MMS Safety Alert

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Gulf of Mexico OCS Region

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OCS Operations Safety Alert

Flash Fires/Explosions

There were 15 flash fires/explosions reported by OCS Gulf of Mexico Area oil operators during the first four months of 1973. Fortunately, these fires resulted in only minor personnel injuries and property damage and no pollution. The relative minor nature of these incidences should not lull operators into believing that they are normal OCS operating occurrences, and that nothing can be done to prevent similar events in the future.

The reported facts and circumstances of these accidents are contained in the following paragraphs. Recommendations which resulted from the investigation or from an analysis of the accident report follow each paragraph. The recommendations should be reviewed by all operators for applicability to their particular OCS installations and operational procedures.

GAS ENGINE RELATED EXPLOSIONS/FIRES

In two separate accidents, gas leakage from a faulty head gasket and housing of a natural gas-driven starter motor resulted in a flash fire. Ignition in one case was provided by a disconnected spark plug lead (the engine ignition system was being worked over) and in the other by a mechanical spark created by the improperly mounted starter.

The recommendation to prevent recurrence of such accidents is "Perform Preventive Maintenance." In the above described accidents, it is apparent that both the combustible gas supply and ignition source for the fires would not have existed if preventive maintenance were scheduled and performed. Proper preventive maintenance should include a daily visual examination of operating machinery as well as periodic thorough examinations.

Three other fires/explosions involving natural gas engines were also reported during this time period. Two were the result of backfire and flashback ignition in the intake manifold of an engine during start-up and the third was a crankcase explosion. Even though crankcase explosions cannot be entirely prevented, the effects of such explosions can be minimzed by installing crankcase explosion relief valves with flame arresters to prevent excessive engine damage and possible ignition of a secondary fire. The description, analysis, and preventive recommendations submitted by the operator involved in one of the two flashback ignitions follows:

The following sequence of events occurred while attempting to start a natural gas engine. Ether starting fluid had been applied, the engine was rolling, and ignition and fuel were on when the engine backfired. The force of the backfire blew the intake airhose off the carburetor and allowed the flame to propagate outward igniting a secondary blaze around the sides and top of the engine. The fire was extinguished by turning off the fuel and discharging a fire extinguisher around the sides and top of the engine.

The backfire which had propagated to the atmosphere by rupture of the intake airhose was identified as the ignition source. The primary source of combustibles for the fire was fuel gas fed through the engine fuel system. The fact that this source of combustibles did not cease at the moment of backfire indicated that the carburetor did not function properly either because of damage from the backfire or because of high fuel gas pressure to the carburetor.

The secondary source of fuel to the fire was found to be a leaking pipe plug in the supply line to the gas starter

turning motor. The remedial action taken to render this engine safe for continued operation included:

1. Rebuilding carburetor.

2. Replacing sensitive fuel regulator (ounce regulator) and adjusting high pressure regulators.

3. Inspecting starter gas system for leaks and tightening all connections.

Recommendations which were made to help prevent similar fires on all gas engines are as follows:

1. Equipment availability permitting, replace fabric air intake hoses between air filter and carburetor with flexible metal or wirebraid reinforced hose.

2. Use a portable combustible gas detector to perform leak checks during scheduled gas engine inspections.

3. Install a relief valve downstream of engine sensitive regulators to prevent excessive fuel gas pressure.

GLYCOL REBOILER FIRES

Two of the reported fires were of identical circumstances. Both involved glycol leaks as the fuel source with the hot surface of the reboiler providing the ignition source. Recommendations to prevent future occurrences of this type fire are:

1. Check for and correct any leaking connections, especially in the area of any direct or indirect fired vessel. Leak detection and correction in these areas are particularly important because of the ever present ignition source.

2. Maintain the integrity of insulation on those surfaces which operate at a temperature which could possibly ignite the vapors and gases handled in the area. The ignition temperature for petroleum vapors is 536 F and that for natural gas is 900 F.

ENGINE EXHAUST FIRES

Three of the reported fires were the result of released hydrocarbons being ignited by engine exhaust systems. One fire occurred within a compressor building. The source of fuel for the fire was gas leakage caused by rod packing failure. The ignition source was exhaust gases escaping from a blown gasket and cracked piping on the exhaust system. The other two fires were of a similar nature to those discussed under Glycol Reboiler Fires. In each case, released hydrocarbons were ignited by the hot surface of the engine exhaust. The prevention recommendations included in the glycol reboiler fire discussion are also applicable.

Without exception, it can be safely said that the one major contributing factor to all of the above accidents is lack of proper maintenance. Each facility is somewhat unique insofar as specific maintenance requirements are concerned; however, the below listed documents generally apply to all installations and should be useful as guides in accomplishing a safer operation.

1. API RP 7C-11F. Recommended Practice for Installation, Maintenance and Operation of Internal-Combustion Engines.

2. National Fire Protection Association Bulletin No. 37, Stationary Combustion Engines and Gas Turbines, 1970.

3. API Division of Refining. Guide for Inspection of Refinery Equipment.

[signed] D.W. Solanas

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