Any comments or questions email monitor@windmillsoft.com.

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http://www.windmill.co.uk/monitor/monitor241.pdf.

## Contents

## Fires in Tunnels: Researching the spread of heat and smoke with Windmill Software

Fires in road tunnels cause serious explosions and loss of life. The main source of casualties in recent tunnel fires in China and elsewhere was the release of toxic substances from incomplete combusion of fuels. A study published next month in *Tunnelling and Underground Space Technology* will say that the key to solving tunnel saftey problems is to understand smoke flow patterns and thermophysical properties of fires in tunnels.

To this end, instead of working with a small-scale smoke tunnel model or numeric simulations, researchers from Chongquing Jiatong University have constructed a full size mock-up of a tunnel fire. This gives a much more realisting reflection real-life fires in tunnels.



Road tunnel fires are mainly caused by vehicles and their load. The researchers thus set fire to gasoline and diesel to simulate oil surface burning caused by fuel leakage following vehicle collision.

For both oil pool fires and burning vehicles the scientists measured the height of the smoke layer at various intervals in their 150 m x 14.5 m x 7.1 m tunnel. They also monitored the velocity with which the smoke spread, the carbon monoxide concentration of the smoke and the radiant heat flux - the amount of heat transferred.

To monitor the heat transferred the researchers used Windmill software. They set up total heat flux sensors 8 m, 18 m and 48 m from the fire source and 1.5 m above the ground. These were from Captec and comprised a thin foil heat-flow sensor that indicates the heat flux when the temperature changes, and a circulating water-cooled heat receiver. The engineers connected the sensors by copper wire to the acquisition module and transmitted the data using the Windmill RS485/232 data acquisition system. Windmill continually collected and logged the data.

The immersed-tube tunnel of the Hong Kong - Zhuhai - Macao Bridge is the longest immersed highway tunnel and the only deeply buried tunnel in the world, with a length of 5664 m. It is 40 m underwater and is designed to last 120 years. The research results will help ensure people are safely evacuated in the event of a fire in the tunnel by predicting the behaviour of thermal parameters in different situations.

## Further Reading

Full-scale immersed tunnel fire experimental research on smoke flow patterns. P.X, S.P.Jiang, R.J.Xing, J.Q.Tana Tunnelling and Underground Space Technology Volume 81, November 2018, Pages 494-505
https://doi.org/10.1016/j.tust.2018.08.009

Windmill Software Products
https://www.windmillsoft.com/

We now offer the full version of the Windmill RS232/RS485 software without charge to Monitor subscribers. Just e-mail monitor@windmillsoft.com for your copy.

## Your Data Acquisition Questions Answered

Question

*We're currently using a pair of Windows XP PCs, as part of teaching modules in our Engineering department. Each PC is connected to an individual Microlink 751 DAQ device via USB. Both PCs are running Windmill software. We're hoping to migrate to Windows 10 PCs. Are you able to provide us with an appropriate version of Windmill software and drivers, that are compatible with Windows 10?*

*If other changes are required to allow us to use Windows 10, and/or you require serial numbers from our existing software or hardware, please let me know.*

Answer

Yes, we will send you Windmill software for Windows 10 and the appropriate hardware drivers to handle the Microlink 751. When you install the software on the new computers you will be asked for a release key to authorise the software - email us this and we will send you the authorisation code.

Windmill stores all its configuration files in text files. After you install the new version of the software you can copy your existing configuration files from your old system to your new. Make a backup of all the new ones first.

The configuration files will either be in the windmill/setups/ folder or wherever you set the "working directory".

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## DAQ News Round-up

Welcome to our round-up of the data acquisition and control news. If you would like to receive more timely DAQ news updates then follow us on Twitter - @DataAcquisition - or grab our rss feed.
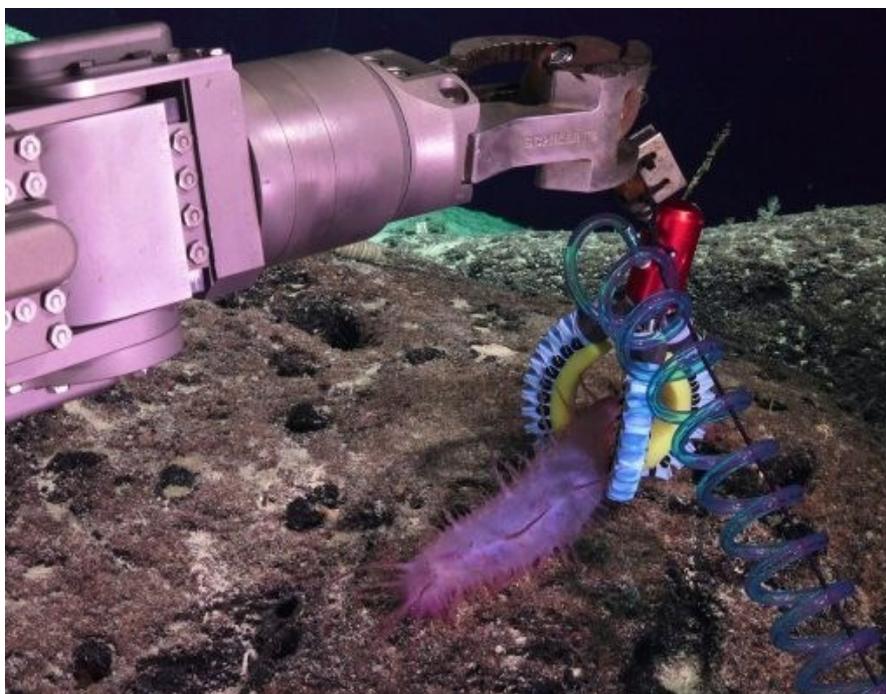
**Musical sensor shows bad medicine plays false note**



Inspired by a musical instrument, the simple sensor can be constructed from common materials and used to detect adulterated or counterfeit drugs.
Source: University of California
https://news.ucr.edu/

**Marine biologists explore delicate deep-sea life with soft robotics and 3D printing**



3D printing of soft robotic manipulators enables real-time manufacturing and modification of tools in highly remote areas where engineering scenarios may be difficult to predict in advance.
Source: SCUBA News
https://news.scubatravel.co.uk/

**Oil and gas wireless sensor networks are connecting stranded assets**
At a pivotal time for the oil and gas industry, wireless sensor networks (WSN) are connecting stranded assets, streamlining operations and reducing deployment costs, according to a recently published report by global IoT research firm ON World.
Source: Industrial Ethernet Book

**3-D-printed plastic objects can track their own use without any electronics**

Objects such as pill bottles or prosthetics can now send information on how they are being used, without the need for batteries.
Source: MIT Technology Review
https://www.technologyreview.com/

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