SOLBERG Oil Mist Solutions

Innovative Solutions

Landfill Gas Recovery
Waste to Energy

Preventing Engine Seal Leakage

The Challenge

The Operator of an active landfill in Marshall, Michigan uses three Waukesha engine gen-sets to turn waste methane gas into electricity, which is in turn used to power the plant. The engines are worn and have been overhauled multiple times. Each one was equipped with a Waukesha supplied crankcase breather. This unit tied into the engine intake creating a venturi effect to generate vacuum. The breather was designed to capture oil mist blow-by from the crankcase, and the vacuum produced by the venturi was used to create a slight negative pressure in the crankcase.

The Operator had continual problems with the existing breathers. These units did not sufficiently stop the oil mist blow-by and the engine intakes became contaminated. The engines do not run efficiently when the intake air is dirty. Secondly, the breathers contributed significant back pressure resulting in positive pressure in every engine. This pressure resulted in leaking seals and an oily mess on the surrounding floor. The waste to energy gen-sets were designed to protect the environment, so the oil leakage was unacceptable.

The Operator called Waukesha and asked for their guidance to solve the problems. Waukesha recommended Solberg Oil Mist Solutions based on some joint breather development work.

The Equipment

Engine Gen-Set:
Waukesha 7042GL
Crankcase Flow:
110 CFM
Existing Crankcase Pressure:
+ 4" H_20
Required Crankcase Pressure:
- ½" H_20
Raw Crankcase Blow-By Emissions:
>450 mg/m^3

The Solution

Solberg designed a Vacuum Assisted Oil Mist Eliminator (VAE) to create negative pressure in the crankcase, eliminate seal leakage and capture visible blow-by emissions. The design went through multiple iterations, and we finalized on the wall mounted unit shown above.

Installation

This was a collaborative process between the Operator and Solberg Manufacturing. We visited the site prior to our initial recommendation. The first VAE was designed as a prototype that was easy to connect, remove and move from engine to engine if necessary. To accommodate this, it was mounted on a stand with locking casters to allow for easy transport. Also, to expedite set-up and testing, the collected oil was drained into a 5 gallon waste bucket. The final clean exhaust was then vented out of the engine room. Once the Operator was pleased with the performance, Solberg designed permanent leg supports to raise the unit to its proper height above the high oil level in the crankcase. At the Operator's discretion, the drain line was routed back to the crankcase.

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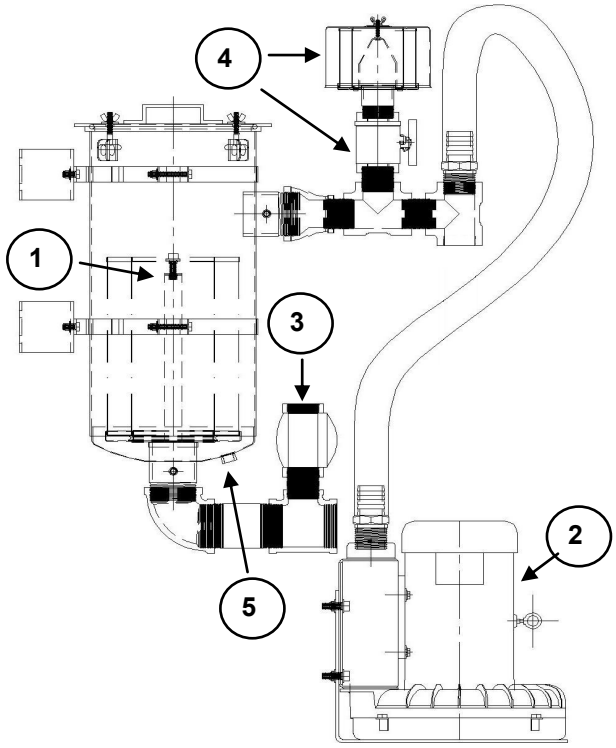
System Components

1. **Internal Air/Oil Separator Element**: 99.97% efficient for .3 micron oil mist. Designed to eliminate the visible blow-by emissions.
2. **Regenerative Blower w/ 4HP Motor:** Creates vacuum to overcome differential pressure created by the separator element and to maintain negative pressure in the crankcase.
3. **Pressure Relief Valve:** Opens at 1" of H_20 positive pressure in the crankcase. Protects engine seals from damage and leakage.
4. **Ball Valve and Fresh Air Filter for Vacuum Control:** As engine blow-by/flow increases over time, he separator element becomes dirty and the differential pressure increases. Without vacuum control, the result is positive crankcase pressure. In this case, the valve is closed to restrict fresh air flow, which increases vacuum produced by the blower. This simple device allows control through the life-cycle of the element and engine.
5. **Oil Return Drain**: This drain line runs back to the crankcase. To ensure proper drainage in this application, the port is located 24" above the high oil level and the line is submerged below the low oil level.



Results

During subsequent visits by Solberg personnel, both mist eliminators functioned well. The Operator was able to easily maintain -1/2" H_20 in the crankcase through periodic manual valve adjustments. Also, visible blow-by emissions were eliminated and carry-over was measured at less than 5PPM. This allowed for the exhaust to be routed outside of the building and into the atmosphere. The Marshall site is planning to install a third Solberg VAE in 2008.

The Operator manages several sites nation-wide, and Solberg is partnering with them to introduce this solution to their network.

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