Leverage for Rainwaterutilization

The Testresults of the new INTEWA hydraulic jump filters demonstrate the advantages in function

1 Conceptual formulation

INTEWA Ingenieurgesellschaft für Energie- und Wassertechnik mbH, Aachen authorized the Forschungsstelle Wasserwirtschaft und Umwelt (fwu) at the university of Siegen with the analysis of function and dimensioning of the hydraulic jump filter systems. In this abstract there are the most important results centralized. The following filter systems were to be analysed:

WSP150	roof areas from 300 up to 1000 m²
WSP200	roof areas from 1000 up to 2000 m²
WSP300	roof areas from 2000 up to 4000 m²
WSP400	roof areas from 4000 up to 6000 m²

2 Experimental setup

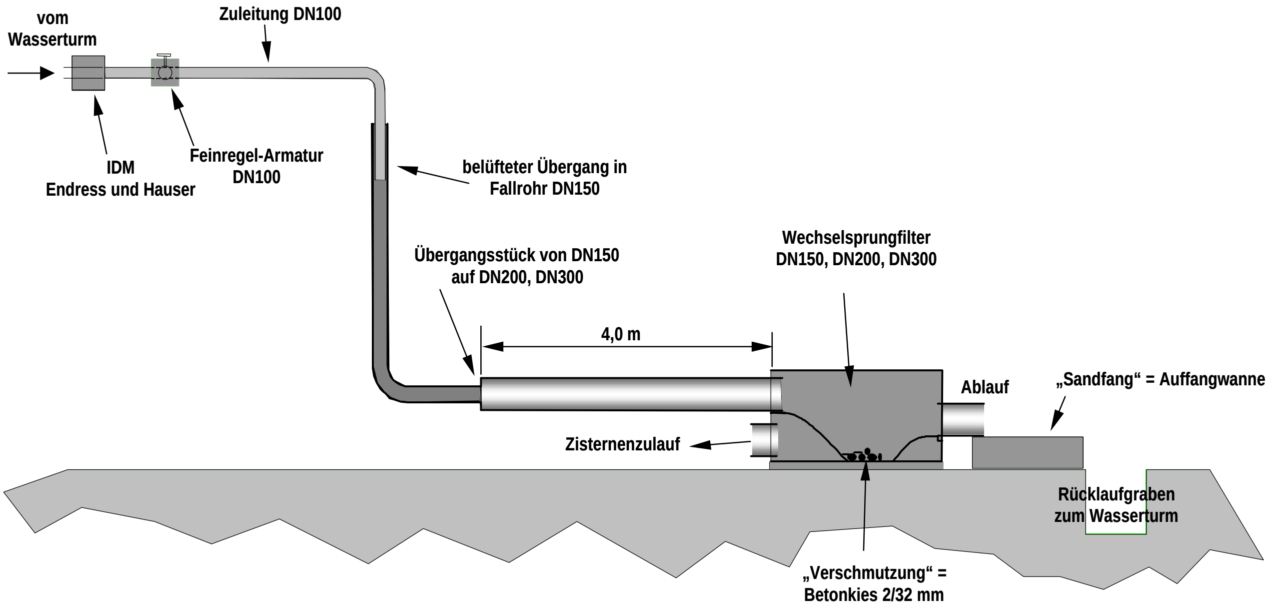

Figure 1: Experimental setup for the acceptance test of the INTEWA hydraulic jump filter

To proof the function of the filtration each of the filters were contaminated with 3,5 kg Sand-stone-composite 0,5 < d < 32mm.

Figure 2: Size of the biggest stones of the sand-stones-composit for the contamination of the INTEWA hydraulic jump filter(Rasterweite 1,0 cm)

The replacement of organic pollution by the sand-stones-composite is like an extreme situation for the filtersystem, which will likely not appear in the oridinary application of the filtersystem. There is a much bigger shearstress needed for the transport of the stones than for the transport of the organic sinking. If stones of this size are rinsed out while heavy rainfall activates the selfcleaning function of the filter it can be assumed that the light organic particles are rinsed out with no problems.

