CASE STUDIES

Safe maintenance of hydraulic systems

1. Organisations involved

Accident prevention and insurance association for the metal working industry ("Berufsgenossenschaft Metall Nord Süd")

2. Description of the case

2.1. Introduction

The number of hydraulic components used in machines has been increasing since 1950. Modern hydraulic systems operate at higher pressure than earlier versions and their hydraulic elements are often combined with electric or electronic parts which make automated production machines and systems ever more complex. Their operators and maintenance workers face an increasing risk arising from accidental machine movements, uncontrolled leakage of hydraulic fluids, the need to deal with an electricity, working in confined spaces, components coming apart under high pressure, and noise. There are also the risks related to insufficient organizational preparation before maintenance activities begin.

2.2. Aims

There are national occupational health and safety regulations and accident prevention regulations intended to prevent occupational accidents and diseases related to the maintenance of hydraulic systems. The BG information 5100 (BGI 5100), providing detailed information on the specific risks related to hydraulic systems, was first published by the German social accident insurance, "Deutsche Gesetzliche Unfallversicherung (DGUV)" in 2007. First and foremost, it is designed for the employer and is to support him in the implementation of his obligations defined by the regulations as well as to identify ways for preventing occupational accidents and work-related health risks and diseases. It also addresses operators and maintenance workers conducting work on machines and systems with hydraulic equipment. It contains description of hazards and measures for preventing risks as well as advices for carrying out maintenance work in a safe manner.

2.3. Scope of the project

- Publication of the BGI 5100

The aim of BGI 5100 is to improve occupational safety and health of those involved in maintaining hydraulic systems. The information brochure was issued by the "Deutsche Gesetzliche Unfallversicherung (DGUV)" and prepared by the committee of experts "Mechanical engineering, manufacturing systems, steel constructions" (Fachausschuss „Maschinenbau, Fertigungssysteme, Stahlbau, FA MFS". It focuses on the maintenance of machines and systems with hydraulic components. In 2008, BGI 5100 was translated into English.

- Development of a course based on the BGI 5100, published in 2007

The training course "INHY - Instandhaltung Hydraulik" (Maintenance of Hydraulic Systems) is based on the BGI 5100 and is delivered to those working on or maintaining machines and systems with hydraulic components by the accident prevention and insurance association for the metal working industry ("Berufsgenossenschaft Metall Nord Süd").

The course communicates the contents of the BGI 5100 and the corresponding information from the Committee of experts – "Mechanical engineering, manufacturing systems, steel constructions". Altogether 21 courses are run each year at the training centers of the "Berufsgenossenschaft Metall Nord Süd" in Germany. The courses last for three days and include one and a half days of detailed information on hydraulic maintenance. Approximately 25 workers from various companies participate in every course.

The contents of BGI 5100 are presented by two trainers: a safety inspector with in-depth knowledge of accidents and all relevant laws, rules, regulations, and standards on hydraulics and machinery, and a hydraulic specialist with specific experience in maintaining hydraulic systems and with knowledge of relevant applications, components, and systems. The course includes practical examples of dangerous situations and discussions on specific topics which are particularly relevant to participants, including dealing with specific hazards. As a result a wide range of practical experience is exchanged between attendees.

2.4. Results and evaluation

In addition to the information offered by the trainers different approaches to the dealing with specific hazards are discussed among the participants. Moreover, participants are made aware of sources of further information such as BGI 5100, information brochures from the FA MFS, and on-line resources such as links to information provided by the manufactures of various hydraulic components. Furthermore, in the hope of creating a lasting information exchange network, attendees are encouraged to exchange contact data with fellow students.

