THE SAFE VIEW

Avoiding costly accidents

A 208 tonne reactor falls off a transport trailer, but who was to blame? Richard Krabbendam reports on a costly accident and its aftermath.*

This article is not written to show anyone in a bad light. It describes what caused the tipping over of a 12 axle-line platform trailer loaded with a 208 tonne reactor. In describing the accident, our main purpose is to make crane operators and haulage contractors aware of what can go wrong and what are the legal consequences of an accident.

The accident described here happened in August 1988 and a final verdict as to the cause of the accident was given by the High Court, London, in March 1996, almost eight years later. Fortunately there were no injuries to personnel, only damage to the reactor insulation and fireproofing.

WHAT HAPPENED?

A 28 metre long, 5.8 metre diameter reactor, weighing 208 tonnes, was loaded on a 3 metre wide 12 axle-line Scheuerle platform trailer and on its way from the Immingham Docks to its final destination at a nearby oil refinery.

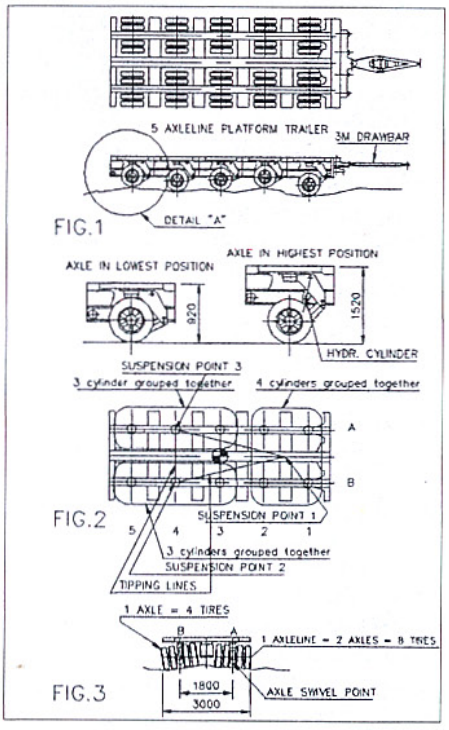
The total distance from the docks to the refinery was almost 7.8 kilometres. After approximately 6 kilometres the trailer combination tipped over while negotiating a long curve with a 2.8 degree camber.

The cause of the accident was classified as operator's fault, as the operator had not compensated the trailer bed to horizontal when negotiating the camber. It almost took 8 years and a court case to proof this. The sour part of it all was that all costs in addition to the repair work and salvage operation of the reactor, including legal fees, technical experts and court costs, were charged to the party at fault.

It proves once again that if you are not extremely sure about what has happened then you are better to settle at a certain amount than to continue with the case and find yourself having to bear all the costs.

THE ISSUES

One party, let's call them "A", had accepted the order to transport the reactor from Belgium to Immingham. The North Sea crossing went smoothly and on a beautiful morning in August the reactor was rolled off from the barge onto the Immingham Docks. This roll-off operation and the transport from the docks to the jobsite was subcontracted to a local haulage contractor, company "B".



The supervisor in charge of company A instructed the transportation crew of company B to set the trailer in a so-called 4-point suspension system, as advised in the trailer manufacturer's manual for loads with high centre of gravity.

This supervisor also instructed B's trailer operator to use a spirit level during all phases of the transport operation in order to closely monitor the horizontal level of the trailer bed during all times and if necessary to compensate the level of the trailer bed with the hydraulic suspension system.

On the request of its client, company A had insured the reactor against damage during transportation. The insurance company found that the cause of the accident was operator's negligence on the part of company B, and claimed the cost of the accident to B.

Party B rejected the claim and said that company A's supervisor had given the wrong instructions and that the trailer should have been set in a 3-point suspension system rather than a 4-point suspension system. They claimed that the levelness of the trailer on a 4-point suspension system could not be controlled, thereby causing the load to tip over. In response, party A claimed that the suspension system of the trailer was not the cause of the accident, rather it was the fact that the trailer bed was not levelled when negotiating the 2.8 degree curve. Party B denied this and a new court case was borne.

In order to fully understand what had happened we should look in more detail at hydraulic platform trailers. A platform trailer in principle consists of a rigid steel frame, in which individual axles are mounted. Each axle is suspended by a hydraulic cylinder. (See Figure 1.) All these hydraulic cylinders are con- ▶

