

Back-pressure valves for faecal sewage pumping stations

Part II. Examination of back-pressure knee valves

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Introduction

As it has been clarified in the first part of the article (PP1/2006), it is difficult to perform a correct interpretation of the PN-EN 12050-4 and PN-EN 12050-1 standards due to translation mistakes and, in some cases, insufficiently precise and logical regulations.

In order to carry out a correct scope interpretation of the PN-EN 12050-4 standard titled 'Pumping stations in buildings and their surroundings. Part 4: Back-pressure valves for faecal and non-faecal sewage pumping stations', the terms of reference of related standards have to be thoroughly analyzed:

- PN-EN 1074-3 'Waterworks fittings. Operating requirements and control tests. Part 3: Back-pressure equipment'
- PN-EN 12334 'Industrial fittings. Back-pressure cast iron fittings'.

In the PN-EN 1074-3 standard it was stated that it 'does not concern back-pressure fittings meant for environmental protection purposes covered by other standards', while the PN-EN 12334 standard includes a condition saying that the equipment can be used for other purposes, if the functionality-related requirements are met, and if the 'standard does not cover back-pressure fittings preventing from reverse flow of effluents.'

It can be clearly concluded from the above that in terms of back-pressure valves also for faecal sewage, other standards are valid.

The PN-EN 12050-4 standard

This part of the European standard deals with back-pressure valves used together with faecal or non-faecal sewage pumping stations. In this part of the European standard the general terms, basic construction and examination rules are presented,

together with information on materials and evaluation of conformity.

Therefore, it is visible which back-pressure valves are in question, as it has been clearly determined. The title of the standard referring to all parts of the PN-EN 12050-1,2,3,4 standard, 'Pumping stations in buildings and their surroundings', is a bit confusing, yet the contents of the PN-EN 12050-4 standard, together with the remarks located in standards dealing with back-pressure equipment mentioned in the introduction, do not leave any doubts. If we want to use a back-pressure valve in a sewage pumping station, it has to fulfil the requirements determined in the PN-EN 12050-4 standard.

Examination of the valve for faecal sewage (section 8.2.3 of the mentioned standard) is the most difficult test and should be a part of the faecal sewage pumping station examination performed according to section 8.5 or 8.6 of the PN-EN 12050-1 standard.

Evaluation of conformity

1. General terms

In order to ensure conformity with the PN-EN 12050-4 standard, the product must be subjected to the following evaluation procedures:

- Preliminary product examination (type examination),
- Production process control performed by the producer.

2. The preliminary product examination (type examination EN 12050-4)

'Type examination according to section 8, attachment A of the mentioned standard has to be performed in the case of a new product according to the standard regulations in order to ensure conformity with the mentioned standard.



If some parameters have been confirmed by the component supplier, the producer of the pumping station is not obliged to examine them again. Previous examinations can be taken into account, if they have been performed according to the conditions of the mentioned standard (the same product, parameter(s), examination method, sample collection procedure, conformity evaluation procedure, etc.).'

This means that if a producer of back-pressure valves possesses completed type examinations according to section 9.2 of the standard, then in the case of areas which are not required to be examined according to the PN-EN 12050-1, 2 standard (for example network pumping stations), the producer will manage with the examinations performed by companies producing particular pumping station elements (for example back-pressure valves).

On the other hand, a producer of a pumping station included in the type examination procedure according to the PN-EN 12050 - 1,2,3 standard is not any more troubled by the necessity of using valves which might not pass the examination procedure, for example from section 8.5 or 8.6 of the PN-EN 12050-1 standard (faecal sewage pumping stations meant for waste water drainage from buildings and their surroundings, placed above the flooding level, in order to secure the buildings and their environment from reverse flow).

