

Quick coupling hose connector for vapor treatment in Cleantech application

Degree programme : BSc in Micro- and Medical Technology | Specialisation : Product development

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Gjosa SA has developed a vapour-based cleaning system to efficiently remove the biofilm in shower hoses composed of pathogens such as *Legionella*. Within the scope of this thesis, the existing, bulky prototype was challenged to develop a user-friendly, small, and smart quick coupling with an integrated RFID identification chip. The discretisation of the form factor should also allow the system to be used in design-sensitive sectors.

Introduction

Pathogens such as *Legionella* find optimal growth conditions in irregularly used shower hoses due to the warm and humid environment. Regular cleaning is therefore essential, especially in vulnerable facilities such as hospitals, retirement homes and hotels. For this purpose, Gjosa SA has developed a cleaning system that removes 99.9 % of the biofilm with 120 °C hot steam and water. However, to be able to use the system in the above-mentioned facilities and environments, the existing prototype needs to be redesigned and redimensioned.

Goals

Development of a quick coupling hose connector and production of a prototype for proof of concept which can easily be integrated into the existing system and takes the following criteria into account:

- Plug and Play System
- Discreet and vandal-proof design
- High user safety
- Connection with standard ½" thread
- Temperature resistant up to at least 120 °C
- Waterproof up to 6 bar (according to standard DIN EN 1112:2008)
- Complies with the guidelines for drinking water applications
- Shower hose identification by RFID tag

Methods

The development was carried out after a thorough investigation of the requirements, of the customer feedback collected by Gjosa SA and of the existing prototype, using iterative methods in close cooperation with the development engineers of Gjosa SA. After a conceptional phase, the retained quick coupling concept was first designed in CAD, analysed using finite element methods and created by combining rapid prototyping and conventional manufacturing processes to test the prototype under real-life conditions on the specially developed test set-up.



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Results

By using a specially shaped bayonet lock, it was possible to develop a mechanically robust quick coupling that can be operated with one hand and ensures user safety. The bayonet groove is designed in such a way that the quick coupling opens directly again if it is not correctly engaged to the end position (Fig. 1). As an additional safety level, an optical sensor has been installed at the connection to the cleaning unit (CTU, Fig. 2), whereby the cleaning process can only be started if the shower hose is correctly connected. The shower hose is directly identified at the CTU through the built-in RFID tag and described with the date of the current cleaning. To achieve the best possible result in the water- and metal-containing environment, an RFID system in the frequency range of 13.56 MHz is used.



Figure 1 (LTR): The quick coupling (QC), once connected to the water tap and once with the bayonet lock open.

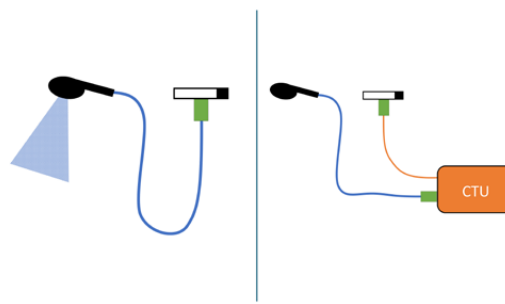


Figure 2 (LTR): Integration of the QC (green) into the system, once during showering and once during the cleaning process.