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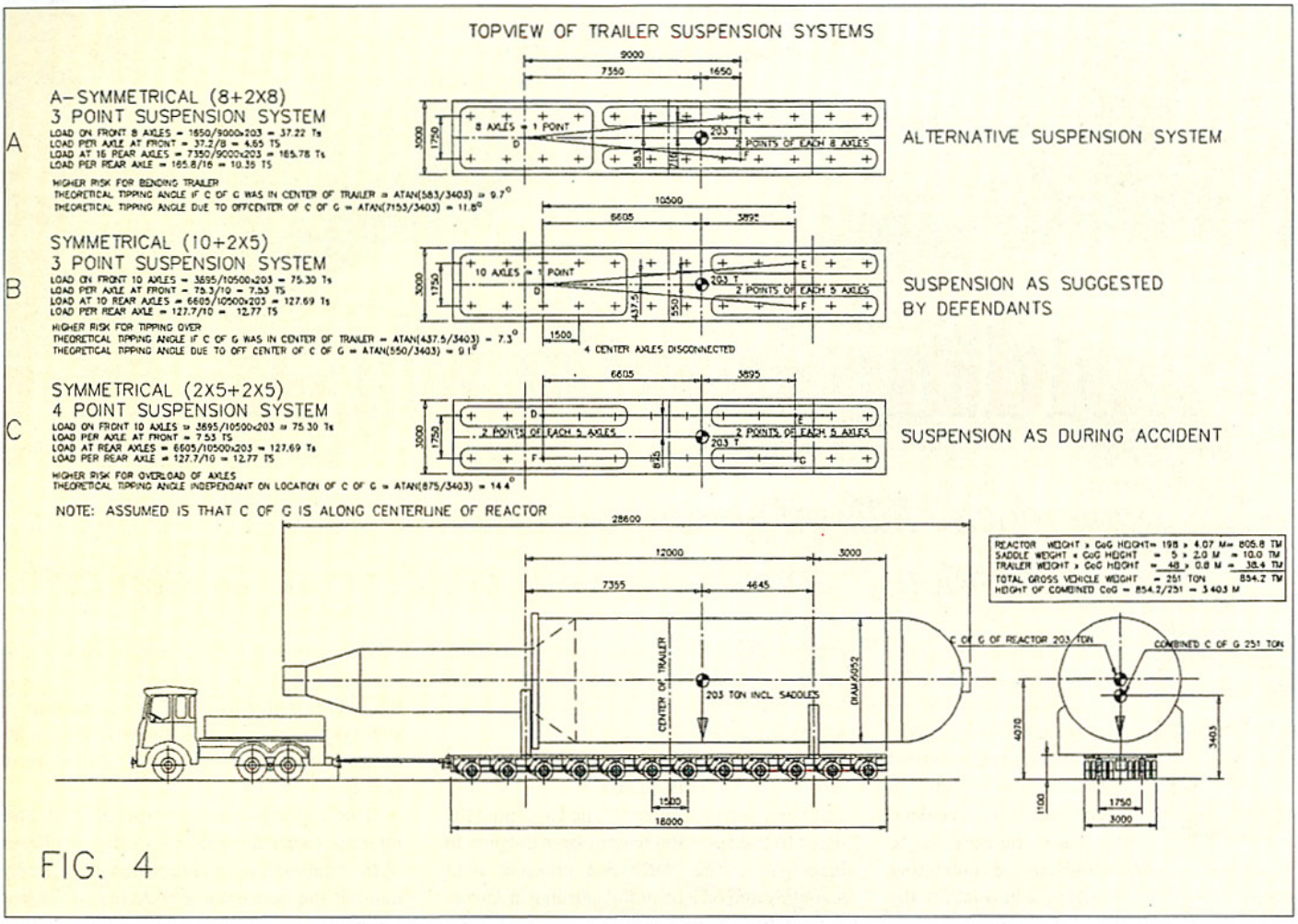

FIG. 4

◀ nected to each other by means of hydraulic lines.

By linking individual suspension cylinders it is possible to create suspension points consisting of two or more suspension cylinders. Figure 2, for example, shows a 3-point suspension system. The four cylinders at the front of the trailer are connected together as one suspension point, while the six rear cylinders are separated into two individual suspension points each consisting of three connected cylinders.

Provided the centre of gravity of the load is placed exactly in the centre of the trailer, each axle will have the same load (hydraulic pressure in each suspension point is equal). Another great advantage of the hydraulic platform trailer is that the trailer can be raised by means of a separate diesel driven hydraulic pump. In most cases the maximum stroke is limited to 600 millimetres.

This hydraulic suspension system means the platform can cope with uneven road surfaces and still guarantee an equal load on each individual axle. See Figures 1, 2 and 3.

In non-hydraulic trailers the same end is achieved by a spring system or by means of swivelling rocker arms applied to each set of axles. However, the more axles there are and the longer the trailer, the more difficult it becomes to guarantee equal load distribution on all axles. This is where the hydraulic platform trailer offers an ideal solution. By coupling individual trailer units to each other, either longitudinally or side by side, we can create platform trailers capable of handling loads up to several hundreds and even several thousands of tonnes.

Of course the hydraulic lines between each trailer must be connected with each other and a 3- or 4-point suspension system should be created by opening and closing the correct valves in the hydraulic lines. The horizontal level of the trailer can be adjusted as well, which comes in handy when the road has a certain camber. Each individual suspension point can be raised or lowered by means of the diesel driven hydraulic pump.

THE CASE

Let's go back to our case. The 203 tonne reactor – 28.6 metres long and 5 metres in diameter – was loaded on the 12 axle-line Scheuerle trailer. The transport saddles were set 12 metres apart and the saddle loads were acting on the forward and aft part of the trailer, which was composed of 2 x 6 axle-lines coupled together longitudinally. See Figure 4.

As this was close to the strength limitation of the trailer frame it was jointly agreed to disconnect the two centre axle-lines of the trailer, thereby reducing the bending moment in the trailer frame. In essence, the reactor was loaded on a 12 axle-line trailer but the axles were grouped into four points, each consisting of five axles (one axle = 4 tyres = 1 suspension cylinder). See Figure 4C.

By using the momentum formula one can exactly calculate the load on each group of axles, and consequently the load per axle.

TRAILER STABILITY

From Figure 4 we can calculate the theoretical tipping angle of the trailer. The trailer will tip over when the combined centre of gravity of the trailer and load passes over the tipping line.

Next month we look in detail at why the reactor tipped over.

Every effort is made to ensure the accuracy of articles published in *International Cranes*. Readers should, however, always refer back to the manufacturer's original load charts and manuals before using cranes.