



**TECHNICAL  
ARTICLE  
SERIES**

# **pH Neutralization System for Acidic and Alkaline Waste Streams at Petrochemical Plant in China**

**ARTICLE #** TL-173

**INDUSTRY:** Wastewater Municipal

**ENTITY:** Digital Analysis Corporation

**SOLUTION(S) PUMPED:** Acids, Alkalies

**PUMP TYPE(S):** CHEM-GARD Horizontal Centrifugal Pump

**Vanton Pump & Equipment Corp.**  
201 Sweetland Avenue  
Hillside, NJ 07205 USA  
Telephone: 908-688-4216  
Fax: 908-686-9314  
E-Mail: [mkt@vanton.com](mailto:mkt@vanton.com)  
[www.vanton.com](http://www.vanton.com)

**Vanton Pumps (Europe) Ltd**  
Unit 4, Royle Park  
Royle Street  
Congleton, Cheshire, UK CW12 1JJ  
Telephone: 01260 277040  
Fax: 01260 280605  
[www.vantonpump.com](http://www.vantonpump.com)



Figure 1



Figure 2. Spent chemical pH Neutralization System Custom Engineered by Digital Analysis Corporation, Skaneateles, New York.

# pH Neutralization System for Acidic and Alkaline Waste Streams at Petrochemical Plant in China

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## Material selection criteria for pH neutralization system handling acidic and alkaline waste streams

When the designers of a sophisticated petrochemical manufacturing plant in Neijing, China were faced with the various problems involved in creating an environmentally safe, minimum maintenance, versatile neutralizing system for handling corrosive and hazardous acidic and alkaline chemical waste fluids under harsh outdoor service, they turned to Digital Analysis Corporation of Skaneateles, NY, specialists in the design of packaged and customized pH adjustment systems.

The criteria for the system included these difficult fluid handling problems:

- The flow of the system is an average flow of 50 GPM with a peak flow of 100 GPM;
- pH range from highly acidic (0.5) to highly alkaline (13.0);
- Temperature fluctuations from 50 degrees F to 150 degrees F;
- Total suspended small solids (salt precipitates) as high as 5,000 mg/L

The original specifications for this system indicated the use of type 304 stainless steel. Based on more than 20 years experience with highly corrosive fluids in industrial processes, the engineers at Digital Analysis concluded that the suggested metal would not be suitable, and that the use of higher alloy materials or exotic metals was problematic and costly. They recommended selected use of diverse thermoplastics for the pumps, piping, tank and other fluid handling components. They made these specific recommendations:

- a) Polypropylene for the four horizontal centrifugal pumps. Digital Analysis selected Vanton Chem-Gard® CGA units with all fluid contact components (casing, flanges and impellers) furnished in solid, virgin polypropylene and meeting ANSI B73.1 and international process pump standards. (Figure 1)
- b) Polypropylene for the custom-fabricated treatment tank. Epoxy-coated steel reinforcement ribs, encapsulated in polypropylene around the perimeter of the tank, provide additional wall support.
- c) Chlorinated polyvinyl chloride (CPVC) for the pipes and fittings.

According to Richard Pinkowski, CEO of Digital Analysis, "In the opinion of our engineering department, since this application involves exposure to both highly acidic and highly alkaline discharge flows, and subsection to sudden temperature and pH changes as well as harsh outdoor conditions, no other materials of construction would offer the long term

reliability, safety and minimum maintenance required."

The installed system is able to rapidly neutralize hot caustic concentrations—as high as 5 percent in a brief period of time—and handle 98 percent sulfuric acid as it is injected into the caustic stream which undergoes rapid and significant temperature elevation.

This spent chemical neutralization system was supplied as a completely fabricated, skid mounted turnkey package (Figure 2). A polypropylene containment drip pan with 8-inch-high walls, isolates the epoxy-coated steel skid from potential leaks or chemical spills and provides for drainage to a sump.

All recirculation, transfer and discharge lines were provided in solvent welded CPVC scheduled 80 pipe, and all reagent delivery lines are made of flexible PFA pipe double contained within a clear flexible PVC hose.

Since this system was designed to ensure minimum maintenance, is economical to operate and easy to service, it was readily certifiable under rigid Chinese standards.