

INTERSTATE COMMERCE COMMISSION
WASHINGTON

REPORT NO. 3471
CHICAGO, ROCK ISLAND & PACIFIC RAILROAD COMPANY
IN RE ACCIDENT
AT COUNTY, IOWA, ON
JUNE 4, 1952

SUMMARY

Date: June 4, 1952
Railroad: Chicago, Rock Island & Pacific
Location: County, Iowa
Kind of accident: Crankcase explosion
Train involved: Freight
Train number: 98
Locomotive unit number: D-E unit 102-B
Consist: 3-unit locomotive and 79 cars
Speed: 18 m. p. h.
Operation: Extended freight service
Track: Tangent and descending
Time: 4:25 p. m.
Casualties: . 1 injured
Cause: Crankcase explosion resulting
from an overheated bearing

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3471

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION
REPORTS UNDER THE LOCOMOTIVE INSPECTION ACT
OF FEBRUARY 17, 1911, AS AMENDED

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD COMPANY

August 11, 1952

Accident at County, Iowa, on June 4, 1952, caused by an explosion in the engine crankcase of a Diesel-electric locomotive unit.

REPORT OF THE COMMISSION¹

PATTERSON, Commissioner:

On June 4, 1952, about 4:25 p.m., at County, Iowa, an explosion occurred in the crankcase of the engine of Chicago, Rock Island & Pacific Railroad Diesel-electric locomotive unit 102-B while units 101, 102-B, and 108 were hauling a freight train at an estimated speed of 18 miles per hour. The fireman was seriously injured.

¹Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.

DESCRIPTION OF ACCIDENT

Chicago, Rock Island & Pacific Railroad Diesel-electric locomotive units Nos. 101, 102-B, and 108, coupled in the order named and operating in multiple control from lead unit 101, departed from Fort Worth, Tex., at 10:00 p.m., June 2, 1952, hauling eastbound freight train No. 98 en route to Chicago, Ill., and proceeded without unusual incident to Hickory Creek, Mo., approximately 675 miles from Fort Worth, where the engine in unit 102-B stopped. As repairs could not readily be made en route, the engine of unit 102-B was shut down and the train was continued with power supplied by the other units to a point near County, Iowa, about 805 miles from Fort Worth, where, at about 4:25 p.m., June 4, following an attempt to restore unit 102-B to service, an explosion occurred in its engine crankcase while the train was running at an estimated speed of 18 miles per hour.

When the engine stopped at Hickory Creek, the fireman went back into the engine compartment and found the left bank fuel injector lay-shaft disconnected and the engine shut down. He connected the lay-shaft and started the Diesel engine but could not keep the engine running, due to low lubricating oil pressure. Movement to Trenton, Mo., about 7 miles, was made with the engine of unit 102-B shut down.

The machinist at Trenton inspected the unit and found the lay-shaft again disconnected, no oil showing in the engine governor gage glass, and oil in the engine very hot, although the engine cooling water temperature was not excessive. He connected the lay-shaft and started the engine, but lubricating oil pressure would not rise above 4 pounds. He then shut the engine down and made the following entry on work report on unit 101: "Do not use middle unit, cut out no lube oil press into Trenton, Mo."

Movement from Trenton to Eldon, Iowa, was made with power supplied by units 101 and 108. The train departed from Eldon, where last crew change was made, at 3:55 p.m., June 4, and had proceeded to County, Iowa, a distance of $5\frac{1}{2}$ miles, when the explosion occurred. The engineer heard the explosion and brought the train to a stop.

The train consisted of 69 loaded and 10 empty cars, 3642 adjusted tons, when it left Eldon, Iowa. Tonnage rating of two units of this type in this district was 4520 tons. The engineer and front brakeman were in the cab of lead unit 101 and the fireman was in the engine room of unit 102-B at the time of the accident. The main track, approaching the point of the accident from the west, was tangent for a distance of 9692 feet and the gradient generally ascending from Eldon to a point 4500 feet west of the point of accident where a gradual descent started.

The force of the explosion blew the right No. 2 oil pan handhole cover from oil pan and loosened several others. All cylinder head covers were blown from the engine, striking and distorting the radiator deflector plates. Two engine compartment windows, one on each side of car body, adjacent to the front of the Diesel engine, were blown from their settings and the right middle window was forced outward approximately 1-1/4 inches. There was no fire after the blast.

