

Focus on IFA's work

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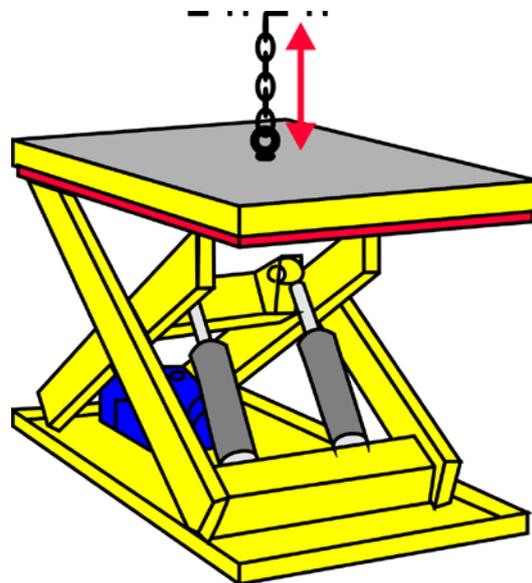
Safety risks of maintenance work on hydraulic machinery

Problem

IFA conducts accident investigations for the German Statutory Accident Insurance Institutions. One such investigation was of an accident that occurred with a hydraulic lifting table. Although the table was fitted with the necessary hydraulic safety equipment, a fatal accident occurred when maintenance work was performed on it, and the cause of the accident was unclear. As the rate of accidents during installation and maintenance work on machinery has risen over the years in comparison to normal machine operation, it was of particular importance to determine the exact causes leading to the accident.

Activities

The accident investigation was conducted on site under consideration of the available description of the accident. The maintenance work was necessary because a pump motor had failed. The motor could only be replaced with the chain hoist pulling the lifting table to its highest extreme. The maintenance workers then used mechanical supports to hold the table in its top position. The chain hoist was removed and the defective motor was replaced. After the repairs, the maintenance worker removed the mechanical supports. The lifting table immediately fell unchecked and at a high rate of speed to its lowest position, causing fatal injuries to the worker. The individual steps of the work procedure were reproduced so as to confirm the sequence of events in the accident.



Schematic diagram of a hydraulic lifting table pulled with the chain hoist at its highest point

Results and Application

Raising the hydraulic lifting table with a chain hoist created a partial vacuum in the hydraulic lifting cylinder. Because the hydraulic oil reservoir was located under the lifting table, not enough hydraulic oil could flow through the valve gaps into the lifting cylinder even after a long period during which the machinery was immobile. Yet the hydraulic safety equipment (valves and pipe breakage protection valves) is only operational if the entire hydraulic system including the lifting cylinder and the pipes are filled with hydraulic oil so that the oil column can bear the weight of the load. If this cannot be adequately confirmed,

hydraulic lifting tables and similar equipment must be put and held in a secure end position both from above and from below by a chain hoist or similar device for the duration of any maintenance work.

Because several similar accidents have become known, hydraulic machine manufacturers should provide suitable information in their user guides and manuals about the known risks during maintenance work according to the requirements of DIN EN ISO 12100 section 6.4.1.3. Equipment operators and owners as well as maintenance firms should make certain that their personnel are sufficiently competent and that user information and manuals are available at or on the machine.

Area of Application

All manufacturers and operators of hydraulic machines used to hold up masses and heavy objects

Additional Information

- DIN EN ISO 12100: Safety of machinery – General principles for design – Risk assessment and risk reduction (03.11). Beuth, Berlin 2011
- DIN EN ISO 4413: Hydraulic fluid power – General rules and safety requirements for systems and their components (04.11). Beuth, Berlin 2011
- Sicherer Umgang mit hydraulischen Anlagen. BIA-Info 11/98. In: Arbeit und Gesundheit (1998) Nr. 11, S. s44
www.dguv.de/webcode/d9479
- Sicherheit bei der Hydraulik-Instandhaltung (DGUV Information 209-070 bisher: BGI/GUV-I 5100, 01.14). Hrsg: Deutsche Gesetzliche Unfallversicherung, Berlin 2014
www.dguv.de/publikationen

Expert Assistance

IFA, Division 5: Accident prevention – Product safety

Literature Requests

IFA, Central Division