at all times cannot be ensured while handling solids /semi solids. This results in to severe leakage accompanied with wear of body, gate and seat ring. (See Fig 'A')

Fig 'A'

The gate of Knife gate valve is always made of stainless steel and 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. (See Fig. 'B')

3. Breakdown / maintenance due to design limitations:

In case of Sluice valve there are common incidents of breakage of spindle and spindle nut connection as well as damage to seat rings. This happens because of a) Accumulation of solids in belly of the valve body, which leads to over-torque while closing of valve and resulting into breakage of spindle / spindle nut connection and b) Crushing of settled particles between seat rings of gate and body damaging the seat rings. (Fig 'C')

Fig 'C'

4. Torque and time requirement for opening/closing:

In case of Sluice valve, the torque requirement for opening of valve is very high due to large wedging

action and heavy load of gate. Higher torque requirement leads to higher gear ratios and thereby time required for opening and closing is very high.

In case of Knife gate valve, the torque requirement for opening of valve is comparatively very low since there is very small wedging action and since the gate is light in weight. Lower torque requirement leads to lower gear ratios and thereby time required for opening and closing is also very low.

5. Weight and load on the pipe line:

Sluice valve is very heavy in weight, hence it is very difficult to mount / dis-mount the valve and it also exerts extra load on pipeline and structure. Also the transportation and installation cost is more due to high weight.

The weight of Knife gate valve is less than half of Sluice valve of same size. Hence it is very easy to handle and the load on pipeline and structure also gets reduced resulting into simpler foundation. Lightweight valve also enables reduction in transportation and installation costs.

6. Flange-to- Flange distance:

In case of Sluice valve the flange-to-flange distance is very high. Hence space requirement goes up particularly when many valves are to be used.

Knife gate valve have less than 1/3 flange-to-flange distance in comparison to sluice valves. This reduces the space requirement drastically and enables reduction in

size of the pumping station thereby reducing cost of the project.

7. Capital Cost:

Overall cost for installed Sluice gate valves is higher in comparison to Knife gate valves.

Conclusion:

Sluice valves were basically designed for use in clear water application needing high-pressure shutoff. However, unavailability of alternate solutions led to the use of these valves in applications other than clear water.

Knife gate valves are most ideal for use in application where there are solid – liquid mixes like sewage. In comparison to Sluice valves, Knife gate valves are low in cost, low in maintenance, high in efficiency and better suited for sewage applications.

Future of Knife gate valves:

It is only a few years back that having understood the immense advantages BMC has first adopted Knife gate valves for their some of the sewage pumping stations of Mumbai. Subsequently many municipal authorities followed suit.

Today for sewage application Knife gate valves is the first choice of most of the municipal authorities and consultants across the country. No doubt that shortly Knife gate valve shall replace the Sluice valve totally for all sewage and slurry application.

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