



Exposure of offshore workers to organophosphate-containing engine oil used on aeroderivative gas turbines

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The incidence of cases of poisoning with neurological symptoms among gas turbine technicians working on offshore oil platforms is briefly described.

Gas turbine engines are used as the power source for electrical generators and heavy machinery on offshore installations. The turbines are very similar to the engines used in aviation. They need the same engine oils. Turbine engines used for industrial applications are called aeroderivative or industrial gas turbines.

In the late 1980s a group of turbine technicians working at the Statoil-operated Statfjord field became ill with symptoms apparently similar to those of multiple sclerosis (MS). In a group of approximately 25 workers, eight had neurological symptoms. The cluster was named the "MS case at Statfjord" and a preliminary investigation was carried out by occupational physicians.

The investigation concluded that there were three with MS in the selected group, but further elucidation was necessary. The others in the group were left with no diagnosis even when some of them could no longer work. Statoil then named the report of the preliminary investigation the final report and terminated any follow-up.

None of the three technicians with the MS diagnosis followed typical multiple sclerosis development. They are, therefore, sceptical about the MS diagnosis and suspect that they are suffering from organophosphate poisoning. The adverse health effects from exposure to synthetic turbine oil with tricresyl phosphate (TCP) was not, however, considered in the investigations.

Statoil changed to NYCO turbo oil in 1992. This oil was formulated with an alternative organophosphate to avoid the health risk from TCP. The question remains whether Statoil knew that the cluster should have been

linked to turbine oil exposure and the symptoms evaluated in the light of known organophosphate toxic effects. Unfortunately, the company has up until now continued to deny that adverse health effects can be connected to turbine oil exposure.

Statoil has done some measurements offshore and, not surprisingly, concluded that exposure to TCP is negligible. They came to this conclusion by carrying out the measurements on cold equipment and ignoring all the other characteristic features of actual exposure scenarios. The consequence of this conclusion is that neurological symptoms among workers exposed to organophosphates are never recorded as being caused by a sometimes massive oil exposure; in reality, it is quite likely for turbine technicians and turbine mechanics to be heavily exposed when working on hot equipment.

Some alleviation of the situation has been achieved by safety delegates and union representatives, who have brought about improved working practices. More action is still needed, however. The vent system on offshore turbines is used to disperse the oil vapour and oil degradation products from the lubrication system. Since the toxicity of the lubricants has been ignored, the vent lines have been placed with little regard for personnel exposure. The consequence is that not only the turbine technicians are exposed to a complex mixture of heated synthetic oil *and its degradation products*. While TCP might have been eliminated, there is evidence that the products of oil pyrolysed by the high temperatures within gas turbines are also toxic.

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