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Cleaner Technology Asia

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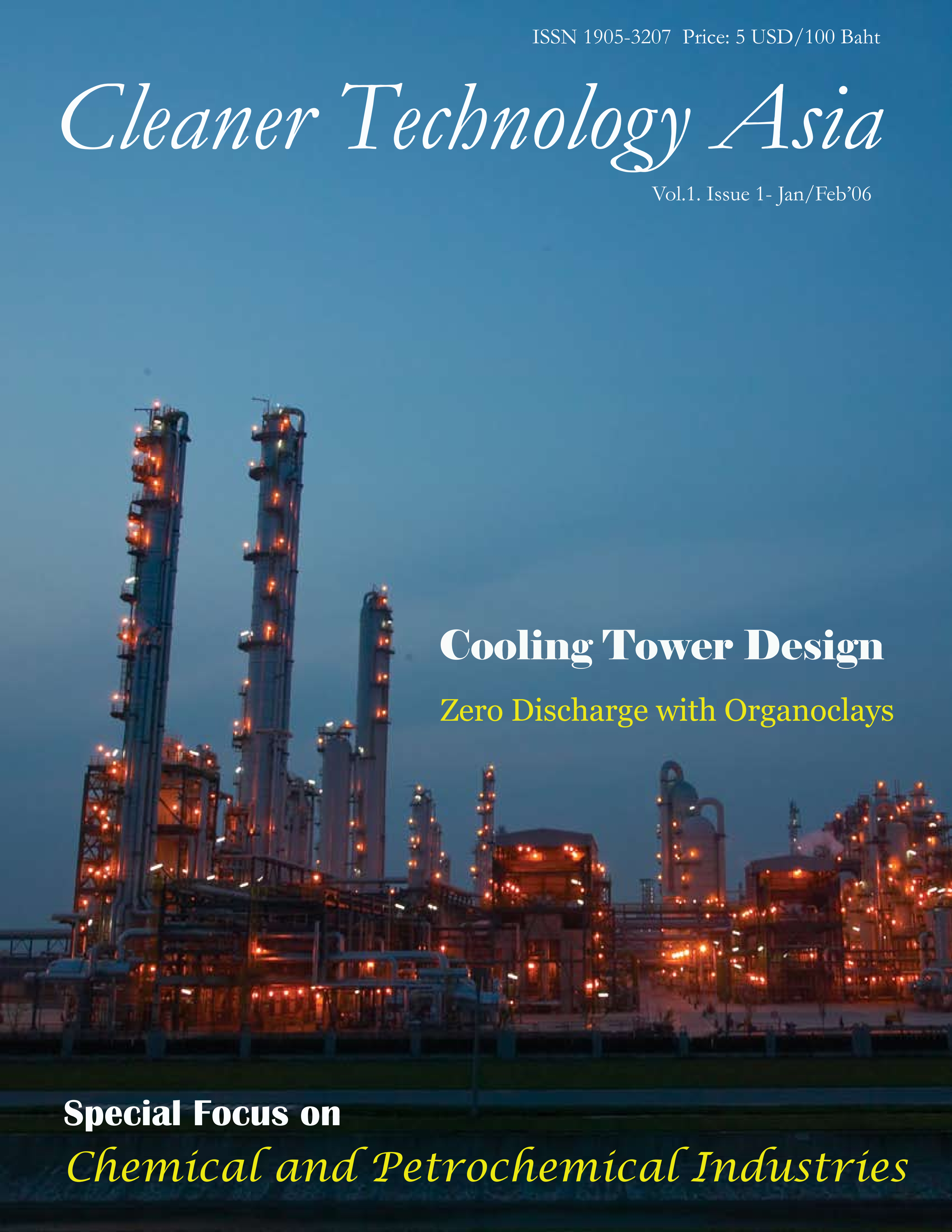

