

Hello and thank you for subscribing. Another story this month about how the versatile Windmill software is being used by researchers.

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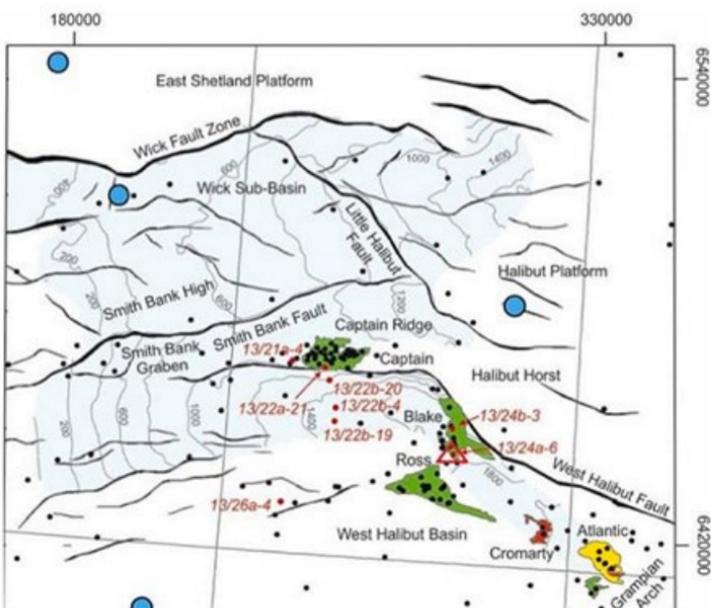
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Windmill helps research CO₂ storage in rock, to mitigate global warming

Carbon dioxide, CO₂, is a greenhouse gas which contributes to global warming. CO₂ concentrations are rising in atmosphere and directly increasing extreme weather events. The gas also dissolves into the ocean, causing ocean acidification.

To mitigate the effects of excess CO₂ it can be trapped within reservoirs of rock. One way to do this is to dissolve CO₂ into the brine within the rock pores under the sea. However, there are concerns on the effect of the stored CO₂ on the reservoir rock, given the need to ensure the long term integrity of the storage reservoir. Injecting CO₂ stresses the rock and affects its fatigue behaviour - the strength of the rock.

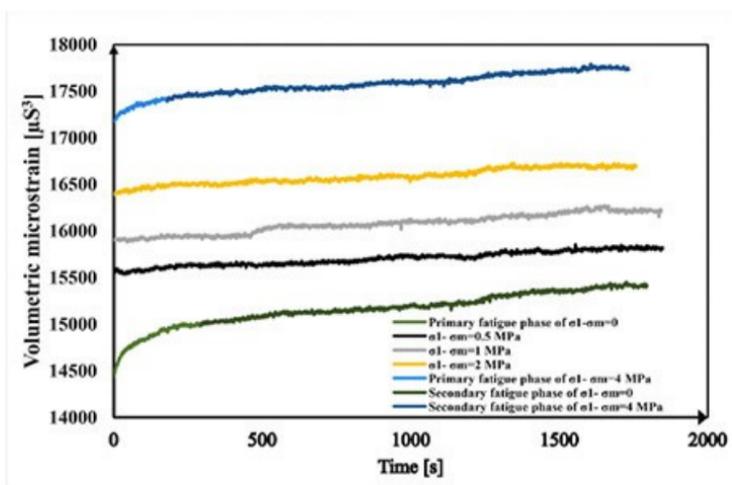
Engineers in Edinburgh and Wolverhampton are investigating how the behaviour of CO₂ in rock is controlled by temperature, pressure and saturation conditions. As part of their investigations they are using Windmill software and the [Microlink 751 multi-function data acquisition unit](#).



Map showing from where the core rock samples were collected - to the North East of Scotland

The experimental set up held the rock sample, brine and CO₂ at 35 °C during fatigue testing. A pressure transducer measured and logged the pressure on the sample. The Microlink 751 recorded displacement data from LVDTs and sent the readings to Windmill software running on a PC to display and save the data. The Microlink was set at 15 bits per channel with each channel set to +/- 10 V dc with a resolution of 0.8 mV giving a precision of +/- 0.05%.

Axial and lateral displacements were recorded per second during the entire fatigue and Windmill displayed the data on the screen. The readings were processed to yield the axial and lateral strain, volumetric strain, fatigue rates, fatigue duration, bulk modulus and compressibility.



Fatigue Curves for different deviatoric stresses

The [Microlink](#) can measure temperature, strain, pressure, voltage and current through 16 analogue input channels. It can switch up to 32 digital outputs and monitor up to 32 digital inputs. It can also count events with up to 8 counters. You can connect eight Microlinks to one PC giving 128 analogue inputs and 256 digital inputs and outputs. Use Windmill software to choose from four analogue input ranges or automatic ranging to let the software match the input signal as closely as possible. You can also use Windmill to select the resolution from 7 options: choose high throughput or high resolution.

Further reading

Ameh Peter et al, [Static fatigue of saline rocks under different CO₂ phase conditions](#), Journal of Petroleum Science and Engineering, Volume 195, December 2020, 107940 Advance Article

[The Microlink 751 multi-function data acquisition unit](#)

Hugh Baker et al, [Rising CO₂ may increase dangerous weather extremes, whatever happens to global temperatures](#), University of Oxford

Your Data Acquisition Questions Answered:

Question

We do have two Microlink 751 with each having a 590-8A connected to it and Windmill 7. We would like to log signals from 0 - 20 mA. Could we have an explanation how to do the setup for 6 channels of 0 - 20 mA?

Answer

Connect the 0-20 mA signal to the + and - connections of one channel in the in the 590 box. For 6 inputs this will be for channels 0 to 5. You should also connect the - inputs to ground.

To the Windmill software the inputs will be like normal analogue voltage inputs, because the 8 channels of current inputs have 100 ohm resistors, which make 20 mA into a 2V signal, and 0 mA into 0 V. Use the SetupIML program to name the engineering units.

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](#).

Velcro-like food sensor detects spoilage and contamination

Color-changing array of silk microneedles could help protect consumers and avoid food waste

Source: National Science Foundation

<https://www.nsf.gov/>

Researchers develop smallest particle sensor in the world

Smartphones, smart watches or fitness wristbands can for the first time measure the quality of the ambient air in real time and sound the alarm in the event of increased fine dust values.

Source: EurekaAlert

<https://www.eurekalert.org/>

Sensitive strain sensor that can detect the touch of a feather

The sensor can stretch up to 80 times higher strain than strain gauges currently on the market and show resistance changes 100 times higher than the most sensitive materials in research development.

Source: University of Sussex

<http://www.sussex.ac.uk>

Environmental Sensing and Monitoring Technologies to grow by 6 billion

Emerging growth areas include such as large-scale monitoring networks.

Source: BCC Research

<https://www.bccresearch.com/>

Sound waves show warming oceans

Seismic monitoring equipment, and historic seismic data, determine how much the temperature of the earth's oceans has changed and continues changing, even at depths that are normally out of the reach of conventional tools.

Source: SCUBA News

<https://news.scubatransel.co.uk/>



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