

Root Cause Analysis of a Plant Fire – First Appearances Can Be Deceptive Chemical Facility, North America

By Bill Jackson



The “root cause” of any incident is a factor which, if removed, would prevent the incident from occurring. A root cause analysis (RCA) is a systematic and structured problem solving technique to identify the root cause and prevent a recurrence of the incident. RCA is often used in the investigation of incidents at petroleum and chemical facilities.

Following an explosion and fire at a decades–old chemical facility, Baker & O'Brien was engaged to assist in an RCA of the incident. Two new electrostatic precipitators (filtration devices used to remove fine particles from the gas streams) had recently been installed, and initially it was thought that these were at fault, since an operator first saw flames emanating from one of the precipitators. However, moments after first seeing the flames, a series of explosions occurred in a process vessel upstream of the precipitators. An emergency plant shutdown was implemented and the explosions ceased.

Following a joint RCA conducted by Baker & O'Brien and the plant staff, it was determined that the root cause was actually related to the plant's control system. Over the years, and as a result of numerous process upgrades, the control system had become a patchwork of poorly integrated systems which did not work well together. The plant's control system did not adequately detect and inform the operators that flammable vapors had escaped from the upstream process vessel and made their way to the precipitators where they ignited. These flames then backed up through the system to the process vessel, resulting in the observed explosions at that location.

Apparently, an insufficiently–thorough design review had been conducted as part of the company's Management of Change (MoC) process when successive plant control system upgrades were performed. As a result of this finding, the plant staff conducted a full design review of the control systems. Prior to restarting months later, the entire control system was comprehensively upgraded.

The Explosion was the Owner's Responsibility – But which Owner?

Litigation – Incident Investigation, North America

By Dave Morgan

Many refinery processing units were designed and constructed decades ago based on standards and practices in effect at the time. However, such units are periodically modified to optimize operations, increase throughput, satisfy new industry standards, and/or meet evolving government regulations with respect to the safe handling of hazardous hydrocarbons and other chemicals. If the operational impacts of such modifications are rigorously analyzed, any associated risks can be identified and mitigated, allowing decades-old equipment to continue to operate safely and reliably. The federal government's Process Safety Management (PSM) regulation is a tool used by process plant operators to prevent the release of hazardous substances and reduce the frequency of potential incidents.

A refinery process unit experienced a failure that resulted in the release of volatile hydrocarbons. A subsequent explosion and fire resulted in significant equipment damage and several fatalities. Because the refinery had previously undergone a change in ownership, an issue arose as to whether the original owner or the new owner was at fault. Both the new owner and the existing owner had modified this process unit on

several occasions, principally to increase capacity. These modifications had increased the severity of the operation.

Baker & O'Brien was retained to review the incident and provide an opinion on which owner was most likely responsible for the incident. Our review focused on whether the unit was properly engineered, operated, inspected, and maintained in accordance with its design parameters—both by the original and the new owner. We also considered what industry standards and practices, as well as government regulations, were in effect at the time of any modifications. Our findings and opinions were presented in an expert report. Subsequent negotiations between the parties resulted in a settlement.



How Much is “Old” Fuel Oil Worth?

Fuel Oil Valuation, North America

By Peter Halliday



In recent years, as power generation plants have transitioned to natural gas firing, fuel oil is gradually being replaced. In some cases, this means that the power generation facilities are modified from fuel oil to natural gas but, in many

cases, the fuel oil fired power plants are closing and giving way to modern natural gas fired cogeneration plants. In such instances, any fuel oil remaining in onsite storage tanks must be disposed of in some way. Even when “empty,” fuel oil storage tanks always contain a minimum quantity of oil called the “heel,” which is the volume in the tank below the minimum operating level. In addition to fuel oil, the heel may contain sediments and colloids, collectively referred to as “sludge,” which can be of little or no value.

When a fuel oil-fired power plant was sold for demolishing and site reclamation, the parties agreed to a price that included

an estimated value, based on historical analyses, of the remaining fuel oil inventory. As there were several large storage tanks onsite, the inventory, if saleable, could potentially be worth a significant amount. However, if it was not of saleable quality, it might have to be disposed of as hazardous waste and be worth nothing — or even incur disposal costs. To allow demolition to proceed, all the remaining inventory had been transferred to a single tank. This was the volume for which the value was in question.

Baker O'Brien was engaged to investigate and provide opinions on: (1) the quantity of sludge potentially present in the fuel oil; (2) recommended practices for removing and disposing of the tank contents; (3) disposition options, e.g., sale for blending, downstream processing, incineration; and (4) the likely net value of the remaining fuel oil. Based on oil quality analyses from different levels inside the tank, our consultants suggested several disposition options for the material and estimated its net value. Our recommendations were used to agree a course of action for disposition.

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