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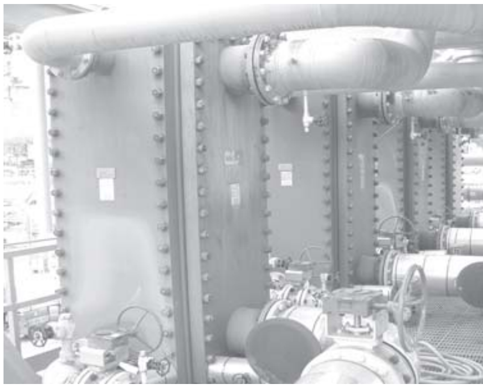

Publisher's Note

Supplement

Dear Readers,

Welcome to the first issue of "*Cleaner Technology Magazine*". Pleased to introduce you this new magazine, which focuses on Process Improvement & Integration and Pollution Prevention & Control. This magazine is published with cooperation of local environmental technology magazine "ET4Thai". As we know very well that we have been experiencing abnormal weather changes recently due to the pollution problems. These problems can be minimized by using cleaner technologies. For the businesses, both efficient as well as environmental friendly technologies are needed to sustain in the competitive world. This magazine focuses on these technologies, which improves production process as well as reducing pollution problems.

As this is first issue, there is a long way to achieve our mission. We welcome our readers to give us constructive ideas to improve the content of this magazine. We are also inviting experts from all over the world to contribute information for this magazine. So this magazine is for everyone in an industry or any research organization. We are welcoming interested relevant journals/periodicals who have mutual interests in order to explore partnerships.

Another key benefit for this magazine reader is to join focused technical training programs at affordable rates. So far, we are about to organize two training courses "**Industrial Waste Auditing: Practical Approach**" (26 April'06, Bangkok) and "**Incineration Technology**" (1-2 August'06, Bangkok).

We designed subscription process at affordable rates. We invite all the interested readers to subscribe in order to receive our magazine regularly. We invite interested companies to market their products by placing advertisements at affordable rates.

Please let us know your feedback after reading first issue of this magazine.

Thanks

Sirinthip Boonlom

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Optimizing Separator Operation with Liquid Measurements

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Petroleum refineries process large amounts of crude oil to make gasoline, diesel, heating oil, and other products. The processing steps produce some water in oil emulsions that are difficult to treat and dispose of. The water produced by a refinery tends to extract the water soluble components of the crude, including heavy metals, sulfides, and salts that can require substantial wastewater treatment prior to discharge. Vessels called separators are used to allow collection of the water phase separately from the organic products and, later on, to remove solid contaminants from the water phase prior to discharge. Selecting appropriate liquid measurement instrumentation for these vessels optimizes removal of waste products and minimizes product

Separators are used in a variety of industries:

- chemical processing (separation of aqueous and non-aqueous solutions).
- secondary oil production (water recovery).
- environmental (recovery of grossly contaminated water).

Separators are charged with the mixture which is allowed to separate into two phases, the aqueous (water–based solution) and the non-aqueous (oil, fuel, organic solvent). Depending upon the density of the non-aqueous component relative to water, the mixture will either float to the top of the water (the usual case) or precipitate to the bottom. The separated components are simply pumped or allowed to drain from the separator. Operation of the separator typically uses an open or vented vessel to overflow with the organic phase, while leaving the water phase behind in the vessel. The water slowly accumulates and must be discharged periodically. Although many measurement technologies are able to distinguish between the oil and water phases, electrical conductivity is probably the most cost effective method for water level control in the separator.

CONDUCTIVITY MEASUREMENT

The use of conductivity is based on the simple principle that aqueous solutions are good conductors of electricity, while non-aqueous solutions do not appreciably conduct electricity. Thus, a conductivity measurement can be used to signal the presence of the aqueous or non-aqueous phase. As water accumulates in a separator, a conductivity sensor mounted above the vessel outlet can sense the presence of the aqueous phase due to the increase in conductivity. Typically, the conductivity of the “rag” water layer directly adjacent to the organic layer is quite high because impurities tend to collect there. This makes detection of the interface quite easy as the organic layer will not conduct but the “rag” layer will conduct well. A conductivity transmitter will indicate this increased conductivity using the 4-20 mA current output or digitally for HART or Foundation Fieldbus devices. A discharge valve can be opened on a signal from the DCS or PLC and closed once the conductivity drops back to zero.

