mance. Installation of the catalytic reactor was completed within 48 hours, requiring the minimum shutdown on the coil coating plant, see Figure 3.

As presented in the initial evaluation from the consultant of the options for Alcoa, the overall investment in the catalytic reactor installation has shown a significant saving both in capital cost and in process downtime when compared with the alternatives available.

Continuous monitoring of the stack emissions shows the catalyst to be achieving VOC and carbon monoxide emissions well within the limits set by the Environmental Protection Act.

Continuing Benefits from a Catalyst Retrofit

Once an oxidation catalyst has been retrofitted into a thermal incinerator exhaust duct there is the potential for significant savings in operating costs through a reduction of the combustion temperature in the incinerator. In Germany, following the retrofit of a platinum-based catalyst system by Johnson Matthey, the operator of a phenolic resin coating plant has been able to reduce his incineration temperature to less than 600°C. This has resulted in a reduced efficiency within the thermal incinerator which presents the downstream catalyst with greatly increased concentrations of VOCs and carbon monoxide.

However, the catalyst effectively oxidises these harmful gases and has brought the incinerator into compliance with the strict German air pollution control regulations (T. A. LUFT) while providing considerable savings in incinerator fuel for the operator. Moreover, operation at lower temperature has the added benefit of reducing thermal stresses in the incinerator, which would be expected to extend its operating life.

Platinum-based catalysts used for VOC control in industrial applications have been proven to have a typical lifetime of between five and seven years. Therefore, retrofitting a thermal incinerator with an oxidation catalyst represents a long-term solution to the problem of non-compliance with existing legislation, and can even be an answer to meeting future, more stringent, environmental legislation.

Tunable Iridium Based Infrared Detector

The detection of infrared radiation at wavelengths 0.75 to 20 micrometres is important for industrial process control, scientific imaging, thermography and radiometry, and surveillance; infrared cameras can be built from arrays of Schottky barrier detectors. The response of infrared detectors, based on Schottky diodes or heterostructures, to incident radiation is limited by the height of the internal potential barrier, and the cut-off wavelength depends on their construction. The longest cut-off wavelength, of 12 micrometres, has recently been achieved by iridium and platinum based Schottky detectors and by a SiGe/Si heterostructure. The cut-off wavelength can be changed only by lowering the Schottky barrier height, and the detectors can be tuned to only a few tens of meV.

However, if a detector had an asymmetrical metal-semiconductor-metal heterostructure, there should be modulation of several hundred meV, and an improved photoresponse. Now, researchers from France Telecom-CNET, have fabricated such a detector, which utilises an iridium electrode, and is tunable. The cut-off wavelength has moved from 2 to over 6 micrometres (I. Sagnes, Y. Campidelli and P. A. Badoz, *J. Electron. Mater.*, 1994, **23**, (6), 497–501).

The tunable infrared photoemission sensor, TIPS, of iridium/silicon/erbium silicide/silicon, is effectively two back-to-back Schottky diodes separated by silicon, creating an asymmetric potential barrier between the iridium and erbium silicide films. An iridium diode was made from evaporated iridium film; iridium and erbium silicide contacts were attached to the diode and an iridium dot, respectively.

With an external bias applied between the iridium and erbium silicide electrodes, the variation in the effective barrier height is over ten times larger than that of a standard Schottky barrier, and the cut-off wavelength can be modulated over a large range. On infrared illumination photocurrents are created, two, specific to TIPS, have tunable thresholds, of size depending on the incident photon energy, and on the applied bias. High detection levels are expected at 2 micrometres wavelength and at 125 K, and if it is combined with large focal plane arrays and with developing microelectronics technology novel detectors can be produced.