NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Subcommittee

TECHNICAL BULLETIN - SEPTEMBER 1993

063. Sobema Matterhorn Link Arm Failure

We have been informed, by NAFLIC member Howson Inspection Services Ltd, of an incident involving a Sobema Matterhorn passenger carrying amusement device. This device has 20 radial arms. These are connected by short link arms, two of which are adjustable in length so that system backlash may be minimised. The adjustable links have a threaded central section and the fatigue failure occurred in one of these threaded bars.

Although there are a number of these Sobema rides in the UK, most of which will be older than the case in point, we are not aware of this failure having occurred in any other instance. We would welcome information, from NAFLIC members or otherwise, on any other cases in which fatigue cracking at these thread roots has been detected.

It is our view that, in a Matterhorn ride, the adjustment of the link arm tensioners needs to be very carefully carried out and operators should adhere strictly to the manufacturer's recommendations which should have been considered in Design Review. In the absence of advice on this in the Instruction Manual, information should be sought from the manufacturer.

Safety critical threaded tensioners on this and other rides are often subjected to significant stress fluctuation and are candidates for fatigue failure. In such circumstances, which ought to be identified in the design calculations and Design Review, Non Destructive Testing needs to be applied with the appropriate periodicity. The normal regions to examine are at the thread immediately adjacent to the nut or where the thread runs out into a straight shank. However, there may be difficulties in tailoring NDT techniques to give reliable crack indications. Conventional, on-site, magnetic and ultrasonic methods are quite likely to fail. We are aware of the following two methods, thought to be reliable, employed by NAFLIC members on such components :-

1. Strip down, clean off, degrease and wire brush component. Permanently magnetise in longitudinal direction. Immerse component in a made-up solution of black magnetic particle ink (make up recommendations 3½ / 4%) using carbon tetrachloride or similar solvent and not the usual water / paraffin base. When the carrier liquid has evaporated examine the suspect thread(s) under a microscope (approx. 20 / 50x). Demagnetise and re-protect the component with dewatering oil or grease. Reassemble to manufacturer's recommendations. The procedure is ideally carried out in a

laboratory.

2. Where access to the end of the component is possible, ultrasonics may be employed provided an identical calibration test piece is made up, having an introduced saw-cut at the position where cracking is suspected. The type and depth of the saw-cut must be carefully decided and equipment calibration should be carried out with great care.

Persons not familiar with these techniques are advised not to attempt them without further advice and assistance.

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