Technische Universität Dresden

FlexNozzle

Nozzle with pressure-controlled spray pattern

Technology Offer

Institute of Natural Materials Technology
Dresden University of Technology

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Excellence Center for Innovation, Transfer and Entrepreneurship

1. State of the Art and its Disadvantages

In the food, pharmaceutical, and cosmetics industries, cleaning of production machinery is essential to ensure consumer safety. However, current cleaning processes are typically over-dimensioned, resulting in significant waste of resources.

Modern cleaning devices are equipped with nozzles that have a fixed spray pattern. The devices are able to create either a coherent water jet or a fine spray. Depending on the area of application, not only spray balls are used, but also complex cleaning devices, such as rotating jet cleaners. However, based on the current state of technology, it is not possible to change between the spray patterns during the cleaning process, especially with rotating devices. Even after cleaning has been completed, replacing equipment such as nozzles is a labor-intensive process and is avoided in most cases.

Heavily attached soiling often necessitates an additional soaking process to effectively reduce adhesion with minimal resource consumption. This soaking process occurs when the soil layer is sufficiently wetted with the cleaning fluid in the beginning of the cleaning process. Current cleaning systems only use a jet nozzle for this purpose, which leads to a significant consumption of resources.

These challenges highlight the need for innovation in cleaning technology. Developing systems that can dynamically adapt spray patterns in real time would significantly reduce resource consumption, improve cleaning efficiency, and address both economic and environmental concerns. Such advancements could pave the way for more sustainable and cost-effective cleaning solutions.

2. Description of the New Technology and Its Advantages

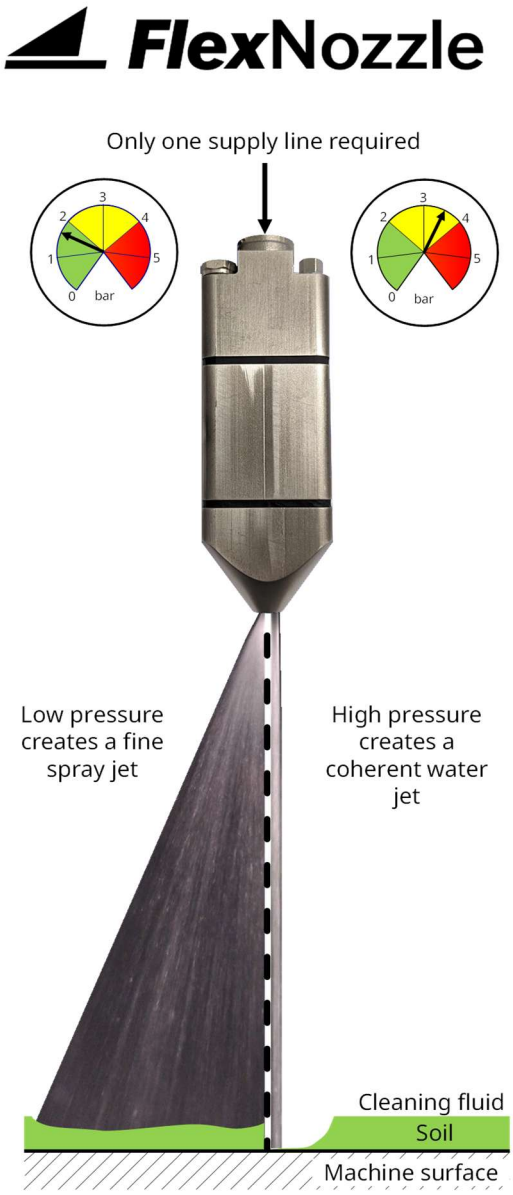
The FlexNozzle is a new type of nozzle that can flexibly change its spray pattern solely through the applied water pressure. It is capable to switch between an atomizing spray and a compact jet. This innovative technology enables its use in established cleaning systems in the food, pharmaceutical, and cosmetics industries, offering considerable potential for saving resources and time during the cleaning process.

At low water or cleaning fluid pressure, the special design of the FlexNozzle produces a fine spray. This is ideal for thoroughly wetting machine surfaces in order to soften soil layers with the cleaning fluid.

When the water pressure is increased and exceeds a defined pressure threshold, the jet shape automatically switches to a coherent water jet. This is characterized by a higher mechanical effect and is particularly effective in removing soil.

No additional control line is required to change the spray pattern, which allows the nozzle to be used in two-axis rotating jet cleaners. The switching point for the spray patterns can be adjusted to suit pump power capabilities.

This demand-driven and flexible cleaning process enables significant resource savings compared to conventional nozzles.



Advantages over the State of the Art:

- No additional control line for jet/spray variation
- Easy to retrofit: standardized coupling
- Individual pressure and threshold settings
- Hygienic Design conformity
- Flexible adaptation of the cleaning process to changing products/soiling
- Resource-saving cleaning

3. Patents / Property Right

The Patent EP 4 197 643 A1 is currently pending before the European Patent Office (EPO) for examination (102021133674, publication: 22.06.2023).

4. Desired Cooperation Partners & Target Companies

The goal of the cooperation is to achieve Technology Readiness Level (TRL) 7, 8, and finally 9.

To reach these levels, it is necessary to first test the technology prototype in real-world applications over a period of one to five years and subsequently develop a qualified system. For TRL 8, this means that the system must be fully integrated, qualified and operationally demonstrated in the intended environment, including the availability of maintenance documentation as well as completed verification and validation. TRL 9, finally, requires the successful demonstration of the system in an operational environment, confirming the full market readiness and deployability of the technology.

For this purpose, we are primarily seeking cooperation partners and companies active in the following areas:

- Manufacturing and distribution of nozzles
- Manufacturing and distribution of cleaning equipment
- End-users of nozzles (e.g., companies in the food, pharmaceutical, or cosmetics industries)

5. Expected Requirements for Cooperation Partners:

We are looking for cooperation partners with whom we can test the nozzle in real-world environments over the long term. For this purpose, it is most suitable to use test facilities or smaller production plants. The cooperation partner should be willing to integrate our FlexNozzle into these systems and allow us to monitor the cleaning progress.

In addition, the ideal partner should:

- Be open to transparent communication and collaboration to ensure the success of the testing phase
- Provide access to relevant operational data and feedback to optimize the nozzle's performance
- Be aligned with the shared goal of improving cleaning efficiency while reducing resource consumption

By working together, we aim to not only validate the functionality of the FlexNozzle in real-world applications but also to identify potential improvements and ensure its readiness for market adoption.

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