ANNALS OF THE FACULTY OF ENGINEERING HUNEDOARA
2004, Tome II, Fascicole 1

RESEARCHES REGARDING THE COMPUTER-AIDED TEST OF A HAULING EYE, USING THE DATA ACQUISITION SYSTEM DAP 2400

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Abstract

In order to determine the mechanical resistance of certain subassemblies as component parts of agricultural machines, motor-vehicles, trailers, etc., it is necessary to test them in order to see the way they behave from the point of view of breaking resistance.

As for exactly determining the behaviour of these subassemblies at field stresses it would be necessary a long period of time, most of the manufacturers choose the solution of testing them in a simulated and accelerated duty on the "hydropulse" installation.

In the case of the present paper it is shown the mecahanical resistance testing in a simulated and accelerated duty of a hauling eye (let) belonging to the hitch of an agricultural dumping trailer RAB 4 and the conclusions drawn after performing these determinations.

Key words: *mechanical resistance, hydropulse, hauling eye, accelerated duty*

1. INTRODUCTION

The hauling eye, manufactured by S.C. Autonova S.A. belongs to the hitch assembley and is used in order to haul the agricultural dumping trailer RAB 4.

The eye is mounted at the end of the hitch, into a welded socket and is attached with a horned nut M30 and with a bolt of 6.3 x 30.

The Main dimensions of the eye are presented in tables 1 and 2.

Table 1 - Ensuring The Mobility Degrees

Crt. Nr.	Name	Values acc. to SR ISO 5692:1996	Values acc. to the techn. docum.	Values measured before the test	Values measured after the test	Remarks
1.	Steering angle	min. ± 60^o	-	± 65^o	± 65^o	
2.	Pitch angle	min. ± 20^o	-	± 23^o	± 23^o	
3.	Roll angle	min. ± 20^o	-	± 22^o	± 22^o	

Table 2 - Dimensional And Angular Measurements

Crt. Nr.	Dimensions according to SR ISO 5692:1996	Dimensions accord to the draw no. RM 2,5 - 1.6/N rev. b.	Dimensions measured before the test	Dimensions measured the test	Remarks
1.	$\Phi\ 50_0^{+0,8}$	$\Phi\ 50^{+0,8}$	Φ 50,1	Φ 50,1	
2.	A-A: 30±0,5 30_0^{+1}	B-B: 30±0,5 30_0^{+1}	30.1÷30,5 30.1÷30,8	30.0÷30.6 30.1÷30.8	
3.	Section B-B: max. 50 min. 30	Section C-C: 40±1	40.3	40.3	
4.	120°	120°	120°	120°	
5.	-	448±1	449.3	449.3	
6.	110 min. 112 max.	110	112	112	
7.	min. 15 max. 20	R 16	R 17	R 17	
8.	-	M 30	M 30	M 30	
9.	-	R 5	R 5.2	R 5.2	
10.	-	R 4	R 4	R 4	
11.	-	R 10	R 10	R 10	
12.	-	Φ 27±0,5	Φ 27.22	Φ 27.22	
13.	-	$\Phi\ 38_0^{-0,25}$	Φ 37.85	Φ 37.85	
14.	-	$\Phi\ 54_{-0,25}^{-0,1}$	Φ 53.84	Φ 53.83	

2. TESTING CONDITIONS

The test of the hauling eye has been performed - mounted on the device mentioned at 5 and that represents a simulation of the extremity of the hitch on a 550 m length, ended with a squared flange, having a side of 330 m and a thickness of 15 mm, with 8 attachement holes, figure 1.