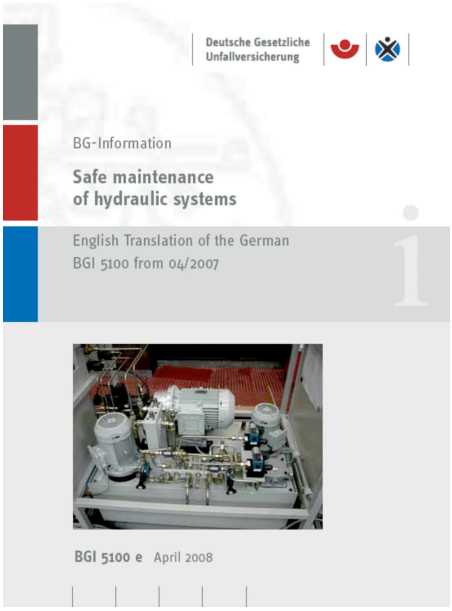
All the information offered can be used on a daily basis by those working on or maintaining machines and systems with hydraulic components.

According to safety representatives' and professionals' reports to the committee of experts due to the interventions more attention is paid to the manufacturers' specifications as well as to preventive maintenance activities related to hydraulics.

Safety instructions and qualifications schemes are adapted in accordance with BGI 5100.

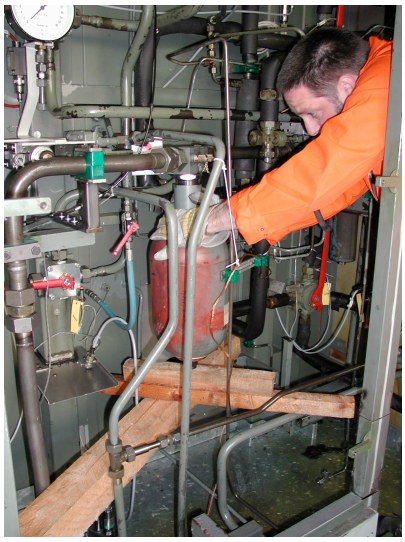
In order to reduce time pressure and the stress maintenance workers are exposed to nowadays, maintenance procedures – as recommended by BGI 5100 - are often planned in advance. Documentations, data specifications are provided for the workers and it is thought about how to isolate the place of the failure beforehand. In order to help find faulty parts, a checklist for trouble-shooting is included in the appendix of the BGI 5100.

Figure 1: Possibilities to reduce stress in maintenance activities



Source BGIA/BGM

Figure 2: Hydraulic Maintenance



Source BGIA/BGM

It was also reported to the committee of experts, that, awareness of occupational safety and health risks has been increased by the publication of the BGI 5100 and its associated course. Whereas occupational risks caused by electricity hazards were the main focus of concern about the safety of those working with machines which had hydraulic components, BGI 5100 has also highlighted the hazards related to hydraulics.

Increased awareness among maintenance workers providing maintenance is demonstrated by the observations of several health and safety officers: machine and system operators are more often asked to shut down machinery or to set up scaffolding for maintenance activities in order to minimize risks. In particular, supervisors learning about BGI 1500 report to the committee of experts that they have often have been unaware of the risks that staff dealing with hydraulic equipment are exposed to.

2.5. *Contact information*

Committee of experts ”Mechanical engineering, manufacturing systems, steel constructions“ Ed. German Social Accident Insurance - Fachausschuss „Maschinenbau, Fertigungssysteme, Stahlbau“ (FA MFS), Deutsche Gesetzliche Unfallversicherung (DGUV).

Safe maintenance of hydraulic systems. BG-Information. English Translation of the German BGI 5100 from 04/2007. April 2008. http://www.arbeitssicherheit.de/arbeitssicherheit/html/modules/bgi51005199/5100/bgi5100_e.pdf

2.6. *Further information on BGI 5100 /BGI 5100 e*

Contact details of the chairman of the Committee of experts, Mechanical engineering, manufacturing systems, Steel Constructions (Fachausschuss Maschinenbau, Fertigungssysteme, Stahlbau (FA MFS))

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2.7. *Transferability*

The BGI 5100 publication and the associated course are easily transferable to any company where the hydraulic systems of production machinery have to be maintained. However, specific provisions for different applications (e.g. maintenance in the mining industry, maintenance of aircrafts, etc.) have to be taken into account, as do the requirements of national legislation and regulations in other European countries and manufacturers' instructions.