



## ClearValue's Water Chemical Manufacturing (ACH/D) Technology

Aluminum Chlorohydrate (ACH), Disinfectants (D) and Caustic are the manufactured products of ClearValue's innovative ACH/D manufacturing technology, which is patent pending from WO 03/009811 A2 and WO 06/088615 in the EU, Canada, Mexico and China. ACH/D patents have issued in the U.S., Australia and India. ACH and D are used extensively in water purification, a most important businesses to humanity.

Water is in nearly every aspect of the human existence. In the U.S., municipal drinking water use is near 125 and 400 gallons per day (GPD)-person and household, respectively; wastewater treatment is approximately 150 GPD-person and 500 GPD-household. Nationally, this translates to nearly 40 billion GPD of drinking water and 50 billion GPD of wastewater. Industrial water usage is near 50 billion GPD and power generation 100 billion GPD. Water is used in nearly every industry, building and manufacturing plant, as well as household.

**D are needed for every drop of water.** Prior to use, a D is required to disinfect water of microbiological contaminants. The D industry is over a \$1B industry in the US and \$4B WW. Traditionally, D are manufactured by electrolysis of salt water, e.g. sodium chloride (NaCl) solution. While the cost and availability of NaCl is near \$80 per ton (\$0.040 per pound), the cost of a gallon of bleach is near \$0.60 due to the cost of electrical energy. Electrolysis is used to manufacture chlorine (Cl<sub>2</sub>), hydrochloric acid (HCl), bleach (5-12% sodium hypochlorite, NaOCl) solution and 25-50% caustic (sodium hydroxide, NaOH) solution. The market price for Cl<sub>2</sub> is near \$0.30 per pound, 33% HCl \$0.11 per pound, 12% NaOCl \$0.60 per gallon and 50% NaOH \$0.25 per pound. ClearValue's innovative ACH/D manufacturing technology reduces manufactured cost of these products to near \$0.020 per pound for HCl, \$0.040 per gallon for 12% NaOCl and \$0.020 per pound for NaOH. Further, Cl<sub>2</sub> is a well recognized safety issue; while, NaOCl and HCl can replace in all water purification applications.

**Nearly all surface waters require a coagulant.** ACH is used as a coagulant in the water industry. Coagulants are used in water purification to gather contaminant particles for separation. Prior to ACH, the coagulant of choice was Alum, aluminum sulfate. However, Alum places soluble aluminum in the water. In drinking water, aluminum is a neurotoxin known to cause neurological disorders such as Alzheimer's, Depression, Dementia, Parkinson's, etc. The aluminum in Alum is soluble; while, the aluminum in ACH is not soluble. Currently, ACH is a \$250M industry in the US and \$1B WW; while, the Alum industry is still near a \$200M industry in the US and nearly \$500M WW. The current market price for 50% ACH is near \$0.32 per pound; while, ClearValue's ACH/D manufacturing technology reduces the manufactured cost of 50% ACH to near \$0.090 per pound. This is while, ClearValue's patented coagulation technologies, U.S. 6,120,690 and U.S. Pat. App. 10/413,849, significantly increase ACH usage and value in coagulation.

**ClearValue's ACH/D manufacturing technology** is an innovative and proprietary combination of D and ACH manufacture. ClearValue does add high shear agitation for ACH manufacture, thereby improving product quality and eliminating waste by-product formation. Also, ClearValue does provide a new HCl reactor design, producing HCl directly from sodium salt (NaCl) and sulfuric acid (H<sub>2</sub>SO<sub>4</sub>). H<sub>2</sub>SO<sub>4</sub> and NaCl produce HCl and sodium sulfate (Na<sub>2</sub>SO<sub>4</sub>), which is further reacted with lime to produce HCl, bleach and pure gypsum, CaSO<sub>4</sub>. (The construction industry is in need of pure gypsum, having recently encountered significant contamination issues from mined gypsum.) HCl is reacted with alumina (Al<sub>2</sub>O<sub>3</sub>/Al(OH)<sub>3</sub>) to produce 50%ACH. Na<sub>2</sub>SO<sub>4</sub>, as a by-product, has a market price of near \$0.050 per pound, while pure gypsum has a market price of near \$0.015 per pound. **In summary**, ACH/D utilizes inexpensive H<sub>2</sub>SO<sub>4</sub>, NaCl, alumina and lime to produce 33% HCl, 12% NaOCl, 50% NaOH and 50%ACH, having as by-products Na<sub>2</sub>SO<sub>4</sub> and CaSO<sub>4</sub>, which are significant markets.

**One hundred ACH/D Facilities** are planned WW: 10 across the U.S.; 1 in each EU Country; 5 in Canada, 5 in Mexico; 10 in Australia, 20 in India and 30 in China. The average, nameplate capacity, of each is daily manufacture of: 1M pounds 33% HCl, 100k gallons 12% NaOCl, 150k pounds 60% ACH, and 1M pounds gypsum, providing annual: cash flow of \$75M (excluding depreciation), contribution margin in excess of \$50M and gross margin of over \$25M. Each nameplate facility is estimated, Texas Gulf Coast basis, to have an equipment cost of \$20M. While, to enter the market and begin operations, a single reaction train @ 1/10 volume and \$3M is planned.

**Alternatively, should ACH/D create an H<sub>2</sub>SO<sub>4</sub> shortage**, each ACH/D facility can be expanded to include H<sub>2</sub>SO<sub>4</sub> manufacture; thereby, using sulfur as a raw material; while, there is a worldwide glut of sulfur from desulfurization of hydrocarbon fuels. ClearValue has trade named ACH/D incorporating H<sub>2</sub>SO<sub>4</sub> manufacture Sulert™.

### Sulert™ and ACH/D General Process Flow Diagram

