

# IMT Information Management Technology AG

Innovative intensive care ventilator  
automatically adapts to patient's conditions



## *Desktop and real-time simulation and testing leveraging Simulink and Speedgoat real-time target machines enables the interdisciplinary team at IMT to rapidly design and test complex adaptive algorithms for intensive care ventilators and other controls applications*

IMT, based in Buchs, Switzerland, develops devices and software for a wide range of applications and industries, from the initial idea through to production.

The interdisciplinary team from industry and academia combine the latest product development technologies for real-time simulation and testing to embedded integration, to rapidly deliver new products and further develop existing ones.

### **Intensive care ventilator**

One of the company's key competences is the development of intensive care ventilators, which can be used to ventilate adults, children and premature babies. The bellavista ventilator uses sophisticated adaptive algorithms which continuously react to the patient's condition, using measurements from over 20 sensors, including pressure,



*The bellavista with neo-natal options*

airflow, temperature, oxygen and carbon dioxide. The quality of the ventilation is controlled by seven actuators.

Most of the product's functionality is safety-critical. For example, detecting if a patient wants to breath in or out, regulating the air supply, and detecting disconnected tubes or blockages.

### **Real-time testing and simulation**

The functionality of the bellavista ventilator has become more and more advanced over the lifetime of the product, and IMT recently found that integrating and testing the software application directly on the embedded hardware had become too limiting and time consuming.

They decided to use desktop and real-time simulation and testing with Simulink Real-Time and a Speedgoat Performance real-time target machine, which enables them to automatically build real-time applications and have them running on the target machine within seconds.

Powerful Simulink Real-Time instrumentation then allows IMT to rapidly test and refine designs in real-time under realistic testing condition with the target machine directly controlling the ventilator via a CAN bus.

Most beneficial for IMT is the possibility of rapidly performing a wide range of tests, such as for safety-critical core functionality, much quicker than before.

Also, engineers are able to easily analyze the behavior of the ventilator for a deep understanding of the complex relationships within the system, and new ideas can be tested immediately. Furthermore, logging data for post execution analysis became very easy and efficient.

After an algorithm has been verified on the Speedgoat Performance real-time target machine, C code is generated using Simulink Coder. This code is then integrated into IMT's own software framework which provides an interface to hardware specific drivers.

### **Prepared for the future**

The next generation of medical devices are getting smarter and are often networked. Growing demands on reliability, safety and usability confront manufacturers with major challenges.

To be prepared for the future, IMT continue to focus on the latest technologies and enhance proven concepts. Simulink Real-Time and Speedgoat solutions are key tools for them.

## Speedgoat's value contribution

*"Rapid prototyping with Speedgoat products helps us to keep costs down by enabling problems to be identified early in the development process."*, Mr. van der Staay.

Mr. van der Staay also commented:

"Simulation-based design and development often isn't practical because there is usually a significant difference between the abstracted models and the real world.

Speedgoat products allow us to work with the real system as early as possible to test and refine our application under realistic conditions. This prevents errors, increases quality, and reduces costs."



Matthias van der Staay,  
Development Team Manager,  
IMT Information Management  
Technology AG



The bellavista showing the Nurse view



## IMT Information Management Technology AG

Buchs, Switzerland

[www.imt.ch](http://www.imt.ch)

### Speedgoat products used

- Performance real-time target machine
- IO601 CAN I/O module

### MathWorks software used

- MATLAB®
- Simulink®
- MATLAB Coder™
- Simulink Coder™
- Simulink Real-Time™

### Learn more

[www.speedgoat.ch/userstories](http://www.speedgoat.ch/userstories)