Results of the INTEWA hydraulic jump filters in the tests:

2.1 Nominal filterwidth DN 150

The filter made of Polyethylen is for roof areas from 300 m² < A < 1000 m². The filter is to connect with standard installation pipes (KG-pipe DN 150).

Figure 3: Filter DN 100, $Q_{150,F}$ = 2,7 l/s (waterlevel reaches the height of the outlet)

Figure 4: Filter DN 150, $Q_{150,F}$ = 6,0 l/s (hydraulic jump is active, the first stones are rinsed out)

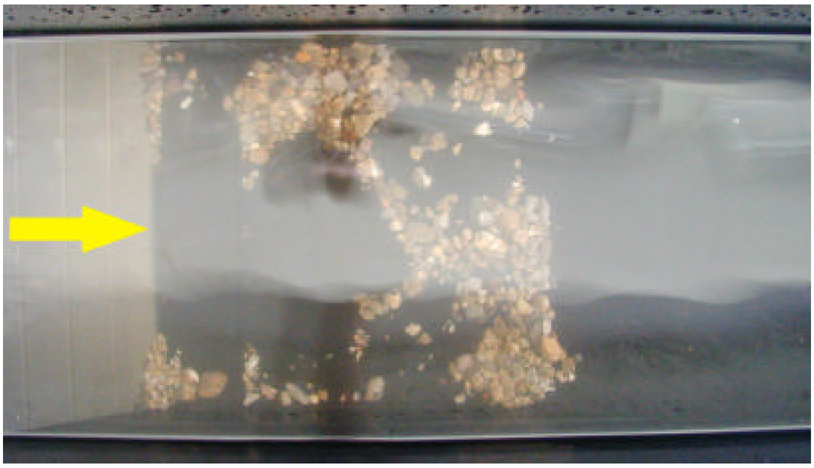

Figure 5: Filter DN 150, after 30 Seconds with flow of Q=9,0 l/s the filter is extensively cleaned (from 3,5 kg stone-sand-composite 150g are remaining)

2.2 Nominal filterwidth DN 200

The filter is for roof areas from 1000 m² < A < 2000 m². The filter is to connect with standard installation pipes (KG-pipe DN 200).

Figure 6: Filter DN 200, Q200,F = 5,5 l/s (waterlevel reaches the height of the outlet)

Figure 7: Filter DN 200, after 30 seconds with a flow of Q =11,0 l/s the filter is extensively cleaned (from 3,5 kg stone-sand-composite 300g are remaining)

2.3 Nominal filterwidth DN 300

The second largest INTEWA filter is for roof areas from 2000 m² < A < 4000 m². The filter is to connect with standard installation pipes (KG-pipe DN 300).

Figure 8: Filter DN 300, Q300,F = 7,4 l/s (waterlevel reaches the height of the outlet)

The hydraulic jump in the filter is full activated by a flow of 15,0 l/s < Q < 18,0 l/s. After 45 seconds with a flow of 18,0 l/s the contaminations (3,5 kg „stone-sand-composit“) are completely rinsed out of the systems except for several stones.

Figure 9: Filter DN 300, Q = 18,0 l/s, very strong hydraulic jump in the filter chassis

3 Abstract

To analyse the function of the INTEWA hydraulic jump filters the university of Siegen installed an experimental setup as shown in figure 1 (fwu). The inlet is simulated ba a pipe DN 100 filled by the watertower. With this experimental setup flows up to 30 l/s can be made available durable.

To test the cleaning function of the filtersystem, the each filter was contaminated with 3,5 kg sand-stone-composite 0,5 < d < 32mm.

For the present term DIN EN 12056, part 3 is to be considered.

The analysis show, that the hydraulic jump filters are working very well. Particularly the self cleaning function of the filters could be approved. The biggest hydraulic jump filter DN400 couldn’t be tested completely, since the experimental setup could provide max. 30 l/s flow.

As well as the small WSP100 filters an excellent overall efficiency of more than 97% can be assumed to the big filtersystems, since the light rainfalls are collected with 100 % efficiency.