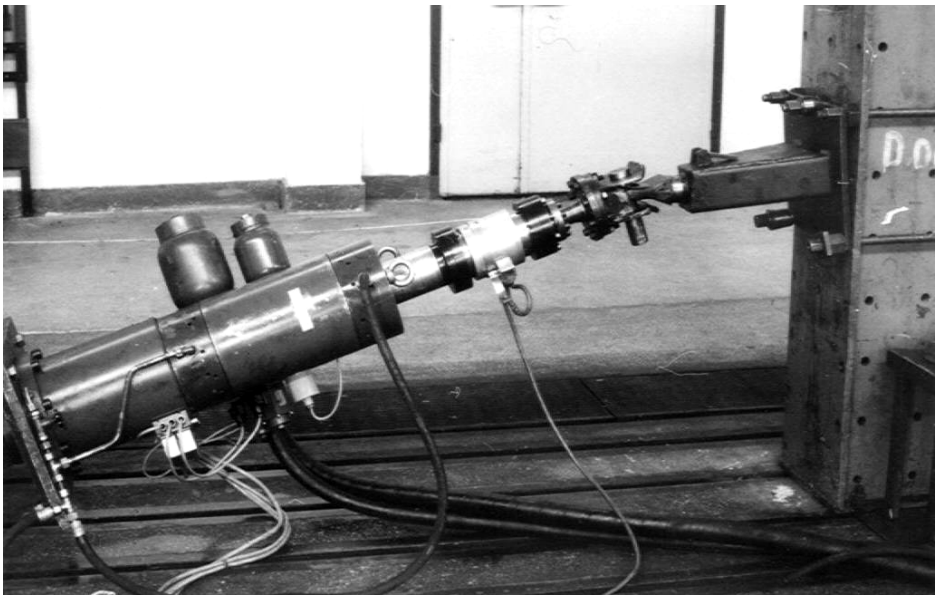

Figure 1 **- Assembly performed on the "HYDROPULSE" installation, in order to test the hauling eye**

During the attaching of the eye to the testing stand pillar it has been considered that the longitudinal axe of the eye should be horizontal. A hydraulic cylinder of 100 kN has been used for the tests. The Chains of force and stroke measuring, of the cylinder have been framed within the 1st precision classe (force measuring chain - LMF 08/± 100 kN; stroke measuring chain - LMC 04/± 100 mm; switch cabinet of the hydraulic cylinder - DCCCH - 08/.

The testing parameters and their values are presented in table 3 and have been established according to the technical documentation of the product and to annex IV of the Directive 89/173/EEC.

Table no. 3

Crt. Nr.	Parameter Name	Value
1.	Maximum towing mass	6000 kg
2.	Maximum mass of the tractor vehicle	3500 kg
3.	Maximum vertical load on the coupling point	500 kg
4.	Dynamic test load, D	21,7 kN
5.	Horizontal force, F_h	21,7 kN
6.	Vertical force, F_v	7,36 kN
7.	Testing force, F	23 kN
8.	Maximum force, F_{max}	23 kN
9.	Resultant, F_{med}	12,1 kN
10.	Minimum force, F_{min}	1,15 kN
11.	Testing angle reporting to the horizontal	18° 44'
12.	Testing frequency, f	12÷14 Hz
13.	Number of cycles of pulsatory strain	2.000.000

After being performed the fatigue tests, has been also performed the endurance test regarding the eye ability to connect with coupling devices mounted on the tractors according to SF no. 42 - 96, p. 2.4.

3. RESULTS OF THE TESTS

The effective values of the applied force and the appropriate displacement measured on the direction of the hydraulic cylinder axe, during the test, are presented in table 4.

Tabelul nr. 4

Crt. Nr.	Nr. of performed cycles	Maximum force [kN]	Maximum displacement [mm]
1.	2500	23.1	1.53
2.	620000	23.15	1.56
3.	1350000	23.08	1.58
4.	2000600	23.15	1.60

The diagrams force - time are represented in figure 2.

After having performed 2000600 cycles, there haven't found any breakages, cracks, remanent deformations, or other visible external damages.

The control of the eye coupling ability consisted in the performing of 500 successive couplings according to 2,4. from S.F. no. 42 - 96; the check finished, there haven't found any damages or deformations of the contact surfaces.

