

LE07 Spring 2001 Final Written Exam

(Durée 2h, aucun document, sujet à rendre)

ANSWER ONE PROBLEM ONLY. You are required to write a short, **structured** (titles, subtitles) report of length 2 to 3 pages. You may use labelled sketches (croquis) to help express your ideas. Please write clearly.

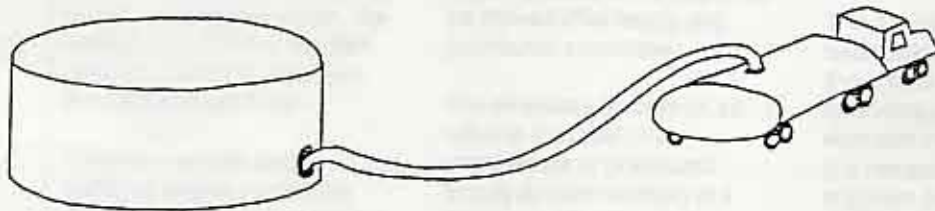
PROBLEM 1: Chemical Spill

Night and day, lorries come and go in your factory to fill up their tanks with highly inflammable chemicals. To fill the lorry tank, the driver must connect the end of the storage tank hose to the lorry inlet valve, see Fig. 1. He then switches on the storage tank pump.

However, one night a driver forgot to turn off the pump and disconnect the hose from his lorry before driving away. His mistake resulted in a large spill of chemicals as well as damage to the filling equipment. When questioned later, he complained of tiredness due to long working hours, of difficult conditions; it was often dark by the storage tanks and the equipment was heavy and old fashioned.

Write a report to the Operations Manager identifying the probable causes of this accident and proposing both technical and organisational solutions. Discuss the relative merits of the different solutions, and make your recommendations.

Fig. 1.



PROBLEM 2 : Materials Handling

You are a maintenance engineer working in an automotive factory which produces large, pressed steel components from sheet metal (tôle). You are responsible for the plant lay-out modifications and the installation of new production equipment. Moving machines and equipment, not to mention the sheet metal itself, is always a difficult job. You have seen the following advert for an interesting materials handling device, called Air Skates and, although you have some reservations about its flexibility, you would like to convince your manager to invest in a system so that you can test it.

Prepare a brief report for your manager which will present your ideas about this device. Explain how it could be used to make the job quicker, safer and more efficient etc. and its advantages and disadvantages as you see it. Do not forget to compare its performance with the traditional material handling devices that you presently use. Identify possible cost savings which might help justify the investment. **There is no need to reproduce a presentation of the device**, but you should refer to the characteristics presented in the advert to support your explanations.

AIR FILM MATERIAL HANDLING SYSTEMS

Material handling systems using the air film principle are also known as Air Skates.

The handling of light to very heavy objects using air film to float the load is easy and very economical. A weight of 1,000 kg requires a pulling force of only 1 kg.

An air film skate is composed of a supporting backplate with an O-shaped flexible cushion or element which is inflated by means of compressed air. The escaping air forms a thin film (approx. 0.02 mm) between the element and floor.

Three or more air skates combine to ensure that the load starts floating and has the ability for omni-directional movement. The load to be moved is lifted only a few centimetres and as a result of the low pressure (1-2 bar) no clouds of dust are formed and the floor cannot be damaged.

The dimensions of the air skates are very small. Four

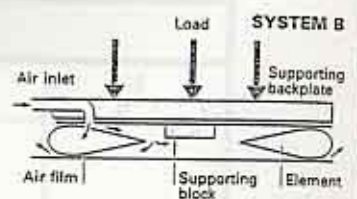
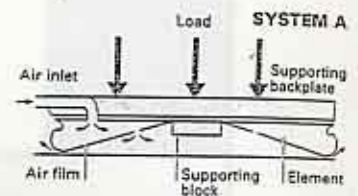
skates of 30 cm x 30 cm can lift 2,000 kg. The lift height is approx. 1.5 cm. Four skates of 50 x 50 cm can lift 10,000 kg. The lift height is 1.5 cm. Combinations of air skates providing a lift capacity up to 100 tonnes are not exceptional.

When an object is moved using an air film system, a regulator unit correctly distributes the compressed air to the air skates and can compensate for out-of-balance loads. In this way the load is lifted vertically and the load can be moved effortlessly and positioned accurately.

The air skates operate on air volume supplied by a compressor or pneumatic supply system working at a pressure of 5-10 bar (500-1000 kPa).

The air skates may be placed separately under the load which is easily accomplished due to the low height. Two basic systems are available, each with its own characteristics. The external differences in operation of the

two systems are shown in the diagrams below.



The specific application for each customer determines the choice of the system, the operating pressure, the element material, etc. Hence, it is necessary to obtain accurate details to get optimal effect from the system.

The use of air film handling techniques is not always considered. Customers who have used the method have been amply rewarded with the following advantages:

- Very efficient
- Limited investment
- Reliable
- Minimal maintenance
- Ergonomic
- Can be used with equal success indoors and outdoors
- Long working life
- Quickly fitted