The fireman was burned about the head and arms. He was returned to Eldon where he was met by a physician and taken to a hospital at Ottumwa, Iowa.

DESCRIPTION OF LOCOMOTIVE UNIT

Diesel-electric locomotive unit 102-B, type B-B, Model F 7, was built by the Electro-Motive Division of General Motors Corporation at La Grange, Ill., in May, 1949. Motive power was supplied by a 567B, 16-cylinder, V-type, two-cycle, 1500-horsepower Diesel engine with direct connected traction power generator. The unit was mounted on two four-wheel trucks, all axles of which were motor driven; weight on driving wheels was 216,580 pounds; maximum tractive effort 54,140 pounds. The unit had made approximately 438,000 miles since new. The Diesel engine was overhauled on June 27, 1951, at which time all main and connecting rod bearings were renewed; mileage on bearings was 136,000. The lubricating oil was changed on March 28, 1952, and again on June 3, 1952, at El Reno, Okla., and approximately 500 miles had been made by the unit from last oil change to time of accident. Ten cylinder heads had been renewed, one or more at a time, since February 11, 1952. All fuel-oil injectors were renewed on March 1, 1952. The engine had a lubricating oil capacity of 200 gallons.

EXAMINATION OF PARTS INVOLVED

After the accident unit 102-B was taken to Silvis, Ill., Shop and held for Federal examination. The automatic warning and shutdown devices, engine cooling radiator fan and shutter control mechanisms, lubricating oil pressure gage, and engine cooling water temperature gage were tested and found in normal operating condition. The lubricating oil separator copper mesh screen element was clean and unobstructed.

A compression test at 90 pounds air pressure was made on all cylinders and the exhaust valves of 11 cylinders were found leaking very freely. Four cylinders were found to have slight piston-ring blow-by. The leaky exhaust valves and their seats

in the cylinder heads were tested with a dial indicator and found to be warped as much as .005 inch. The compression rings were free in the grooves and within normal wear tolerance. All pistons showed indication of overheat, but none were scored. All pistons had oil-ring grooves packed with hard carbon and one or both oil-control rings stuck in groove.

The top decks, including cylinder heads and all valves and injector mechanisms were heavily coated with a thick black sludge, which appeared to be heavily oxidized lubricating oil, and showed indication of overheat. The oil pan contained considerable bearing metal and sludge and appeared to have been subjected to excessive heat for a prolonged period of time.

The 50-pound lubricating oil pressure relief valve stem was galled and the valve held off its seat. The stem was coated with hard carbon and stuck in the guide. A hammer was necessary to move the valve stem in the guide.

All fuel injectors were rack tested and two were found to be dripping at spray tip, due to check valves being off the seat, and injectors were not properly atomizing the fuel oil.

The entire lubricating oil system contained deposits of bearing metal. The suction screens were open except for particles of bearing metal clinging to the screen wire.

The lubricating oil cooling radiator core was solidly plugged between the tubes and cooling fins with a hard heavy black substance similar to that described as being on other portions of the engine, which would seriously impair heat transfer to the cooling water. The radiator core was boiled for 20 hours with a commercial solvent, then removed and hot water at high pressure was directed at the spaces between the fins, but the water would not penetrate the spaces in the radiator core intended for lubricating oil passage.

Several connecting rod bearings were slightly scored and appeared to have been overheated. The No. 4 main bearing top and bottom shell tangs were flattened and the bearing shell turned, blocking the oil passage from the lubricating oil header. The bearing was badly distorted and showed indications of severe overheating. The No. 4 main bearing crankshaft journal was badly scored and overheated. The Nos. 2, 5, 7, and 8 main bearings and journals were scored and all bearings showed evidence of overheating.

A Diesel-engine isolation tag, carrier's form MP-151, was not attached to the shut-down engine as required by the carrier's instructions.

Samples of lubricating oil were taken from the crankcase and tested at Silvis and found to be within the carrier's specifications as to flash point and viscosity.

INSPECTION AND REPAIR REPORTS

The last annual and monthly tests were made at Silvis, Ill., on June 29, 1951 and June 1, 1952, respectively.

Daily inspection reports, on file from May 1, 1952, were examined and the following items that may have a bearing on the accident were found reported:

May 21, time not shown, Silvis, Ill., engineer's report:
"Lube oil leak between and below air boxes, from engine block, bolt worked out of block at oil leak." Items signed for and report approved by foreman.

