



closed-circuit gas mixing platform.

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HIGHLIGHTS

1. Based on Demcon Macawi Respiratory Module
2. Pneumatic control algorithms
3. Functionally focused design allowing quick clinical testing
4. Intellectual property (IP) of Demcon life sciences & health
5. Knowledge and application on the 60601-1 family of standards

Therapeutic gases can help patients in different ways. We developed a gas mixing platform that can mix a therapeutic gas into an air/O₂ mixture for patient treatment of spontaneously breathing patients. As therapeutic gas is expensive, it is important to design a system to minimize gas usage in order to make the treatment viable from a business point-of-view.

Closed-inhalator development

To minimize the amount of therapeutic gas used, the system is a closed-circuit inhalator. This means that the exhaled gas of the patient stays in the system and the CO₂ is removed by filtration. The consumed O₂ of the patient is automatically corrected by the system, as well as the amount of therapeutic gas used. Furthermore, the pressure in the system is controlled



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to prevent ambient air from leaking into the system which could dilute the mixture of therapeutic gas and thereby negatively affect the treatment.

Challenge

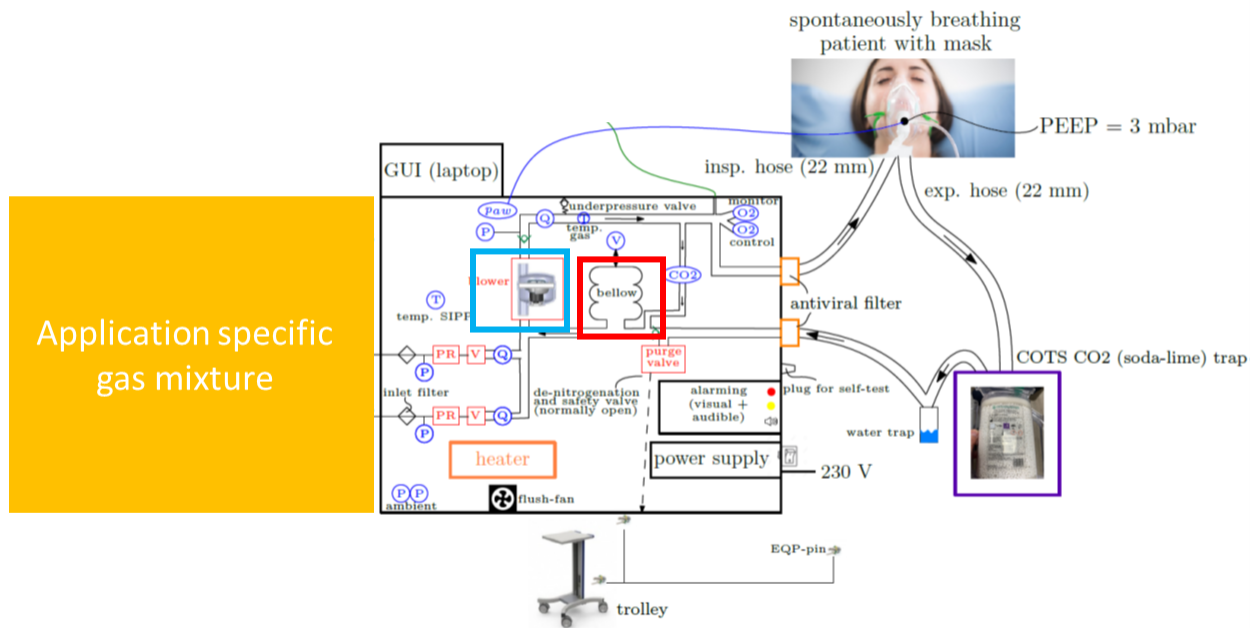
The challenge of this gas mixing platform was two-fold. Firstly, it was a challenge to implement the different control loops in the system to accommodate the various scenarios that can exist in practice, while using a minimal amount of therapeutic gas. Detailed knowledge of pneumatic control algorithms helped when tackling this challenge. Secondly, the focus was to develop an alpha system of the gas mixing platform as soon as possible which could be used for initial clinical testing in hospitals. Using the Demcon Macawi Respiratory Module as the heart of the system enabled us to develop this clinical prototype in a matter of months.

Development of the gas mixing platform

We successfully developed a gas mixing prototype suitable for initial clinical testing. Development included development activities starting at the feasibility phase up to the assembly and system verification of alpha prototypes. The gas mixing prototype could be used for future product development and eventually industrialization activities.

Future perspective

Our gas mixing platform is ready for testing with a therapeutic gas chosen by customer based on their application. After initial testing of the mixture, the gas mixing platform could be brought to clinical trial level quickly with the available hardware and documentation. Besides, we can further develop the gas mixing platform to an industrial product level.



Legenda

Main elements of the system:

- Gas paths: therapeutic mixture
- Large bellow: moves along with patient effort
- Blower for continuous mixing (and support)
- Closed-circuit system (gas loss reduction)
- Several sensors/actuators
- Display, GUI, trolley, power supply