Bristle-Blast Surface Preparation Process for Reduced Environmental Contamination and Improved Health/Safety Management

Summary of OSEA Paper, Lukas Janotta, M.Sc. RWTH

This Abstract summarizes Professor Stango's work presented at the OSEA International Oil & Gas Industry Conference 2010 in Singapore comparing Bristle Blasting to the grit blasting process and needle scalers as viewed from an occupational safety and health perspective. All three of these processes are capable of simultaneously removing surface contamination, exposing base metal and generating appropriate surface profiles for subsequently applied coatings. [1]

Needle scalers – also known as needle guns – are percussive power hand-tools with rapidly vibrating small diameter rods. The tool oscillates with frequencies ranging from 2,700 to 4,500 strikes per minute and reaches a noise level of 109 dB(A), which is well above the OSHA threshold level of 85 dB(A) requiring protection for the user and the workers nearby area. Mean forces exerted by the operator-tool system can rise up to 75 N (17 lb). Moreover, the power tool induced vibrations range between 10.9 and 28.7 m/s², which can lead to serious health disorders associated with the hand-arm vibration syndrome (HAVS). [2, 3]

Grit blasting processes are characterized by a high-speed particle stream of granular media (i.e., steel, coal slag, etc.) that repeatedly impacts and erodes the target surface. However, grit blasting processes produce hazardous dust and residues, which demand considerable personal protective equipment such as encapsulated control-suits, dust-filtering devices as well as fresh air that must be supplied from a remote source. Throughout the cleaning operation, workers have to sustain a steady reaction force of approximately 88 N (20 lb) that results in operator fatigue. In addition, noise levels up to 119 dB(A) are often encountered, which necessitate the use of ear protection. [4, 5]

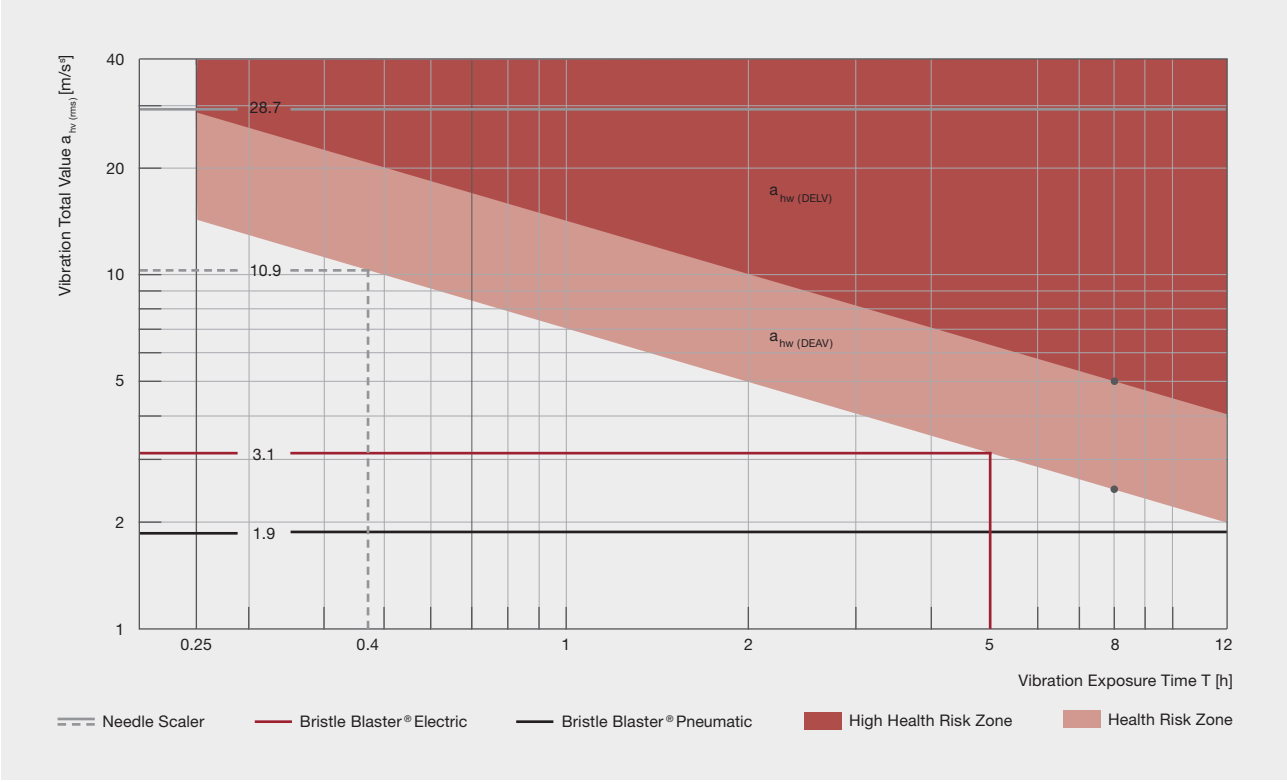

Figure 1: Relationship between the magnitude of tool vibratory acceleration and the worker's exposure time [7]

The Bristle Blasting process generates crater-like micro-indentations showing results of surface conditions meeting SSPC's cleanliness standard SP 5 (white metal) with anchor profiles up to 84 µm. In contrast to needle scalers and grit blasting processes, noise levels emitted during Bristle Blasting processes are below OSHA's threshold level – approx. 83.5 dB(A) – with mean operating forces of 20 N (4.5 lb).
While the electric power tool issues an acceleration of 3.1 m/s², the acceleration of the pneumatically powered tool is 1.9 m/s². Consequently, the latter does not pose a health risk to the user for any period of use according to the standard published by ANSI. Figure 1 shows the relationship between the magnitude of tool vibratory acceleration and the worker's exposure time.

In the best case, onset of health risk for needle scalers occurs within ½ hour of daily use, whereas electric driven Bristle Blasters® can be used for up to 5 hours of continuous use without the risk of injury. [6, 7]

Key Facts

- Simultaneous surface cleaning and profiling
- Noise emission below threshold level
- Low-fatigue work relative to operating forces
- Least exposure to harmful vibration and minimal health risk

References: [1] Stango, R.J., "Bristle-Blast Surface Preparation Process for Reduced Environmental Contamination and Improved Health/Safety Management". In OSEA International Oil and Gas Industry Conference 2010, Singapore, p. 16 | [2] Ibid., p. 6 | [3] Ibid., p. 7 | [4] Ibid., p. 3 | [5] Ibid., p. 4 [6] Ibid., p. 8 | [7] Ibid., p. 11

MONTI - Werkzeuge GmbH
Headquarter
Hennef | Germany
T +49 (0) 2242 9090 630
info@monti.de
www.monti.de

MONTI Tools Inc.
North American Corporate Office
Houston | TX | USA
T +1 832 623 7970
info@monti-tools.com
www.monti-tools.com

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