June 4, time not shown, Armourdale, Kans., engineer's report:
"Unit is using too much cooling water"
"Change oil"
"No seal on knife switch"
"Bolt that connects lay-shaft to governor lost"
"Engine dead into Trenton No oil press"
Items not signed for and report not approved.

June 4, 9:15 a.m., en route, engineer's report:
"Engine is blocked out No lube oil press on arrival at Trenton, Mo."
Items not signed for and report not approved.

June 4, unit 101, 10:30 a.m., en route, engineer's report:
"Batt Vol 72- Chg Amp 10- Lube oil press 25"
"Do not use middle unit, cut out No lube oil press into Trenton, Mo."
"Temp O.K. Scavenger clean No seal on M valve"
Items not signed for and report not approved.

SUMMARY OF EVIDENCE

The condition of the injured fireman was such that statement could not be obtained from him at the time investigation of the accident was made.

The engineer in charge of the locomotive units at time of the accident stated that about the time the train stopped the fireman came to the cab of unit 101 and told him that he had started the engine in unit 102-B and had 15 pounds oil pressure, that an inspection plate was loose, and he had reached down to tighten it when the explosion in the crankcase occurred. In a signed statement the engineer stated that he did not know the reason the engine of unit 102-B was shut down until he read the report after the accident occurred.

DISCUSSION

The exhaust valves of 11 cylinders were leaking freely, resulting in incomplete combustion of the fuel oil. Two fuel-oil injectors were defective and not properly atomizing the fuel oil. The lubricating oil relief valve stem was galled and the valve was held off its seat, resulting in low lubricating oil pressure and inadequate lubrication to bearings. The lubricating oil cooling radiator core was solidly plugged, resulting in excessively hot lubricating oil. Number 4 main bearing shell was turned until it blocked the oil passage from lubricating oil header.

The leaky condition of the exhaust valves and the defective fuel oil injectors may have permitted some of the unburned fuel oil to pass into the crankcase and mix with the vapor of the excessively hot lubricating oil. Apparently when the concentration of oil vapors in the crankcase reached a combustible ratio and the temperature of the overheated bearings attained the flash temperature of the oil vapor, ignition took place and resulted in the explosion.

A defective lubricating oil pressure relief valve is one of the more common causes of low oil pressure, usually due to valve being stuck open or to foreign matter on the valve seat. With the relief valve stuck in open position, a considerable amount of lubricating oil would be by-passed into the oil pan sump instead of being forced through the bearing lubrication system. The heavy carbon deposit on the valve stem and its guide indicated that the valve had been held off its seat for an excessively long period of time. The lubricating oil pressure valve was mounted on the lubricating oil crossover manifold under the accessory gear train cover on the left side of the engine and was readily available for inspection by removal of a cover plate.

Instructions issued by the Mechanical Department of the Chicago, Rock Island & Pacific Railroad Company, in effect at the time this accident occurred, provide that when an engine

of a Diesel locomotive unit is shut down a tag shall be applied to the starting switch or isolation switch by the employee shutting the engine down. The tag should show the Diesel engine number, the engine position, the reason the engine was shut down, the name of the employee shutting it down, the date, time, and place. In cases where it is known that attempts to start the engine would be dangerous or very injurious to the engine, the tag must bear a warning that the engine positively must not be started until proper repairs have been made by a qualified mechanic or Mechanical Department supervisor.

The carrier had an approved tag, Form MP-151, entitled Diesel Unit Isolation Report, for this purpose. This tag was made of heavy bright yellow paper, approximately 3 inches wide and 6 inches high, and was equipped with a wire for fastening to the switch. Instructions provide that holders for these tags be placed on the wall of each Diesel unit adjacent to the isolating switch or engine starting switch and that two of the tags be in the holder at all times.

No such warning tag was on the isolation switch of the shut-down engine and there were none on the unit at the time of the accident. If the engine had been tagged in accordance with the carrier's instructions, the succeeding fireman would have seen the warning and been aware of the condition of the engine before attempting to restore it to service and this accident could have been averted.

CAUSE OF ACCIDENT

It is found that this accident was caused by an explosion in the engine crankcase of a Diesel-electric locomotive unit, resulting from an overheated main bearing.

Dated at Washington, D. C., this 11th day
of August, 1952.

By the Commission, Commissioner Patterson.

SEAL

W. P. BARTEL,
Secretary.