

**FOR MORE INFORMATION:**

Anguil Environmental Systems, Inc.

Phone: 414-365-6400

www.anguil.com | info@anguil.com

SEMICONDUCTOR FABRICATOR FINDS COMPETITIVE ADVANTAGE IN AN ENVIRONMENTAL REQUIREMENT

Anguil Environmental recently helped a large chip manufacturer stay ahead of their competition by supplying a single abatement system capable of processing over 100,000 SCFM of process air containing Volatile Organic Compounds (VOCs).



ABSTRACT

In the face of rapid industry advancement, semiconductor chip manufacturers are continually looking for an edge on the competition. Historically, that requires them to stay current with the latest trend in wafer sizes. As enhancements to production capabilities continue to increase wafer sizes, the amount of emission-laden air coming from the wafer fabrication process also increases. With rising global environmental concerns, manufacturers must be cognizant of the impact their facilities have on air, water and soil and stay in compliance with tightening regulations.

Anguil Environmental recently helped a large chip manufacturer stay ahead of their competition by supplying a single abatement system capable of processing over 100,000 SCFM of process air containing Volatile Organic Compounds (VOCs). Their previous VOC abatement systems were capable of less than 50,000 SCFM each. Anguil was able to replace two systems with one while maintaining a similar footprint and achieving greater than 99% overall VOC removal.

CHALLENGES ADDRESSED



Regulatory
Requirements



Increased
Capacity



Maintain
Footprint



No Pressure
Fluctuations

- >98% VOC removal required by the local regulatory agency
- Double capacity to 100,000 SCFM using a single system with the same footprint of the two existing pollution control devices
- No pressure fluctuations were allowed in the upstream process equipment

SOLUTION IN ACTION

Nailing Down the Requirements

The making of microprocessors has long been considered one of the most complex, time consuming and expensive manufacturing processes in the world. That process begins with the manufacturing of silicon wafers. This is the most important step in the entire process as it is where the integrated circuit is formed into the wafer. The entire manufacturing process requires hundreds of individual steps and days, if not weeks, to complete.

**FOR MORE INFORMATION:**

Anguil Environmental Systems, Inc.

Phone: 414-365-6400

www.anguil.com | info@anguil.com

SOLUTION IN ACTION: A Competitive Advantage

A few of the key processes involved include:

- Fabrication of the silicon ingot and slicing into individual wafers
- Application of a photoresist coating
- Lithography of the integrated circuit onto the wafers
- Cleaning, polishing, and testing of each wafer
- Sawing each wafer to create thousands of individual chips

Many of these steps use various chemicals, and as a result, water and air from the manufacturing process require further treatment before being released to the sewer or atmosphere. As wafer sizes have increased from 200 mm to 300 mm to 450 mm due to production advancements, VOC-laden process emissions requiring treatment have also increased, ballooning required abatement equipment capacities and operating costs. The manufacturer approached Anguil, an industry leader in air pollution control technologies, to develop the best solution to treat a large volume of VOC-laden air (>100,000 CFM) while achieving greater than 98% overall VOC removal efficiency. The equipment could not impart any pressure fluctuation into the process ductwork; doing so would result in thousands of dollars of lost product. In addition to the typical VOCs present from this process, Anguil engineers would also need to design for the presence of Hexamethyldisilazane (HMDS). HMDS is a silazane containing compound that when oxidized creates SiO₂, solid silica.



Pulling It All Together

Anguil Environmental provides highly engineered environmental equipment and service solutions that help clients solve complex industrial air and water challenges across the globe. Because Anguil supplies both thermal and catalytic oxidizers as well as emission concentrators, they were able to review all aspects of the project and select the best air pollution control technology to meet the customer's requirements. Ultimately, Anguil provided a Rotor Concentrator Thermal Oxidizer (RCTO) on time, under budget and in compliance with regulations.

The first step was for Anguil engineers to select a newly developed zeolite rotor concentrator wheel sized to handle in excess of 100,000 SCFM of process air. The emission concentrator is an energy and cost saving add-on to oxidation technologies that can reduce the amount of treated air by as much as 95%. This greatly reduced flow is rich in emissions and much less of an operating cost burden on the destruction device. The customer's previous systems were limited to less than 50,000 SCFM. The industry-leading capacity of Anguil's new wheel essentially allowed the customer to replace two separate systems with one, providing significant savings in capital investment and precious floor space at the foundry.

