

**KCH ENGINEERED SYSTEMS**  
**CASE STUDY FOR THE EXHAUST/SCRUBBER SYSTEM FOR**  
**MONO-CRYSTALLINE AND MULTI-CRYSTALLINE AND MANUFACTURING**  
**OF SOLAR CELLS**

A large Solar Manufacturing Company recently constructed a new facility in the Southeastern United States. This company's mission was to provide the highest quality crystalline Photovoltaic (PV) products on the market today. Their manufacturing techniques, their world class etching tools and wet-bench technologies and equipment would require the use of world class exhaust/ventilation technology. To ensure their compliance with the state air quality management districts would require very carefully balanced exhaust air handling equipment and state of the art air pollution control equipment. These chemicals were all very corrosive and all exhaust and air scrubber equipment must be extremely corrosion resistant.

**KCH Engineered Systems was awarded the contract to design the large exhaust and scrubber systems.** KCH Engineered Systems had demonstrated the design / engineering, manufacturing, and installation capabilities to meet the challenging requirements of controlling these toxic and dangerous chemicals in the workplace. KCH also provided the delicate balance required to ensure each chemistry that evolved from the process, could be segregated, without cross contamination, to its respective scrubber technology. This was critical as the different compounds being evolved from the process required different and specific air pollution control designs. There was no way to provide baffles or barriers to physically segregate these incompatible exhaust streams, so it had to be done by means of precision air balance and designed pressures.

In the wet chemistry phase of creating a solar cell, raw silicon wafers are etched in acid baths. These acids usually consist of high concentrations of Nitric Acid, Hydrochloric Acid and Hydrofluoric Acid. This etching leaves a series of pyramid structures on the mono-crystalline surface and this assists light absorption.

This wet chemistry phase also included alkaline baths with high concentrations of Sodium Hydroxide and Potassium Hydroxide. In addition to the acid/alkali chemistries, there were organic baths that were required to be segregated in the exhaust air streams. A separate airstream containing Isopropyl Alcohol (IPA) was exhausted and controlled using a unique design in wet scrubber technology.

The organic and the inorganic chemistries required different principles of design regarding the air pollution control technology. This created a delicate air balance challenge to ensure the correct chemistries were properly exhausted to the correct system.

The KCH Engineering Staff was up to the task of designing these special, delicately balanced corrosion resistant exhaust systems. System testing proved that the segregation of the chemistries in each exhaust stream was achieved. It was also demonstrated that due to the extremely high removal efficiencies that were achieved in each individual design

of the KCH Air Pollution Control Technology, all state and federal requirements for facility wide Air Toxics emission requirements were met, enabling this Solar Cell Manufacturing Company to maximize production.