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**UTILITYWEEK**  
**IET CONFERENCE** **Smart Metering**  
8-9 March 2011. The Hatton, London, UK

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## Keeping power plants online with risk management

3 February 2011



ENKA: Turkish power company has world class risk management

### **Effective risk management can prevent disastrous accidents and outages at power plants, argue Philip Johnson and Adriano Lanzilotto**

Insurer FM Global's client loss history shows that mechanical and electrical failure of equipment and components is the main driver for losses and prolonged unplanned outages in power plants in the UK and Europe. While the age of the equipment has an important bearing on failures, so does poor maintenance procedures. Poor maintenance can be due to insufficient operator training or competence, a lack of designated responsibilities, or even the number of operators employed - a pertinent point given today's recessionary lay-offs.

The material used in the manufacture of equipment and components poses another risk. Sourcing replacement equipment from the larger and widely recognised manufacturers is the best option for reliability, but it comes with a cost. Alternative, cheaper suppliers are aggressively entering the market, especially in developing countries such as China. In some cases such manufacturers can offer products of good engineering quality, but there have been reports of suppliers using sub-standard materials with detrimental effects on reliability.

Most often fire is the result of mechanical failures, because much of the equipment within a power plant contains oil. For example, there is lubricant, hydraulic and seal oil in the piping around a turbine and insulating oil in electrical equipment. Combustible material surrounded by hot machinery is a dangerous combination. An oil leak from a flange, pipe or pressurised vessel will frequently be sprayed on to a hot surface and ignite. On the electrical side, failure of equipment can result in overheating of the insulating liquid (such as in a transformer) with the risk of fire or explosion.

Often there are warning signs, such as excessive vibration, and temperature or pressure gauges that indicate the equipment is not working properly or is under stress. Unfortunately, operators are not always trained to recognise these signs and to stop the machine before a major problem occurs. Even if operators do spot the danger signals, they may not have the authority to make the decision to press the off switch.

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Failure to understand and manage the implications of any changes introduced at the plant can also lead to loss. For example, a coal-fired power station changed the type of coal it was burning - a minor change they failed to assess properly. The new coal generated too much heat, which, over a period of years, resulted in cracks in the turbine blades. The coal was also heavier than the coal used before and the weight of the coal dust, which was collected and placed in hoppers for disposal, contributed to the hoppers' collapse.

Another problem that power companies face is the long lead time frequently associated with getting replacement equipment. This can take months if not years for some equipment, meaning a company could be looking at a two-year loss of profit while waiting to replace a set of turbine blades.

Poor risk management can have disastrous consequences, as shown by 2009's accident at the Russian Sayano-Sheshenskaya hydroelectric power plant. Required to take over grid regulation because of a fire at another plant, the unit experienced high vibration. Its new vibration control unit was out of service and operators did not detect the high vibration, which contributed to bolt fatigue.

The result was that the turbine cover opened and water under high pressure flowed into the turbine pit, flooding the powerhouse, which disabled the controls and protections of the units. Failure of the emergency electric supply meant that the emergency gate to the unit was closed and emergency lighting failed.

There were no emergency or evacuation procedures in place and 75 people died. Equipment lost in the powerhouse had a rebuild time of five years and a price tag of £800 million. Aluminium smelters supplied by the plant experienced business interruption, while the cost of power in Siberia has risen. The incident was also an environmental disaster with oil spills into the Yenisei River.

Reports suggest that inherent design problems at the plant were aggravated by lack of funding in replacing obsolete equipment, poor maintenance and operational standards, and gross management negligence and carelessness.

Many proactive organisations are willing to make significant capital investments to ensure a quicker loss recovery and take preventative measures such as keeping spare parts on their premises. But with a "spare" transformer or gas turbine rotor costing approximately US\$1.0 million, this may not be a feasible or desirable option for many power companies.

However, risk management need not be expensive and there are many simple procedures that can be adopted to improve the quality of a site's risk and help mitigate damages should a disruption occur. They include:

good emergency response procedures for potentially dangerous situations, calling for quick action when, for example, equipment shows signs of stress (excessive temperatures, high vibrations);

training operators to recognise dangerous situations and implement the correct procedures;

a well-equipped and trained fire response team;

strict contractor management and ignition source control procedures (hot work, smoking, electrical maintenance);

making sure equipment maintenance programmes strictly follow the original equipment manufacturer's specifications;

active and passive fire protection systems in the areas of the plant where oil is circulated.

# UTILITYWEEK

Publication: Utility Week online  
Circulation: 3,578  
Date: 3<sup>rd</sup> February 2011  
FM Global Spokesperson: Philip Johnston  
and Adriano Lanzilotto

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Turkish power company ENKA Power has world class risk management. Operating a plant that was built according to FM Global specifications, it holds spare equipment, such as transformers and turbine rotors, on site. It justifies the sizeable investment because, in the event of a major incident, it will not lose years' worth of profits, rather, just a week or two while the replacement part is installed.

ENKA Power's plant operations and maintenance general manager Tahsin Kosem reinforces the company's approach to property loss prevention. "The need for high reliability and availability of plants and for cost-effective risk management are compatible objectives and need to be balanced. At ENKA Power, we value the need for proactive preventive maintenance and have developed highly engineered policies aimed at increasing equipment life expectancy, thereby reducing the risk of premature replacement of equipment.

"In the event of an emergency, we know we can rely on the availability of key spare equipment on site as well as on the prompt response from our engineers and operators. All these measures will translate into higher availability and reliability of our plants, both in terms of generation capacity and revenues."

ENKA Power also constantly upgrades its training procedures, and new employees undertake FM Global training as part of their induction courses. The company has installed extensive fire protection systems in its plant, some of which require very small investment. For example, it has installed metal shields around every flange in the piping system so oil spray leaks will not come in contact with hot surfaces but rather drain away.

Power companies need to consider the benefits of taking a longer term, proactive approach to risk management. Experience shows that effectively identifying and mitigating risks can enhance their competitive edge and protect them against the hidden costs of loss.

**Philip Johnson is vice president, client service manager, and Adriano Lanzilotto account manager, both in Northern Europe Operations at FM Global.**

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## ***Keeping power plants online with risk management***

**Effective risk management can prevent disastrous accidents and outages at power plants, argue Philip Johnson and Adriano Lanzilotto**

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