Customer success story

Suncor Energy

Advanced smoke detection systems provide maintenance solutions and help to prevent downtime at Canadian Oil Sands.

Suncor Energy Inc.

Location:
Athabasca River Valley, Alberta, Canada

Industry: Oil

Deep within northern Alberta, men, women, and monstrous machines are working all day and all night every day of the year to meet a portion of the world's insatiable demand for oil.

In huge open-pit mines, Suncor Energy Inc. excavates oil sands — deposits of bitumen trapped in a mixture of sand, clay, and water. Alberta oil sands are approximately 10-12% bitumen, a complex hydrocarbon also known as natural asphalt or tar. Roughly 75% of that can be recovered through a multi-step extraction and upgrading process that changes its molecular structure. Upgrading reduces the carbon-hydrogen ratio and removes impurities to create a synthetic crude oil.

Canada has the world's largest known oil-sand reserves. The sands are closest to the surface in the Athabasca River Valley north of Fort McMurray, so that's where most of the mines are today. But the long-range potential is staggering. Estimates of the total amount of oil in the deposits range as high as 2.5 trillion barrels. The catch is that less than a tenth of that – an estimated 177 billion barrels – is economically recoverable using today's technology. Many of the deposits are too deep, though Suncor and other companies are already recovering some bitumen through a process known as in situ extraction, in which steam is injected deep down into a deposit to heat the thick bitumen until it flows through the sand toward wells that pump it to the surface. The required amounts of water and energy make this method expensive, but engineers and scientists are working to improve it, and to invent other in situ techniques.

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Think big

Suncor's Athabasca operations cover 500 square miles and employ 2,400 people full time. Massive hydraulic shovels dig from terraces along the sides of huge open pits to fill giant dump trucks, some of which can hold as much as 400 tons of sand. The trucks haul the sand to conveyors that deliver it to the world's largest crushing/sizing machines. Here the chunks of sand are broken up and rocks are removed to prepare the ore for transport via slurry pipelines to the extraction plant.

The slurry pipelines are kept warm, not only to keep the slurry moving in wintertime, when temperatures can drop to –50° F, but to start releasing the bitumen from the sand and clay. The pipeline delivers the slurry to the extraction plant, where steam and additional hot water further separate the bitumen to prepare it for upgrading.

It takes energy to make energy. Lights, pumps, heat-tracing systems, conveyors, crushers, upgraders, and other crucial equipment at Suncor's mines and processing facilities depend on electricity and steam generated on site with natural gas and coke. These mission critical systems and processes are crucial to the company's oil production. Interruption can have disastrous effects and must be avoided to ensure profitability.

It's all about downtime. Suncor has the capacity to produce about 225,000 barrels of synthetic crude oil per day, most of which is transported through pipelines to Suncor's refineries in Ontario and Colorado and ends up as various petroleum products including gasoline at Sunoco (in Canada) and Phillips 66 stations. Suncor is also a major supplier of jet fuel to Denver International Airport.

With demand so high and competition trailing at their heels, Suncor's mines are operational 24/7. Mining and the production of oil presents many fire hazards.

Suncor isn't taking any chances with fire protection. Its fully networked fire alarm infrastructure encompasses more than 15,000 devices. Multiple teams are responsible for the engineering, specification, installation, and maintenance of these systems. To help prevent an outage the company depends on early warning active air-sampling smoke detectors for the earliest possible warning of problems in their switchgear rooms, motor control centers, substations and other critical areas.

Xtralis VESDA Sampling pipe installed in cabinets

In addition to early warning detection, maintenance access is critical. Suncor has implemented a standard smoke detection practice for structures with ceilings over 12 feet high, where they will use VESDA air-sampling smoke detectors manufactured by Xtralis. They have installed many Xtralis VESDA VLC systems and ordered more to cover planned expansions at the site.

“The ease of maintenance is really what sold us on VESDA detectors,” says Curtis Langston, senior fire alarm technician for Suncor. “Inspecting and maintaining a VESDA system is easy and cost-effective because the detector itself can be installed at eye level on a wall or in any other accessible location. Only the sampling pipes are on ceilings above high-voltage equipment and in other hard-to-reach areas, not the detectors themselves.”