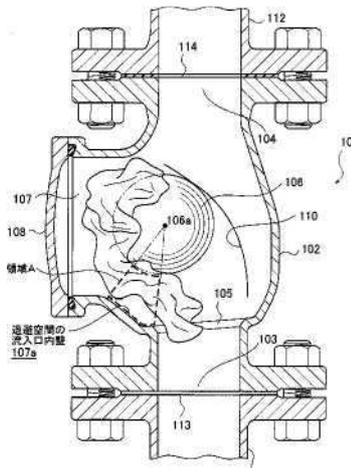
This is particularly important due to the conformity evaluation procedure, section 9.4 of the PN-EN 12050-4 standard: 'Products not conforming with requirements: All products not compatible with requirements have to be kept away and excluded from supplies. Additionally the following procedure should be issued as an instruction on the way they should be handled: If during a local production quality control products incompatible with the requirements are detected, the producer should examine the cause of the damage and take necessary countermeasures, for example stop the production causing the fault(s) and/or remove the faulty product. Only after deep examination and correction of the mistake, as well as completion of the next control with a positive result can the assessors make the decision to initiate production.'

Therefore, virtually almost 100% effectiveness is required in the case of such sewage pumping station elements as pumps or back-pressure. These are the crucial elements of the highest failure risk.

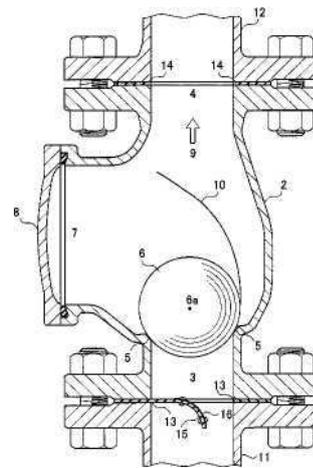
An important element of back-pressure valve examination is the noise level emitted in the air only by the back-pressure valve, measured at 0.7 m/s of flow speed and with a water closure creating a 2 m high column of water over the outlet. 'If it is required or if the noise level is higher than 70 dB, it is necessary to perform an examination according to EN 12639:2000. Additionally, if the acoustic pressure level determined with method A is higher than 80dB, the level of acoustic power also has to be shown. If the acoustic power is lower than 70 dB, the producer can declare it to be 70dB without the necessity to perform examinations, unless he claims the value is lower. In such situations, examinations according to EN 12639:2000 have to be carried out, and the value has to be declared according to their results'.

Summary

Examination of the valve for faecal sewage (section 8.2.3 of the mentioned standard) is the most difficult test and consists of effective passing of the test material



Pic. 1 Valve blockage [6]



Pic. 2. The valve according to the patent application[6]

(0.4 m x 0.25 m floor canvas at 0.7 m/s of flow speed in the outlet line) through the tested back-pressure valve.

Precisely due to this reason, the analysis of the state of technology included in the article titled 'Back-pressure ball valves for contaminated liquids' (PP2/2005) has proved to be accurate. As it was claimed, 'However, such a solution is not exactly appropriate for faecal sewage, as solids in the waste water can quickly block the ball in its fully opened position, as the ball is intensively washed by them from all the sides.' The solution of a Japanese company presented in picture 2 of the quoted article can be treated as a confirmation of this thesis. The rest of the scenario was written by 'life itself', mainly the experience of the company in question. The company has published an improvement of the valve in the next patent applications nr JP2005291357 [6] from 2005, aiming at prevention of blockages caused by large pieces of material.

At the same time, a case of a stuck valve was presented, as in picture 1. An improvement was presented, which had to prevent the current inclination from blocking the flow in the direction opposite to ball movement at the moment of valve opening. The solution is based on an appropriately profiled and balanced flap located on the collar joint of the inlet with the incoming pipeline, as presented in picture 2. The mentioned flap directs the flow current in the direction opposite to the ball inclination from the closed position. This solution is forced by faulty valve activity, and it is not the final solution to the problem. It is not strange that Japanese engineers could not invent anything more simple and effective on such short notice.

The author of this article has spent almost 10 years finding a simple and effective solution to this problem. Type examinations performed for back-pressure and ball knee valves of the SZUSTER system by a third party have proved 100% success of the valves in a difficult test, and in the above described conditions. In summary it can be said, that 'the impossible has become possible.'

SOURCES;

1. PN-EN 12050-1, 2, 3, 4 standards
2. EN 12050-4 [2]
4. PN-EN 1074-3 'Waterworks fittings. Functionality requirements and controlling examination. Part 3: Back-pressure fittings'.
5. PN-EN 12334 'Industrial fittings. Back-pressure cast iron fittings'.
6. Japanese invention application no. JP2005291357 published on 10th of October 2005.

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