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THE EFFICIENCY ANALYSIS OF ROTATING NOZZLE WITH HANDHELD ON FLAT SURFACE CLEANING WORK

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ABSTRACT

With handheld on flat surface cleaning work, for improvement the working efficiency of the cleaning work, usually use the fan jet nozzle, the self-rotating tube nozzle, high performance orbital jet nozzle with powered rotation nozzle. Through the test campaign with the same conditions of pressure, flow rate. This article analyzing the working efficiency for the different rotation nozzles.

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FOREWORD

With handheld on flat surface cleaning work, for improvement the working efficiency of the cleaning work, usually select to use the fan jet nozzle, the self-rotating tube nozzle, high performance orbital jet nozzle with powered rotation nozzle. Through the test campaign with the same conditions of pressure, distance of target, moving speed and similar flow rate. This article will be try to analyzing and compare the working efficiency for the different rotation nozzles.

1 . TEST TOOLS

This test has used an ETC2000-1- LS (see the figure 1) of WOMA Apparatebau GmbH / Germany, That tools can be divided into two parts including the high pressure fixture and reciprocating motion mechanism droved by pneumatic Motor.

figure 1 Test tools

The high pressure fixture used for fix the high pressure tube for infuse the high pressure liquid. Lower end of the tube has equipped with the testing nozzles, upper end has connected with the high pressure water jet system by HP hose. The high pressure fixture can be adjust the distance between nozzle head with cleaning surface and also can be adjust the included angle between nozzle head with cleaning surface.

Reciprocating motion mechanism droved by pneumatic motor. Its pilot wheel along the slideway for reciprocating rectilinear motion .The speed of reciprocating motion can be control by adjust input tolerance of compress air of air motor.

The high pressure water jet system is WOMA's TWIN JET high pressure system.
Working pressure is 2000 bar and flow rate is 20 l/min.

2 . TEST NOZZLES

This test has select to use 4 different type spray nozzles.
1). Fan jet nozzle: model form 19, nozzle Ø 1 mm, jet angle 20 ° (see the figure 2).

2). The self-rotating tube nozzle: model ORBIMASTER 2500, nozzle Ø 0.85 mm. Jet angle 20° (see the figure 3).

figure 2 Fan jet nozzle

figure 3 The self-rotating tube nozzle

3). The powered rotation nozzle: model SPEEDY 2000, install 8 pieces form 21 nozzle, nozzle Ø0.35 mm (see the figure 4).

4). The high performance orbital jet nozzle: model TURBO nozzle TD2000, install 6 pieces form 21 nozzle, including 3 pieces nozzle Ø 0.4 mm / 2 pieces nozzle Ø 0.35 mm / 1 piece nozzle Ø 0.5 mm (see the figure 5).

figure 4 The powered rotation nozzle

figure 5 The high performance orbital jet nozzle

3 . TEST RESULT

During the test, the included angle between water jet with the direction of reciprocating motion all are 1000. This test including the painting remove on the steel surface, the painting remove on the concrete surface and rust remove on the steel surface and so on 3 items.

1). Painting remove on the steel surface.

Distance of target: 50 mm

No.	Nozzle type	Testing pressure bar	Result of paint remove	Width of Remove coat
1	ORBIMASTER	500	Remove 60% of surface layer paint	20 mm
		600	Remove 90% of surface layer paint	
		700	Remove 10% of priming paint	
		800	Remove 30% of priming paint	
		900	Remove 50% of priming paint	
		1000	Remove 80% of priming paint	
		1100	Remove 90% of priming paint	
		1200	Remove 100% of priming paint	
2	SPEEDY 2000	500	Remove 70% of priming paint	70 mm
		600	Remove 90% of priming paint	
		700	Remove 95% of priming paint	
		800	Remove 100% of priming paint	
3	Fan nozzle	500	Remove 90% of priming paint	34 mm
		600	Remove 95% of priming paint	
		700	Remove 100% of priming paint	
4	TURBO nozzle	1200	Remove 100% of priming paint	78 mm

2). Painting remove on the concrete surface
Distance of target: 75 mm

No.	Nozzle type	Testing pressure bar	Result of paint remove	Width of Remove coat
1	ORBIMASTER	500	Remove 80% of paint	20 mm
		600	Remove 95% of paint	
		700	Remove 100% of paint	
2	SPEEDY 2000	500	Remove 100% of paint	70 mm
3		500	Remove 100% of paint	34 mm

3). Rust remove on the steel surface
Distance of target: 50 mm

No.	Nozzle type	Testing pressure bar	Result of rust remove	Width of Remove coat
1	ORBIMASTER	1000	Almost remove rust on the surface	20 mm
		1200	Remove 100% rust on the surface	
		1400	The verge of corrosive pitting are bright	
		1600	20% corrosive pitting are bright	
		1800	60% corrosive pitting are bright	
		2000	80% corrosive pitting are bright	
2	TURBO NOZZLE	1700	The verge of corrosive pitting are bright	
		1800	20% corrosive pitting are bright	78 mm
		1900	60% corrosive pitting are bright	
		2000	80% corrosive pitting are bright	
3	SPEEDY 2000	1700	The verge of corrosive pitting are bright	70 mm
		1800	20% corrosive pitting are bright	
		1900	60% corrosive pitting are bright	
		2000	80% corrosive pitting are bright	

4 . ANALYSIS OF THE TESTING RESULT

According to the testing result, we get to know when the pressure is lower than 1200 bar, high performance orbital jet nozzle (TURBO nozzle) can not rotating by its self, because the reacting force is too small, so we can't compare its working efficiency. Therefore, when the pressure is lower than 1200 bar, the working efficiency of SPEEDY 2000 is the highest, because the work widths of SPEEDY 2000 can amount to 70 mm. when the pressure is up than 1200 bar, the working efficiency of high performance orbital jet nozzle (TURBO nozzle) is the highest, because its work widths can amount to 78 mm.