**FOR MORE INFORMATION:**

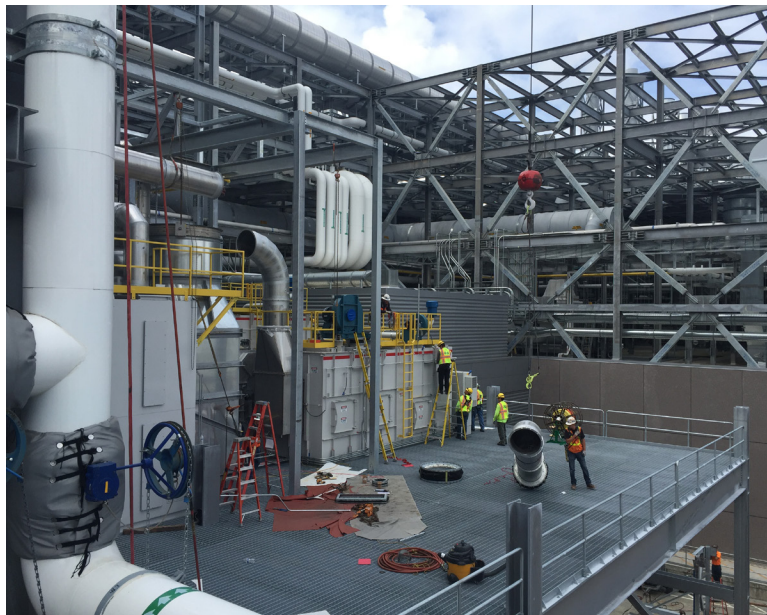
Anguil Environmental Systems, Inc.

Phone: 414-365-6400

www.anguil.com | info@anguil.com

SOLUTION IN ACTION: A Competitive Advantage

The second step was for Anguil engineers to select and design the proper oxidizer technology to pair with the new concentrator wheel. Oxidizers are air pollution control devices that utilize time, temperature and turbulence to remove harmful pollutants from various industrial processes. In order to meet the difficult >98% overall Destruction Rate Efficiency (DRE), the oxidizer itself would need to be capable of >99.5% (Note: the overall DRE is a combination of the zeolite concentrator wheel removal efficiency multiplied by the oxidizer destruction efficiency). The presence of HMDS further complicated the oxidizer selection and design as the compound forms silica dust when it is oxidized in the combustion chamber. This silica dust can plug or foul various components inside the oxidizer over time. Ultimately Anguil engineering selected a thermal recuperative oxidizer with a specially designed shell and tube heat exchanger as the best solution. The heat exchanger was designed specifically to minimize any silica build-up and allow for easy cleaning of the silica that does build-up over time.



Installation, Commissioning and Operation

Immediately upon being awarded the contract, Anguil began designing and building not one, but three new Rotor Concentrator Thermal Oxidizer (RCTO) systems. Each system was to be installed on a mezzanine level of an existing building. This put further constraints on the allowable footprint and weight of each system, size of individual pieces and the project timeline. The three systems were to be installed in series and in conjunction with other processing equipment on the same level of the building. Meeting specific delivery dates was critical to ensure all equipment could be installed in the proper order with no costly delays. Hundreds of pieces of new equipment arrived on site and needed to be installed in a specific order. Missing a date on any one piece would cause a ripple effect and delay the entire project.

Once installation was complete, Anguil's start-up technicians arrived on site to complete final commissioning and comprehensive operator training, which consisted of both "on skid" and classroom sessions. With all three systems installed and in operation, test data has shown each unit is achieving greater than 99% overall VOC removal, higher than original design requirements. With Anguil's larger capacity design, the customer was able to replace two systems, which drove an overall reduction in utility consumption at this facility. They have also gained valuable floor space. The customer has gone on to purchase several similar systems for plants around the world as a result of this successful project.



**FOR MORE INFORMATION:**

Anguil Environmental Systems, Inc.

Phone: 414-365-6400

www.anguil.com | info@anguil.com

SOLUTION IN ACTION: A Competitive Advantage

Project Takeaways

- Anguil listened to the customer's needs and challenges and developed a new solution that meets or exceeds every requirement while providing significant capital savings, additional floor space and no negative impact on the highly sensitive manufacturing process.
- The zeolite concentrator wheel portion of the system can process >100,000 SCFM of VOC laden process air, providing the necessary removal efficiency to achieve the required 98% overall VOC destruction efficiency. The wheel also provides a >20:1 concentration ratio, minimizing the size of the thermal oxidizer and the associated utility consumption.
- Anguil engineers selected a thermal recuperative oxidizer as the best VOC destruction technology. The oxidizer included a specially designed shell-and-tube heat exchanger to combat the presence of silica build up due to the oxidation of HMDS.
- The combination of the concentrator wheel and thermal recuperative oxidizer resulted in a complete RCTO system capable of processing twice the air volume of any of the customer's previous abatement systems.
- The overall footprint of Anguil's RCTO system is similar to the previous systems' footprint. This allows the customer to process twice the air volume from the same "VOC abatement" footprint, saving valuable floor space.
- Replacing two-for-one provides Anguil's customer with a significant capital and operating costs savings compared to the previous supplier.
- The overall VOC removal efficiency of the RCTO system is performing higher than the original design, achieving a 99% overall VOC removal efficiency.

Have a Similar Application? Anguil Can Help!

**(414) 365-6400****info@anguil.com****www.anguil.com**