



CHRYSSAFIDIS S.A.

# Tideflex

Tideflex  
Technologies

## ■ Tideflex® Effluent Diffuser Check Valves

### (Advantages of Providing Them on Diffuser Effluent Outfall Lines)

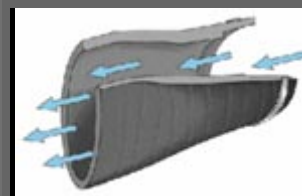
"Diffuser Effluent Outfall Systems" that do not have "Back Flow Preventers" face serious problems, the most important of which are described hereunder.

These problems could be avoided with the use of Tideflex® diffuser check valves.



### ■ Principle of operation:

Minimum internal pressure opens the valve, while,



Minimum back-pressure closes the valve tight

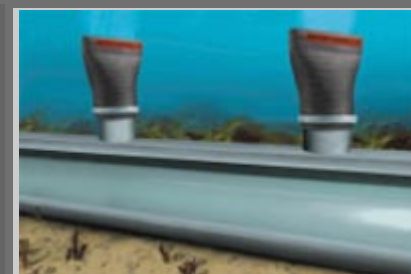


### ■ Piles of Sand, Silt and Stones:

In Outfall Systems without Check Valves, wave action over a period of years results in stone and sand entering the system and creating high piles of stone and sand underneath each nozzle opening. The stone piles restrict the flow even more than 50%. Along with the flow restriction, the stones and silt act as a filter for the effluent resulting in the stones becoming toxic.

### ■ Marine Growth Intrusion:

Without "Back Flow Prevention", critical intrusion of marine growth inside the outfall pipe takes place. This problem alone justifies the use of TF-2 Diffuser Check Valves.



### ■ Outfall Lines Require Costly Flushing:

Without "Back Flow Prevention", outfall lines require periodic purging or flushing to stay clear, often requiring extensive diving operations. Cleaning is time-consuming and clean up cost is excessive, as, besides build up of stones and silt, there is a large amount of marine growth blocking the flow.

### ■ Saline Intrusion:

During low flow conditions, salt water enters the diffuser system, if Diffuser Check Valves are not provided. Because of the higher specific gravity, the salt water intrudes and forms a saline wedge on the bottom of the pipe.

Salt water can block a number of ports, which will upset the internal hydraulics and reduce the dilution efficiency of the diffuser. This can block up to 20% of the flow of effluent in the system. When the volume of effluent from the sewage treatment plants increases, at high flow conditions, the hydraulics are often such that, increased flow volume at gravity pressure is not enough to expel the seawater.

#### **.Salt Water Purging:**

Purging salt water from conventional diffusers often requires flows near the peak capacity of the plant. Tideflex® fitted diffusers purge salt water at very low flow allowing the diffuser to perform efficiently.

#### **.TF-2 Diffuser Check Valves Enhance Jet Velocity:**

The benefits of using the TF-2 engineered Check Valves is they enhance initial dilution. The restriction induced by the TF-2 Check Valve at low flow, increases velocity of the jet stream which improves initial dilution. The TF-2 Check Valve creates an elliptical (flattened) plume which has larger surface area than a circular plume of a pipe nozzle, also enhancing near field mixing. TF-2 Diffuser Check Valves also enable more uniform flow through each nozzle, as opposed to higher flow through the first five or ten nozzles. This is similar to putting your thumb at the end of a garden hose.

#### **.Hydraulic Transients: Reverse Differential Pressure Causing Reverse Flow:**

Pumped outfalls can experience pressure transients when pumps are turned on and off. This can result in ambient seawater, sand, silt, etc. to be drawn into the outfall through the ports. Tideflex® Check Valves prevent intrusion during hydraulic instabilities.

This was not known until videos showed a Tideflex® check valve in an extremely "sucked in" position following a power failure. It was obvious in seeing these videos that, had they not installed a Tideflex® Check Valve, large quantities of salt water, sand and debris would have entered the system.

#### **.Ocean Wave Action:**

An existing diffuser system with TF-2 check valves, at a location in northern Spain, is subject to 50' waves. On the "Down Swing of the Wave" the check valves get pushed down on (i.e. "partially" sucked in). On the "Upswing" the 50' wave force creates a suction effect and pulls a tremendous amount of effluent out of the system. During low flow, the pulling force of large quantities of effluent causes problems by creating air pockets, resulting in water hammer.

Initially it was planned to remove one of the check valves allowing seawater to go into the system to prevent the air pockets. Finally, it was decided to install a check valve in the reverse direction to permit seawater to go into the system. This was a better solution, as, during the times when there are no 50' waves, seawater will not be going into the system through an open pipe. Seawater going into the system will only occur when 50' waves create air pockets. Even though this is an extreme condition (causing air pockets), all diffuser systems subjected to ocean wave action and without Diffuser Check Valves fill with sand and stones.

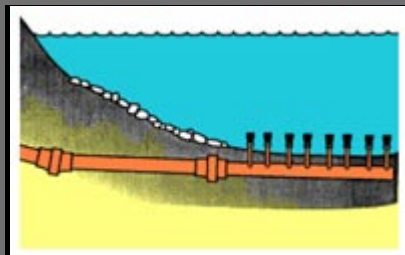
#### **.Outfall Lines as a Standby:**

Building a large, ultramodern sewage treatment plant often leads in abandoning the old diffuser pipeline system. However, since the diffuser pipeline system represents a huge investment, it is preferable to keep the old diffuser system on stand-by, in the event of an emergency breakdown at the sewage treatment plant. This means that the system should be clean for an emergency discharge situation. TF-2 Check Valves are the best solution for this purpose and have been adopted by the City of Hong Kong.

#### **.Vacation Beaches:**

Many outfall lines are installed in cities and towns that depend entirely on the tourist trade for their livelihood. In many of these towns the population increases 4-10 times the normal winter population. During low flow conditions, in the winter, salt water and other debris enter the system.

#### **.Small Costs of Diffuser Valves:**



The small additional cost for Diffuser Check Valves to overcome all of the above "Real Problems" represents no more than a 2% additional cost of the overall project.

The savings that result from avoiding the problems stated above far outweigh the relatively small extra initial cost of installing Diffuser Check Valves.

Furthermore, the TF-2 Diffuser Check Valve is an all-elastomer product, without any moving mechanical parts, and, as such, is not subject to corrosion. No other valve fulfills both of these requirements, making it ideal for underwater service.