Controlling costs and protecting the environment: combustion efficiency in crematoria

Application background

As with any furnace application, operators of cremators need to monitor combustion efficiency, however they also face some unique challenges.

All furnace operators have to control combustion efficiency for operational reasons: the more efficiently the fuel is burned, the lower the operational costs. Then there are the usual environmental constraints as most regions in the world now have specific emissions targets to avoid pollution. Crematoria operators also have to factor in a social aspect. Due to the nature of the business, they are not sited in industrial locations and have to carry out their work with sensitivity. Out of consideration to the bereaved and people living nearby, plumes of smoke and ash coming from the stack is not an option.

The Process

Many cremators operate for up to 15 hours a day, so operators have to select equipment to monitor combustion that is both accurate and reliable. The process of cremation involves sustained high temperatures of between 850 to 1500°C and the flue gases are corrosive. Any equipment installed must be able to cope with the aggressive conditions found in the stack. Maintenance causes down-time and replacement parts add to the operating costs , so both must be kept to a minimum.

The picture below demonstrates how corrosive the atmosphere is – the stainless steel probes pictured were in place for just a few weeks before deterioration:

Case study: Crematoria in Australia

One of the major suppliers of crematoria has reduced consumption of natural gas by 40% through effective combustion control, using Michell's XZR500 combustion control analyzers.

In Australia no smoke is allowed to issue from a crematorium, so combustion control is necessary for the company to comply with this legislation. Although all the exhaust from the cremation chambers is filtered before being released into the atmosphere, having minimal emissions makes this process easier and reduces costs.

Case study: Crematoria in Belgium

A cremator company in Belgium selected the XZR500 to overcome the high maintenance costs of replacing the probes on their previous analyzer every three months due to deterioration. The HR160 probes supplied with the analyzer are designed to withstand highly corrosive atmospheres and operate for years – saving on both maintenance and the cost of spares.

The operator's primary need for controlling combustion in the process is to comply with the emissions targets. In Belgium the government agency OVAM monitors emissions: twice a year measurements are taken by a certified entity, which reports to OVAM and the customer. The limits for the relevant VLAREM II permit are strict, per Nm^3: dust <30mg, mercury / compounds <0.2mg, SO_2 <300mg, NOx <400mg, dioxides <0.1 nanograms. Failing to get the levels of oxygen just right, would lead to inefficient combustion and an increase in the unacceptable emissions.

The XZR500 probe and control unit installed.

XZR500 Combustion Analyzer

The XZR500 combustion analyzer from Michell Instruments provides fast, accurate and reliable measurements in high-temperature, aggressive environments.

At the start of the cremation process, there is a lot of moisture present in the chamber. Many chemicals are also released including from clothing, replacement joints and mercury fillings. The Zirconia Metallic Sealed Reference Senor (MSRS) in the XZR500 is designed to withstand these conditions for long periods of time. The semi-insitu design allows non-conditioned (or representative) sampling with minimal installation. The Pitot effect in the sampling probe – where the gas is drawn along the probe as through a chimney – negates the need for aspirator air which is a further saving. The H160 probe is particularly suitable for the aggressive environment. The sensor has a built-in porous ceramic filter to further protect and prolong the life of the sample cell.

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