

DESIGN AND RAPID PROTOTYPING OF MEDICAL DEVICES – CASE STUDY: MECHANICAL VENTILATOR

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Abstract

In the year 2019th, 77.000 new ventilators were more than enough to meet the market demand worldwide. However, during the peak of the COVID-19 pandemic, large cities alone need more than additional 30.000 machines per city (example: New York). At the time, almost all ventilator manufacturers have boosted their production by 30-50% but, they still weren't able to deliver the required production growth. One way to solve the medical devices shortage problem is the development and large-scale production of new medical devices. The main issue of this approach is the complexity of medical devices as a mechanical system, especially taking into account the obligatory medical verification. That's the main reason why existing standardized medical equipment should be used as a basis for the development of the new prototypes. This approach is implemented during the development of the new mechanical ventilator. Used methods include all traditional product development activities (such as the definition of desired characteristics, comparative analysis of literature and existing ventilators, definition of different variant solutions, and selection of best technical solution for further development) followed by the modern product development methods: 3d modeling, FMEA and rapid prototyping using advanced 3d printers. The verification of the new mechanical ventilator prototype was successfully performed, setting up a basis for further improvements. The developed prototype has numerous advantages compared to the competition (i.e. it is much cheaper and easily produced with comparable technical characteristics) but its main advantage is a brand-new system for patients' exile air sterilization and filtration.

Keywords

Machine Design; Product Development; Rapid Prototyping; Mechanical Ventilator; Medical Devices;

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