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Corrosion-resistant heat exchangers using AlWaFlon® pressure tubes made with DuPont™ Teflon® PTFE allow improved energy efficiency and reduced CO₂ emissions

Frankfurt am Main/Germany, June 18, 2012, AlWaFlon® pressure tubes supplied by Wallstein Ingenieur GmbH of Recklinghausen/Germany are made with DuPont™ Teflon® polytetrafluoroethylene (PTFE). This enables them to resist even the highly corrosive media present at flue gas desulphurization plants of coal-fired power stations. Unlike heat exchangers made of nickel-base alloys, these systems withstand a long-term exposure to aggressive acid mixtures. Such mixtures are comprised of SO₂, SO₃, HF and HCl, which are formed as flue gases cool and then condense on the heat exchanger surfaces along with ash particles.

The superior performance of these systems made with Teflon® PTFE is confirmed by a growing number of applications, the oldest of which have been in service since the early 1980s. One current example is the heat displacement system employed at the hard coal fired power plant at Siekierki near Warsaw, Poland. Here the energy recovered is used as a substitute for primary energy in reheating the cleaned flue gas. One benefit of this technology is that it prevents corrosion in the ducting and flue gas stack while also avoiding droplet formation once the gas is discharged from the stack. The system has been continuously in use for two years, and no corrosion issues or other problems have been encountered.

Heat exchangers incorporating AlWaFlon® pressure tubes contribute significantly to the sustainable operation of coal-fired power plants. They are suitable for service in temperature ranges in which metal-based heat exchanger systems can no longer be used due to attack by a mixture of acids. As a result, fossil fuel input and CO₂ emissions can be reduced even in highly corrosive applications. Moreover, more efficient cleaning cycles can be implemented thanks to the anti-stick properties of Teflon® fluoropolymers. An on-line cleaning system is also in use at the Siekierki plant.

The CHP (combined heat and power) generating station at Siekierki has a rated output of 620 MW and is operated by PGNiG S.A. It comprises two flue gas desulphurization lines, including a heat displacement system, fitted by RAFAKO S.A., the Polish equipment building company which refers to itself as Europe's largest boiler manufacturer. The systems were sourced from Wallstein and comprise 12 flue gas heat exchanger modules featuring AlWaFlon® pressure tubes plus 42 clean gas heat exchanger modules of which 14 likewise incorporate AlWaFlon® pressure tubes. Line 2 has been in service since November 2010; Line 1 was commissioned half a year later. Each of these lines saves 23 MW of energy that would otherwise have to be sourced from superheated steam. This is equivalent to an 8600 kg/h reduction in CO₂ emissions.
Hugo Graepel, project engineer at Wallstein, comments: “In all, the heat exchangers for Siekierki contain around 1,000 kilometers of AlWaFlon® pressure hose. The plant operates to the contractual expectations. In fact, the Siekierki project is just one example among many of how this system proves its merits on a sustainable basis even under extremely tough operating conditions. Our customers confirm in unison that the benefits of corrosion and pressure resistance, through a high circumferential tensile strength, are the key to achieving continuous availability and maximum energy efficiency across the range of applications.”

The AlWaFlon® system was jointly developed through partnership among Wallstein Ingenieur GmbH, DuPont, and Fluortubing B.V. Indeed, the AlWaFlon® trademark stands for the combined benefits of DuPont™ Teflon® PTFE, a chemically almost inert fluoropolymer, and a special processing method tailored to this material. The product is characterized by an exceptionally high maximum usage temperature of 260 °C and a similarly high Vicat softening point of 130 °C to 140 °C, combined with both a high flexural fatigue strength and stress cracking resistance.

Recently concluded long-term studies conducted at different test temperatures by the German TÜV Süd have yielded independent proof of the performance capabilities of AlWaFlon® pressure tubes. In the context of these long-term trials, the latest generation of DuPont™ Teflon® fluoropolymers was likewise approved for this application. Earlier on, internal pressure creep rupture tests over 10,000 hours conducted at BASF test laboratories had already demonstrated that AlWaFlon® pressure tubes can resist the combination of internal pressure and high temperature for a very long time and indeed surpass the performance of corresponding products made of diverse other fluoropolymers.

DuPont has commercialized a new generation of Teflon® fluoropolymer offerings, using new technology to enhance the sustainability of our manufacturing processes while continuing to deliver outstanding performance to meet a range of market needs.

Hugo Graepel continues: “It is confirmed by these independent studies that AlWaFlon® pressure tubes can resist higher mechanical loads than, for example, pressure tubes made of other fluoropolymers even if they exhibit the same wall thickness. We can thus produce larger diameter hose, which in turn allows more heat to be transferred. Alternatively, the same heat exchanger performance can be achieved with fewer or shorter pressure tubes. We consider our competitive position strengthened by TÜV Süd’s approval of the latest generation of Teflon® PTFE products, given that the AlWaFlon® heat exchanger system based on these products becomes both more cost-efficient and more sustainable as a result. These advantages, in conjunction with the security of supply, enable us to make our own sustainable contribution towards enhanced energy efficiency.”

Wallstein Ingenieur GmbH is part of the Wallstein network of affiliated companies whose core competence lies in industrial heat and process engineering. The company ranks among Germany’s leading equipment and plant manufacturers and serves customers in the waste incineration and power plant sectors as well as other industries. For thermal and environmental/process engineering applications, Wallstein supplies individual components as well as heat displacement systems and complete flue gas purification plants.

Fluortubing B.V., with headquarters in Utrecht/the Netherlands, specializes in the extrusion and thermoforming of standard and application-specific pressure tubes and tubes made of PTFE. Moreover, the company employs vertical extrusion lines optimized, e.g., for the paste-extrusion of products of low wall thickness (under 10 mm to around 200 mm in internal diameter). Among the company's specialty products are convoluted PTFE pressure tubes, which can also be supplied in conductive form and colored to customer requirements.
DuPont Fluoropolymer Solutions is a leading producer of fluoropolymer resins, additives, films, finishes and dispersions, PTFE (polytetrafluoroethylene), PFA (perfluoroalkoxy), FEP (fluorinated ethylene propylene), ETFE (ethylene-tetrafluoroethylene) and PVF (polyvinylfluoride). Major markets for these fluoropolymer products include the automotive, chemical processing, semiconductor, oil exploration, chemical handling, data communication, aerospace, electronics, housewares, building and renewable energy industries. For more information about Teflon® branded products, visit www.teflon.com.

DuPont (NYSE: DD) has been bringing world-class science and engineering to the global marketplace in the form of innovative products, materials, and services since 1802. The company believes that by collaborating with customers, governments, NGOs, and thought leaders we can help find solutions to such global challenges as providing enough healthy food for people everywhere, decreasing dependence on fossil fuels, and protecting life and the environment. For additional information about DuPont and its commitment to inclusive innovation, please visit http://www.dupont.com.

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In the flue gas desulphurization plant of the Siekierki coal-fired power station situated near Warsaw/Poland, large-size heat exchangers equipped with AlWaFlon® pressure tubes made with DuPont™ Teflon® PTFE prove resistant to the attack of highly corrosive mixed acids. The AlWaFlon® heat exchanger system is key to achieving major primary energy savings, resulting in substantial reduction in CO₂ emissions. This primary energy would otherwise be needed for reheating the cleaned exhaust gas so as to be discharged through the stack.

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