The OMNI Transmitter

INSTRUMENTATION
ELECTRICAL
CONTROLS

NOVEMBER 2018 NEWSLETTER

instrumentation | calibration | loop check | startup | commissioning | electrical installation | control panel design & fabrication | project management

Inside This Issue…

THE MOVE TO MODULAR:

Better Projects, Better Quality, Better Function

Modular process "super" skids are widely used in biotech, pharmaceuticals and petrochemical construction due to the many advantages offered. Modular projects are typically completed months faster than stick-built projects and experience fewer delays. Most super skid projects are completed within a few percentage points of their original estimated cost.

With skid modules, tanks, pumps, filters, heat exchangers, and all associated piping are assembled on frames or "skids" as standalone sub-systems, rather than having multiple contractors install them in place. This pre-fabricated approach simplifies and streamlines the project, reducing trade stacking and site interference. As a result, there are fewer installation issues, better integration, and more consistency in quality. Electrical functionality is tested prior to site installation, so commissioning and final testing can be completed in a shorter period of time. Super skids can either be assembled in a vendor facility and transported to the project site, or constructed on-site by contractors in an adjacent area in parallel with construction of the building.

Omni works closely with engineers and owners on super skid projects to determine ideal locations for instruments and maintenance to ensure maximum ease of access. Once instrumentation, controls and network wiring are installed on each skid module, continuity checks, loop checks, and calibration can be performed. The ultimate goal is for pre-commissioning to proceed swiftly and efficiently. When the super skids are ready for transport and setting, final control and power wiring will be completed and and commissioning can begin.

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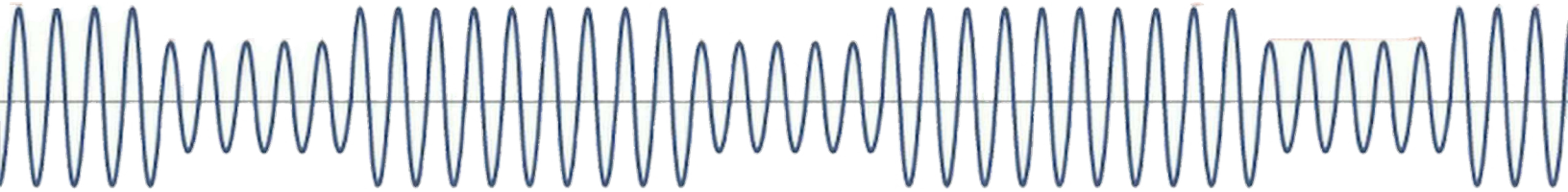
Scientists Harvest Energy from Living Cells

In the last issue of the Omni Transmitter, we reported on the world's largest lithium-ion battery, used to store power generated by an Australian wind farm. Now, a team of scientists at the University of Perugia in Italy is harvesting energy from a microscopic source: frog eggs. The goal is to develop microscopic medical devices that can run autonomously in the human body on "battery" power generated within cells.

Every frog egg is a single cell, and all biological cells store and transfer electrical charge, much like a battery. This energy is used to power physiological function; neurons use the energy to send nerve impulses through the body, and muscle cells use it to contract. The team successfully harvested electrical power from a frog egg to charge a small capacitor and used it to produce a radio signal. The amount of power is miniscule – about 1.1 nanowatts – but researchers believe it is sufficient to be used by a microbot for wireless sensing and transmission. Possible uses: a sensor implanted in a vein could continually measure blood sugar, or a miniature endoscope could transmit images of a gastrointestinal tract and release medication at the same time. Once drained of energy, the devices would tap into the body's cells to refuel.

Research is still in early stages, and there are many challenges. Scientists must figure out how to miniaturize the capacitor and have it charge itself with the body, but the possibilities are intriguing.

SAGS AND UNDERVOLTAGE



There a number of power quality issues that can cause problems in a building or facility. These include voltage sags, undervoltage, overvoltage, surges, interruptions, and several others. Voltage sags and undervoltage are the most common, accounting for about 92% of commercial and industrial power quality problems.

A voltage sag or dip is a brief reduction in voltage (below 90% of its nominal value) that lasts between 0.5 cycle to one minute. Undervoltage is when a power sag exceeds one minute. While undervoltage is usually a chronic problem due to conditions beyond the user's control (weather, high demand, or distribution system design) sags can be caused by both internal and external factors. Sags that originate in a user's facility typically occur due to a sudden increase in loads, such as when motors or magnets are started, short circuits or faults, or when there is an abrupt increase in source impedance, often due to a loose connection. If chronic undervoltage is an issue, even small sags can exacerbate the problem.

