**Case study**: Asia Pacific

# New oil detection test kit quickly identifies cooling water oil leaks

A large refinery in Asia Pacific experienced an oil leak in a cooling water system serving over 50 heat exchangers, seriously contaminating the entire cooling water system. Many of the exchangers had no outlet cooling water valves available for sampling which complicated detection of the leak source.

Unfortunately, this event occurred during the hot summer months and the refinery was already cooling capacity limited. Biological growth increased requiring modifications to the biological control program. The blow down rate had to be increased twenty-five percent. Continued monitoring indicated that the leak was worsening, raising safety concerns. Hence, all efforts were being made to find the leak.

Hydrocarbon gas sniffers and ORP meters were employed at available sample points with no success in locating the leak even after several months. Many overtime hours by operators, maintenance people, engineers and refinery management had been expended trying to find the source. Contamination effects can cause serious corrosion and fouling issues that could result in crude oil rate reductions or, worse yet, a unit shutdown.

Baker Hughes brought in an experienced technical consultant to use a newly developed method for leak detection. It was hoped that by employing the new tool Baker Hughes could quickly identify the type of hydrocarbon contamination and then determine the suspect exchanger causing this problem.

The new Baker Hughes Oil Detection test kit uses an extraction process along with a color sensitive reagent to help identify the oil source from a sample of the bulk cooling water. Baker Hughes quickly identified diesel oil as the hydrocarbon source.

At the beginning of the identification process, Baker Hughes recommended increasing chlorine feed to a specific ORP level in the cooling water supply. Once the Baker Hughes Oil Detection test pinpointed the leak as diesel oil, a systematic approach was employed to test the inlet and outlet of each diesel oil exchanger looking for a differential ORP reading.

After evaluating six diesel exchangers, one was found that produced a significant ORP differential. In order to further confirm the source of the leak, Baker Hughes employed its Oil Detection test on the inlet and outlet of the suspected exchanger. In addition, Baker Hughes sampled the inlet and outlet cooling water of this exchanger for TOC testing. All three tests (ORP, Baker Hughes Oil Detection test and TOC) confirmed that this was indeed the source exchanger for the hydrocarbon leak.

The exchanger was removed from service and repaired. Within two weeks after repair was completed, cooling water clarity returned to normal. Because this vacuum unit pumparound exchanger was historically problematic, an additional cooler was put in service to help relieve the heavy heat load requirement. Lastly, a change in cooling water chemistry was implemented resulting in a four fold improvement in reliability.

## Challenges

- Oil leak experienced in a cooling water system serving over 50 heat exchangers, seriously contaminating the entire cooling water system
- Biological growth increased requiring modifications to the biological control program

## Results

- The new Baker Hughes Oil Detection test kit, using an extraction process along with a color sensitive reagent, helped identify the oil source from a sample of the bulk cooling water
- ORP, Baker Hughes Oil Detection test, and TOC tests were performed and confirmed the source exchanger for the hydrocarbon leak
- The exchanger was removed from service and repaired. Within two weeks after repair was completed, cooling water clarity returned to normal