The risk of fire at the plant’s electrical and processing facilities can come from broken lubrication or fuel lines, fused circuit boards, failing lighting ballasts, over loaded cabling and transformers, and a variety of other ignition sources. Early detection is crucial for the containment of a potential hazard to a single cabinet or room.

VESDA air sampling smoke detectors are capable of sensing 0.0015% to 6% obscuration per foot (the widest sensitivity range in the industry) and provide multiple programmable alarm thresholds. These detectors work by continuously drawing air from a pipe network with multiple sampling ports. Smoke particles that may be present within the hazard are actively transported to a centralized detection unit. Each detector has a dual-stage filter that removes dust and dirt and provides a clean air wash that keeps the optical surfaces uncontaminated, for stable calibration and detector longevity. When the air sample passes through the detection chamber, it is exposed to a laser light source. If combustion particles are present, light is scattered within the chamber and sophisticated circuitry along with algorithm sends a data-rich alarm signal to the facility’s Alarm Management Station where it is supervised by a team of emergency response technicians.

A representative from Xtralis provided a technical awareness presentation to Suncor in early 2003. At that time, Langston and his crew had to maintain the ceiling-mounted linear-beam smoke detectors that have since been replaced with VESDA systems. The linear-beam smoke detectors were located above equipment cabinets, arch resistant switchgear, cable trays and other barriers. And because arc-resistant switchgear cabinets are designed to explode upward - if they blow up (minimizing damage to adjacent equipment) safety protocols required a plant shutdown before maintenance crews could service or maintain the linear-beam detection systems. In some cases this meant scaffolding, lifts, or other costly measures. Installing VESDA detectors dramatically reduced Suncor’s maintenance costs as there were no electrical components to maintain within the VESDA pipe network, and the detector was centrally located on the wall for easy access.

Level 2 generators with VESDA Sampling Pipe in protected area, and detection unit mounted in a control room for ease of maintenance access.

In addition to serving as a viable alternative to a linear-beam detector, a single VESDA system can take the place of many conventional single-point smoke detectors. The National Fire Protection Association (NFPA72) states: “Each sampling port of an air-sampling-type smoke detector shall be treated as a spot-type detector for the purpose of location and spacing.” [NFPA 72, Section 5.7.3.3.1]

Conventional smoke detectors, which characteristically respond to the presence of smoke at an average of 2% obscuration per foot, cannot compete with the early warning capabilities of VESDA detectors. Furthermore, the performance of conventional smoke detectors in electrical generating facilities and their associated operational areas may be reduced, due to a number of factors including smoke diffusion and stratification, high airflows, and, in the case of production areas, high levels of background smoke. Air-sampling smoke detectors can overcome these challenges because both the sampling-pipe network and the alarm threshold can be designed and programmed specifically for each room needing protection.

For example, a smoldering fire in a typical generating/turbine hall would release little heat, and the high ceiling would allow thermal layering, so smoke could stratify below the ceiling. Ceiling-mounted conventional passive smoke detectors may not sense the smoke, but VESDA sampling pipes can be installed vertically up one wall, horizontally across the ceiling, and down the wall on the other side of the room, to actively sample air from multiple heights and locations.

Likewise, the forced airflow inside a high-voltage control room might dilute smoke or remove it through the HVAC system before it reaches conventional ceiling-mounted detectors. At a Suncor motor control center, this problem was solved by attaching VESDA sampling pipes to return-air grilles. In a nearby cable-spreading room (a fiber optics hub), sampling pipes were installed beneath the floor as well as on the ceiling. A sampling pipe can even be installed in a duct (sampled air is returned from the detector to the duct).

Another significant VESDA advantage is its built-in data logger that records all alarms, service events, and fault events by time and date.

VESDA also offers AutoLearn™ and Referencing software to further minimize nuisance alarms by automatically compensating for expected changes in ambient air conditions. Other VESDA software includes ASPIRE™, for computer modeling of pipe network layouts. By entering parameters such as pipe length, air temperature, and aspirator pressure, ASPIRE can predict the performance of a proposed network.

Under-Floor Configuration

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Curtis Langston
Senior Fire Alarm Technician
Suncor

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