



Thermal News Summer 2015

closing the loop on thermal solutions

Welcome! Durex' core technologies and advanced thermal solutions provide superior performance—giving our customers advantages in their industries. Here we'll focus on thermal solutions for semiconductor processing equipment. Future issues will look at thermal solutions for the Analytical Instrumentation, Foodservice Equipment, Medical Device, Plastics, and Process Industries.

Semiconductor Processing - Precision Thermal Management and Control

Semiconductor device manufacturing requires multiple lithography, deposition, and etch steps. Process temperature control is critical for successfully producing a device and its performance specifications. This applies to all semiconductor devices, especially memory devices and other integrated circuits (IC), where performance is dependent on memory capacity and processing speed. New generations of semiconductor devices are becoming smaller, and more complex. Subsequently, manufacturing every new generation of semiconductor devices requires more innovative and precise temperature control.

Semiconductor and Photovoltaic Manufacturing Equipment

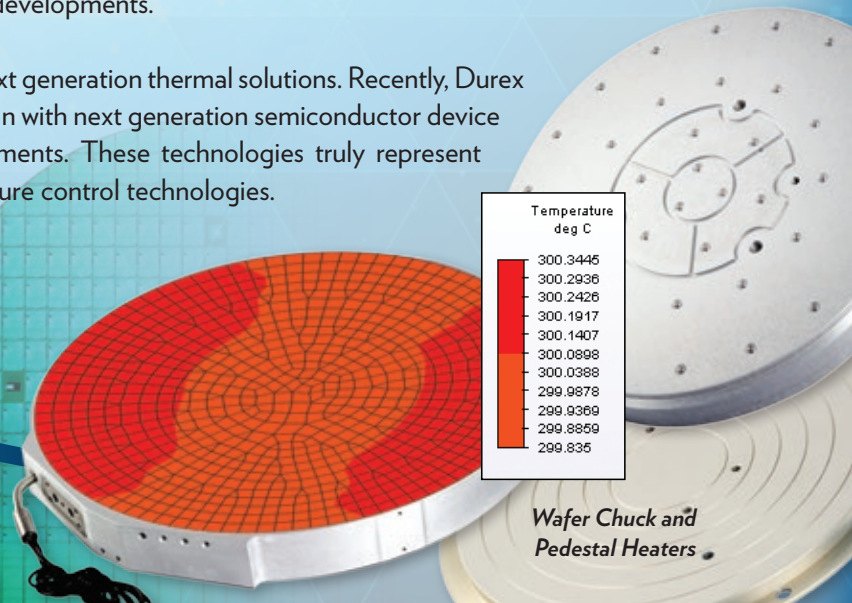
Innovative Pedestal Heater Technology

Durex' first experiences in developing thermal solutions for semiconductor OEMs was in the early 1990s with development of cast aluminum pedestal heaters for chemical vapor deposition, photolithography, etch and wafer testing equipment. The early applications for 100 and 150 mm wafer processing were the basis for Durex' continuing thermal research and development. With a core competency in design and manufacturing metal-based pedestal heaters for in-situ vacuum applications, Durex became a preferred thermal solution supplier. Durex' innovative solutions continued as the industry progressed toward 300mm manufacturing equipment and dimensional line width and spacing reductions.

Durex Thermal Engineering, Innovation and New Technologies

In 1965, Gordon E. Moore, co-founder of the Intel Corporation and Fairchild Semiconductor, observed that there was and would continue to be a doubling every 2 years in the number of transistors per integrated circuit. This observation became what is known as Moore's Law and one of the guidelines for semiconductor technology roadmaps that are still valid today. Doubling is easy to say, but it also comes with many technological challenges and new developments.

In parallel, Durex had the challenge of developing next generation thermal solutions. Recently, Durex developed new core thermal technologies that align with next generation semiconductor device performance, manufacturing, and cost requirements. These technologies truly represent improvement over older heater and temperature control technologies.



Temperature deg C
300.3445
300.2936
300.2426
300.1917
300.1407
300.0898
300.0388
299.9878
299.9369
299.8859
299.835

Wafer Chuck and Pedestal Heaters

HALO® and SENTINEL® Gas and Abatement Line Thermal Solution

Durex' HALO temperature controller and SENTINEL foam insulated silicone rubber heating solutions were designed to optimize performance of Semiconductor Vacuum Abatement Systems.

HALO Temperature Controller



HALO® is a patent pending integrated controller that reduces thermal system complexity and cost as compared to traditional solutions. Combined in one controller are multiple sensor inputs, including process temperature, limit temperature, and current sensing that allows monitoring of multiple heaters wired in parallel. Designed to be used in remote locations that may not be easily accessible by maintenance

personnel, HALO includes a light bar that provides visual indication of system health. Other features include Modbus RS-485 communications, digit input/output, hi/low alarm output, and ramp/soak temperature profiles.

SENTINEL Pump Line Heaters



Durex Industries developed the patent-pending SENTINEL® advanced heater technology, because Semiconductor Equipment Industry engineers need thermal solutions that meet specifications for next generation manufacturing processes while reducing thermal system costs. SENTINEL Pump Line Heaters are available in standard I.D. size diameters of 1.0, 1.5, 2.0, 4.0 and 6.0 inch straight sections, elbows, tees, reducers, and flanges. The heaters can also be easily designed to the dimensions of valves, regulators, and other gas delivery and pump line components.

Aluminum Nitride (AlN) Heater Technology

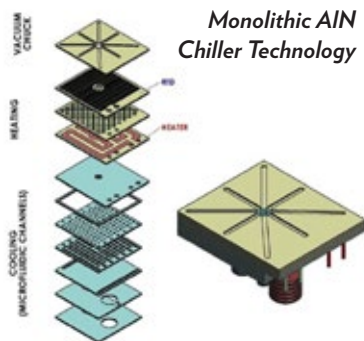
Ultra-pure high performance advanced ceramic materials are essential for processing next generation semiconductor devices. Durex recognized the benefit of developing a heater technology that would complement the

physical properties of AlN. Thermal coefficient of expansion, thermal transfer, hardness and resistance to most chemicals, make AlN a preferred material for in-situ vacuum and other semiconductor applications.

One example is where Durex developed a new Chiller Technology based Aluminum Nitride (AlN) Ceramic Heater technology with an embedded Tungsten RTD sensor. This patent pending extreme ceramic Chiller/Heater is capable of:

- Heating from 100 to 450°C @ 200°C per second
- Cooling from 450 to 100°C @ 100°C per second

This performance is based on Durex' multilayer monolithic ceramic technology that could include heaters, cooling microfluidic, RTD sensors, ground planes and other layers. The high thermal conductivity and low temperature expansion properties of AlN enable the fast temperature response. Applications for fast heat/cool chillers are common in semiconductor equipment and analytical instrumentation.



Contact Durex Industries for all your heater, sensor and control requirements.

For more information, visit our website!

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