

POROČILO O PRESKUŠANJU / TEST REPORT

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Št. poročila / Report no. 41 - LCPP - 2022

Naslovník

Address

Dimitrije Stopar

Naročnik

Customer

MARK ECO TRADE GmbH

Neubaugasse 24/1,
A-8020 Graz, Austria

Vzorec

Sample

TUBE

Datum sprejema

Sample received

18.05.2022

Rezultati

Results

Analysis results are given on page 2 to 4

Opozorilo

Warning

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The test results refer exclusively to the tested sample.

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Opomba

Remark

Datum izdaje poročila

Date of report

26.09.2022

Analizo izvedel / Performed by



dr. Jasna TOMPA

Vodja preskušanja / Head of testing



Predstojnica inštituta / Head of Institute

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red. prof. dr. Olivera ŠAUPERL

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red. prof. dr. Simona STRNAD

Rezultati analize

Analysis results

Test apparatus: MARK ECO SYSTEMS (MES). 310 mm long tube with a rectangular inner tube of 18 mm x 8 mm. The shell is made of stainless steel. The mechanism is located between the inner tube and the outer casing and is a trade secret of the supplier. The device is designed for installation on a water pipe, either directly on the pipe or with a closed-circuit tank to which the device is connected with a constant flow pump. The latter is used in industrial applications.

Installation: The test device MES (Fig. 1) was installed in a closed circuit on a 10-liter tank with a pump and a control valve to achieve a constant flow of 600 liters per hour (see Figure 2), as this is the value proposed by the supplier.



Figure 1: Test device MES

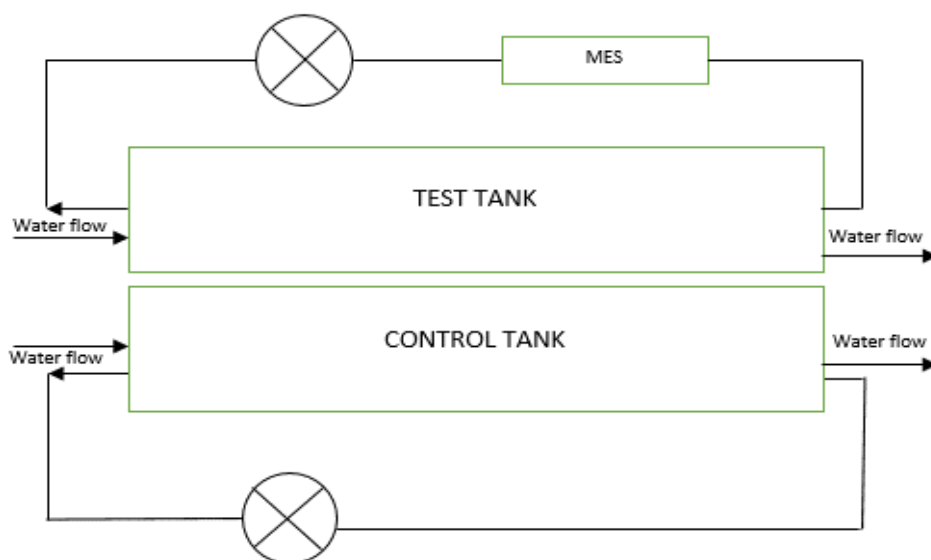


Figure 2: MES installation (schematic)

Procedure: The pipe with limescale was cut into eight similar pieces 2 cm long (see example in Fig. 3), four pieces for MES testing and four pieces for control testing; each piece was weighed before and after the test (laboratory balance, accuracy ± 0.0001 g). The pumps ran for 84 days for nine hours between 7:00 a.m. and 4:00 p.m. (i.e., 756 hours until a significant change was visually detected), controlled by a simple mechanical timer. The water used throughout the test was taken from the Maribor Waterworks (Mariborski vodovod). The water hardness was between 16.1 °N and 16.8 °N, and the temperature was between 15.4 °C and 16.7 °C.



Figure3: Example of preparation of a test piece of the pipe

Results

The measurement results are summarized in Tables 1-2.

Table 1: MES Test; mass before and after decalcification in g, mass loss in g and mass loss in %.

MES_Before testing	Sample	Mass/g	MES_After testing	Sample	Mass/g	Mass decrease/g	Mass loss/%		
	1	16.3534		1	15.3567	0.9967	6.09		
	2	19.7210		2	18.4609	1.2601	6.39		
	3	14.9123		3	12.9131	1.9992	13.41		
	4	20.9134		4	19.8502	1.0632	5.08		
	Total mass/g	71.9001		Total mass/g	66.5809	Total mass decrease/g	5.3192	Total mass loss/%	7.40

Table 2: Control Test; mass before and after limescale removal in g, mass loss in g and mass loss in %.

Control_Before testing	Sample	Mass/g	Control_After testing	Sample	Mass/g	Mass decrease/g	Mass loss/%		
	5	19.8231		5	19.8230	0.0001	0.00		
	6	17.5173		6	17.4123	0.1050	0.60		
	7	17.0561		7	17.0237	0.0324	0.19		
	8	16.1224		8	15.9014	0.2210	1.37		
	Total mass/g	70.5189		Total mass/g	70.1604	Total mass decrease/g	0.3585	Total mass loss/%	0.51

In the test procedure, the total weight of the samples

- was reduced from 71.9001 g to 66.5809 g by using MES, which corresponds to a difference of 5.3192 g, or 7.40 %.

- in the control, the total weight of the parts was reduced from 70.5189 g to 70.1604 g, which corresponds to a difference of 0.3585 g, i.e., 0.51 %.