VICOR

Case study:
Instrumentation for ore prospecting



Reliable operation in a tough environment

Customer's challenge

When drilling for ore at shallower sites complexity and cost can be significantly reduced using a motor driven helical screw drill bit. New sensors and onboard processing of the power demands of the drill's motor allows automatic logging information on the changing composition of the soil that the drill passes through. This allows faster and more accurate prioritization of follow-on site surveys, saving manpower and costs. The key goals were:

- Automate the data logging of motor data
- Distribution of power to motor over 20m away
- Reliable operation in a harsh environment (temperature and vibration)

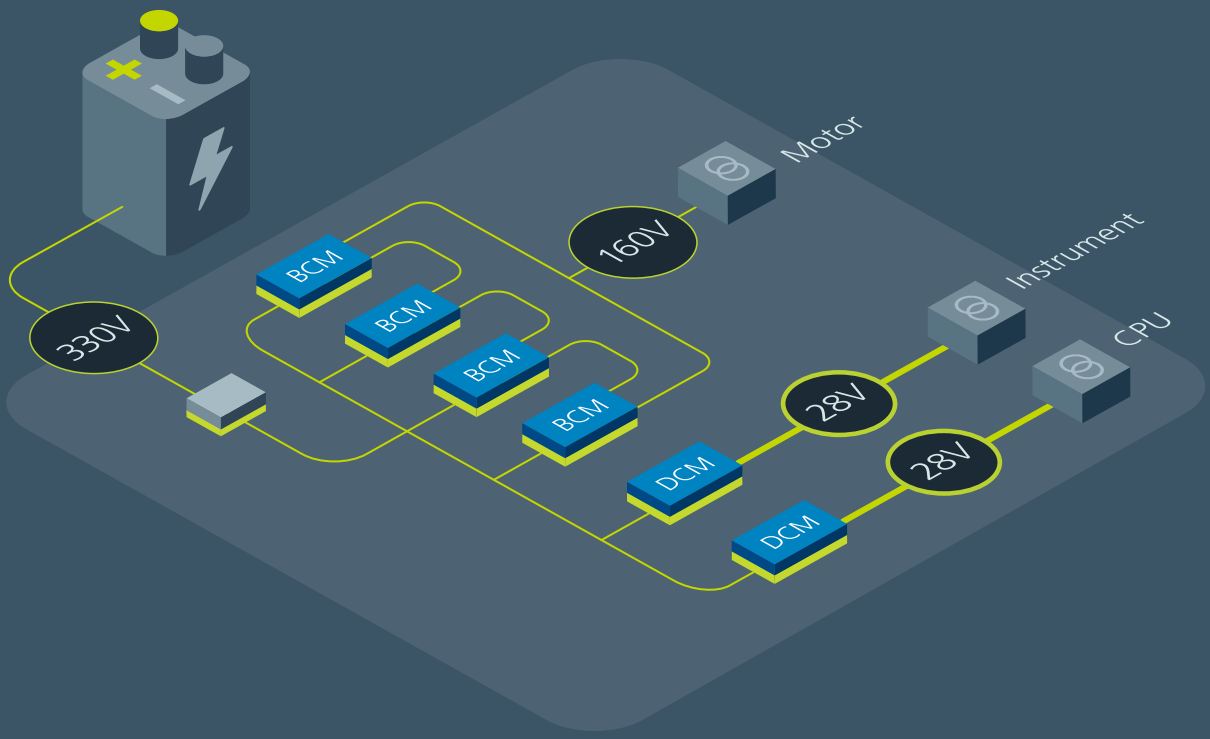
The Vicor solution

Logging the motor's load condition allowed precise control of drill rotation speed, improving the integrity of the recovered soil samples. This was simplified through the use of the BCM bus converter modules built-in PMBus ports. These rugged converters operate over wide temperature ranges and offer excellent resistance to shock and vibration improving system reliability. Key benefits were:

- Bus Converter digital interface simplified logging of motor speed and torque data
- The wide input voltage range of the BCM converters compensated for the long power cable
- 91.5% conversion efficiency simplified heat management as fan cooling was not permitted

Vicor modules provide simple interfacing in a harsh environment

The Power Delivery Network: The truck-based AC generator output was rectified to provide a $330V_{DC}$ bus that remotely powered the drive motor via a long cable. At the drill head, four BCM VIA Bus converters with their outputs in series transformed and isolated the 330V rail, providing the drill's motor drive electronics with a 2.5kW $160V_{DC}$ rail. Two DCM DC-DC converters provided regulated 28V rails from the 330V DC bus to power instrumentation and processors. To analyze this power chain, go to **Vicor Whiteboard** online tool.





DCM™ DC-DC converter

Isolated regulated

Input: 9 – 420V

Output: 3.3, 5, 12, 13.8, 15, 24, 28, 36, 48V

Power: Up to 1300W

Peak efficiency: 96%

As small as
24.8 x 22.8 x 7.21mm

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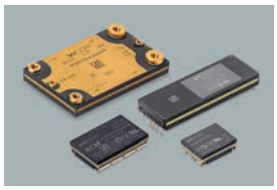

BCM® bus converter

Isolated fixed-ratio

Input: 800 – 48V

Output: 2.4 – 55.0V

Current: Up to 150A

Peak efficiency: 98%

As small as
22.0 x 16.5 x 6.7mm

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