For critical light loads, a local or central UPS should be installed to guard against power quality issues and provide clean, constant power when needed. For larger loads such as motors, HVAC, and heaters, sags and undervoltage can be more challenging. Monitoring equipment can be used to determine how, when and where issues are occurring, and identify whether the issue is internal or external. Some equipment, such as VFDs, can be programmed with catch-on-the-fly and auto restart, and large, instantaneous loads may require a soft start. If it is determined that your power issues are external, contact your utility company.

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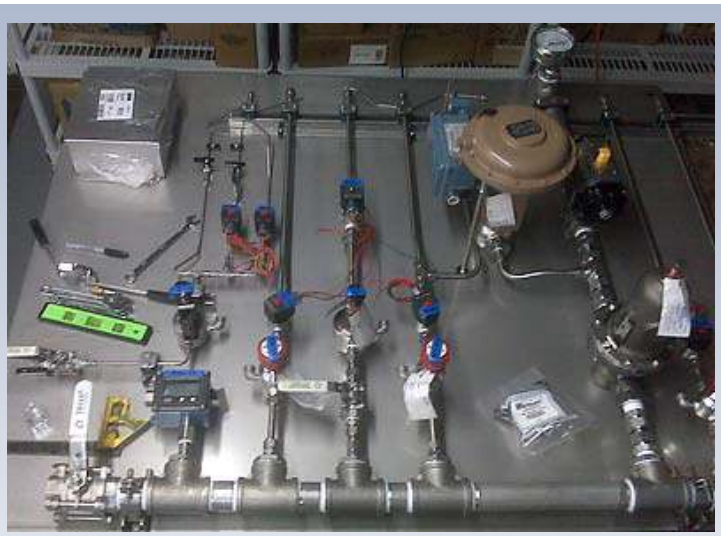
Excavation & Trenching Safety

Excavation and trenching rank among most hazardous operations in the construction industry and are strictly regulated by OSHA to prevent potentially-fatal cave-ins (a cubic yard of soil weighs about 2,200 lbs.), falls, falling loads, hazardous atmospheres, and mobile equipment incidents. Conducting safe projects and preserving the health and safety of our employees and clients is top priority at Omni Instrumentation Services, Inc., and we abide by all excavation and trenching safety regulations.

OSHA defines an excavation as any man-made cut, cavity, trench, or depression formed by earth removal. A trench is a narrow excavation (in relation to its length, and not greater than 15 ft. wide) below the surface of the ground, and the the depth is generally greater than the width. OSHA requires that all trenches 5 ft. deep or greater require a protective system, unless the trench is in stable rock. Trenches less than 5 ft. deep must be inspected by a competent person to determine whether a protective system is required. Protective systems for trenches 20 ft. deep or greater must be designed and/or approved by a registered professional engineer. Protective systems include benching (excavated "steps"), sloping, shoring, and shielding with trench boxes or similar supports.

Before digging, establish the location of all underground utilities. Safe access and egress – ladders, steps, ramps, etc. – must be provided in trenches 4 ft. or deeper and must be located within 25 ft. of all workers. Heavy equipment must be kept away from trench edges, and excavated materials must be at least 2 ft. from trench edges. Trenches should be inspected at the start of each shift or after a rainstorm, and tested for atmospheric hazards such as low oxygen, fumes, and gases.

FROM THE PANEL SHOP: Custom Solenoid Panel Fabrication



Pictured above is fabrication of a custom nitrogen manifold panel with solenoids requested by a client for a specific part of their process. The junction box in the upper left will house a terminal block to terminate all solenoids. All panels are fabricated to exact specifications and are inspected and fully tested with the client prior to delivery.

Left: These panels were designed and fabricated based on our client's P&IDs. The system consists of a flow panel, reactor panel, analyzer panel, and PLC panel. The flow panel takes various gases via bulkheads from cylinders located outside the panel and mixes them based on the engineer's input via the PLC panel. These mixtures are sent to the interconnected reactor panel to create a reaction whose output gases simulate gasoline or diesel engine exhaust via an analyzer panel.