Since non-aqueous solutions, especially oils, can coat the metal electrode surfaces of standard conductivity sensors, only toroidal conductivity sensors should be used. Toroidal (also called electrodeless or inductive) sensors are resistant to surface coating because they do not require metal electrodes to be in the process solution. In general, any insertion or submersion toroidal sensor will perform well; however, sensors that offer easy mounting may be preferred over others (see Figure 1). If the non-aqueous phase is extremely viscous or contains a high concentration of suspended solids, refineries may find it best to choose a submersion or insertion sensor that offers a large bore and greater resistance to fouling (see Figure 2).

Fig 1: Retractable conductivity sensors that can be removed while the process is operating are a popular mounting option.

Another form of separator is used to remove solids from wastewater prior to discharge. A prime example is the API Separator. API (Ameri-

Fig. 2: The Model 226 Conductivity sensor offers a large bore and is more resistant to coating and fouling effects.

can Petroleum Institute) Separators are frequently used in the treatment of refinery wastewater that has been contaminated by oil and oil-bearing sludge. Separators use the difference in specific gravity to allow heavier liquids to settle below lighter liquids. The lighter liquid is skimmed off, while the heavier liquid remains behind. Wastewater may contain insoluble oil, sludge, and some soluble components. Soluble or emulsified oil cannot be removed by settling and requires further treatment.

In a typical API separator, wastewater is first collected in a pretreatment section that allows sludge removal. A diffusion barrier slowly allows the wastewater to flow down the separator towards the outlet while the lighter oil fractions can be skimmed off. Conveyors may be used to remove heavier solids and help separate the lighter oils. Baffle plates are used to prevent oil from escaping into the outlet section. Following this primary step, further treatment processes are used to more completely remove entrained oil in all forms, including emulsified oil, and to condition the water to meet the specifications for release into a stream or body of water. Downstream treatment can include chemical flocculation to remove emulsified oil and special processes for the removal of phenols and sulfides. Factors such as oil globule size, specific gravity, temperature, and viscosity are factors involved in separator design and also affect downstream water characteristics.

pH is controlled within the refinery to minimize corrosion due to acid, to meet environmental discharge regulations, and to optimize chemical reactions that can depend on the concentration of hydrogen ion. At the discharge from the API Separator, pH control enhances the efficiency of secondary waste treatment processes, such as flocculation. However, because the emulsified oil may still be present at this stage, the pH sensor can become coated, resulting in slow response and eventual failure. Obtaining the benefits of an accurate pH measurement may require regular attention, either by removing and cleaning the sensor or by automating a cleaning regimen using a cleaning nozzle or retraction device. The characteristics of the oil waste itself will determine how often the sensor will need cleaning.

pH MEASUREMENT

A good sensor for pH measurement in refineries would be a sensor that prevents the formation of a continuous coating on the sensor, and will preserve the pH signal (see Figure 3). Another good characteristic to look for in a pH sensor is the lifespan of the sensor in applications that may contain solids and other coating agents, and has been designed specifically for the rugged environment found in refineries and chemical plants. In addition to measuring pH and temperature, some sensors also simultaneously measure both glass and reference impedance as diagnostics – an advancement that can be used to alert the user to pH glass breakage or the buildup of a coating, and can help predict maintenance schedules.

Fig.3: The coating-resistant Model 396P sensor can be used to detect coating or glass breakage while measuring pH online

CONCLUSION

As these examples show, simple steps in optimizing liquid measurement can improve separator efficiency and help ensure effective removal of waste products while minimizing product loss. ■