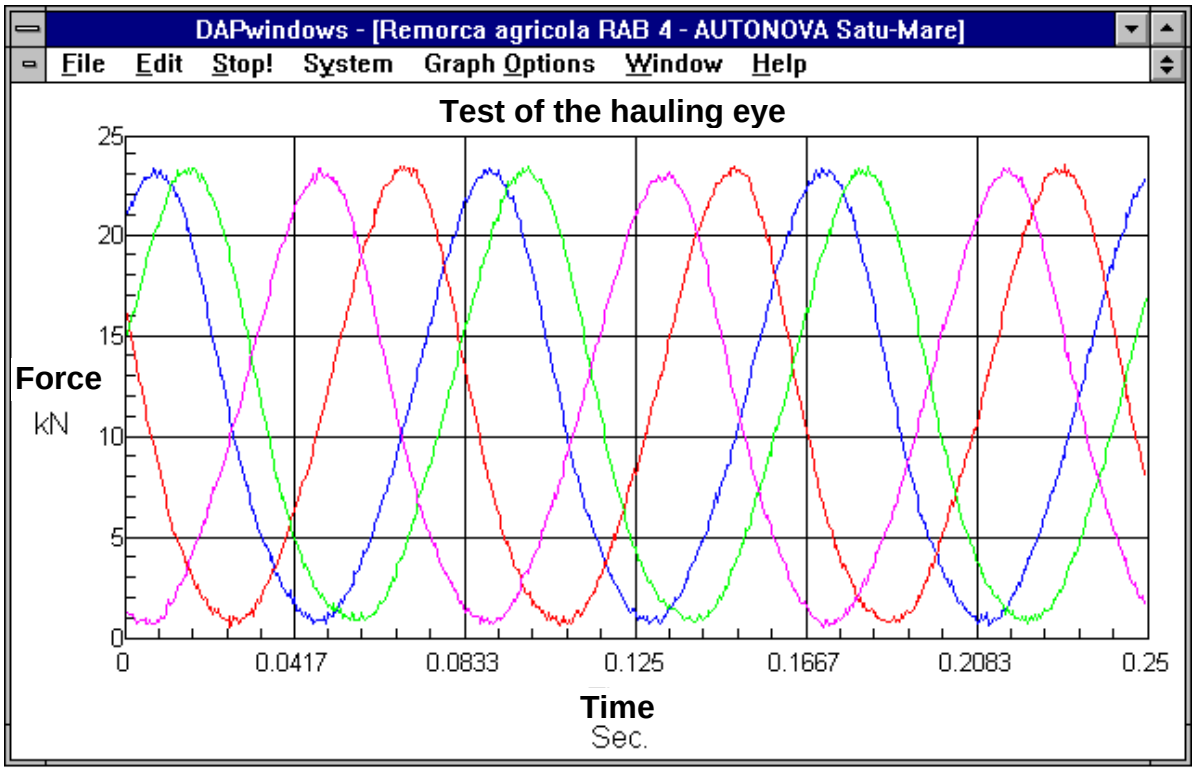

Figure 2 **- Force-time diagram for the hauling eye**

Au *n* = 2,500 cycles;
At *n* = 620,000 cycles;
At *n* = 1350,000 cycles;
At *n* = 2000,600 cycles.

4. CONCLUSIONS

The hauling eye forming the hitch assembly, equipies the agricultural dumping trailer RAB 4.

The eye has been appropriate as for the fatigue test and for the coupling ability to the complementary coupling devices (500 successive couplings).

The necessary data in order to determinate the dynamic stress at which the product has been subdued, have been transmitted to the beneficiary, for supplementing those belonging to the technical documentation. The tests have been performed on the hydropulse installation of dynamic tests, and after having performed 2000600 cycles, there haven't found any breakages, cracks, remanent deformations or other visible external damages of the hauling eye.

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