International Journal of Application or Innovation in Engineering & Management (IJAIEM)
Web Site: www.ijaiem.org Email: editor@ijaiem.org
Volume 11, Issue 7, July 2022 **ISSN 2319 – 4847**

VERIFICATION OF THE NEW PRODUCTION - FRICTION CLUTCH ATTACK BODY

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ABSTRACT

In today's environment, new product development can be crucial for organizations in terms of their survival in the market. The development of a new optimal product is imperative for companies that produce parts for incorporation into a final product in the automotive industry. In this paper, the developed new product - attack body for vehicle friction clutch is treated. For this purpose, advanced techniques have been introduced and the same has been done with a scientific approach. The achieved goal of product development is confirmed by its verification, on the basis of comparing the new product with an existing product in the company, on the basis of which the optimization of the new product was made.

Keywords: product development, friction clutch, clutch attack body

1. INTRODUCTION

For the optimization of the construction of the attack body of the clutch, the previous experience of the company RUEN INOX AUTOMOBILE - Kochani, R. North Macedonia was used, and the modern world experiences in this area.

The optimization of the intrusive body consisted in improving the technical characteristics: by calculating the parameters of the diaphragm (membrane) springs and with the constructive shaping of both their geometric shape and the shape of the other elements of the attack body. The improvement of the technical characteristics with the calculation of the parameters of the diaphragm (membrane) springs was done with Mathcad software. The improvement of the technical characteristics with the constructive shaping of the geometric form was done using the software programs for drawing Auto CAD and SolidWorks. The emphasis of the optimization was placed on the modification of the tin cover and the modification of the diaphragm spring according to: the structural, geometrical and functional characteristics of this product. The same diaphragm springs can be used for the attack bodies, which depends on the power of the engines, that is, the torsional moment.

In addition to these programs, the CATIA software program is also used in factories that manufacture parts for the first installation in the automotive industry.

Figure 1 Prospect of the new product - attack body 4304.20.00

Important elements of the attack body of the clutch (Figure 1) are: the diaphragm (membrane) spring, the pressure plate and the cover

2. CHARACTERISTICS OF THE OLD END NEW PRODUCT

In order to verify the newly developed product, the attack body 4304.20.00 for friction clutch, experimental measurements were carried out on this attack body and the existing (old) attack body 4301.20.00 on the basis of which the new one was optimized.

During these experimental measurements (tests), the functional characteristics of the mentioned attack bodies were determined and compared below, in a way that allows insight and comparison of the same parameters for both performances of attack bodies, and shown in Table 1.

Table 1: Functional characteristics

FUNCTIONAL CHARACTERISTICS OF THE ATTACK BODY OF THE CLUTCH						
Attack body 4301.20.00	Disengagement force max 700 daN	Raising min 1.7/12 mm	Height $60^{\pm 1.8}$ mm	Parallelism 0.8 mm	Pressure force 3100÷3600 daN	Flywheel 10 mm
	572	2.1÷1.9÷2.0	58.0÷58.6	0.6	3541	
	560	1.95÷1.95÷2.15	58.2÷59.0	0.8	3524	
Attack body 4304.20.00	Disengagement force max 550 daN	Raising min 1.7/12 mm	Height 60±1.8 mm	Parallelism 0.8 mm	Pressure force 2610÷2960 daN	Flywheel 10 mm
	442	2.0 ÷ 2.0 ÷ 2.05	59.4 ÷ 59.9	0.5	2954	
	465	2.0 ÷ 2.05 ÷ 1.95	59.15 ÷ 59.65	0.5	2957	

The general conclusion is: the new attack body 4304.20.00 has a lower pressure force, and it is understood a lower disengagement force, in relation to the existing attack body 4301.20.00. This means that the new attack body for the clutch will be intended for vehicles with less power, but also less torsional moment by about 20% compared to the existing attack body.

3. DYNAMIC FATIGUE TESTING CURVES

The next two pages show the output curves from the control with the control machines, from the examination of the attacking bodies before and after the dynamic fatigue. On the first page (Figure 2) are the diagrams for the existing attack body, and on the second page (Figure 3) are the diagrams for the new attack body.

The diagrams on the left vertical on the next two pages show the curve of the pressure force of the attack body, and the diagrams on the right vertical (on the two next pages) show the two curves - the curve of the disengagement force of the attacking body and the curve of lifting the pressure plate with a certain disengagement movement.

Proper reading of the next diagrams presents much-needed data on attack bodies.

Comparing the curves (of the pressure force, the disengagement force and the lifting force of the pressure plate) before fatigue and after fatigue, for the existing attack body and for the new attack body (on the next two pages), it can be concluded that in terms of fatigue better refers the new attack body. This is concluded on the basis that for the new attack body the functional parameters after the fatigue load deviate less than the same parameters measured before the fatigue.

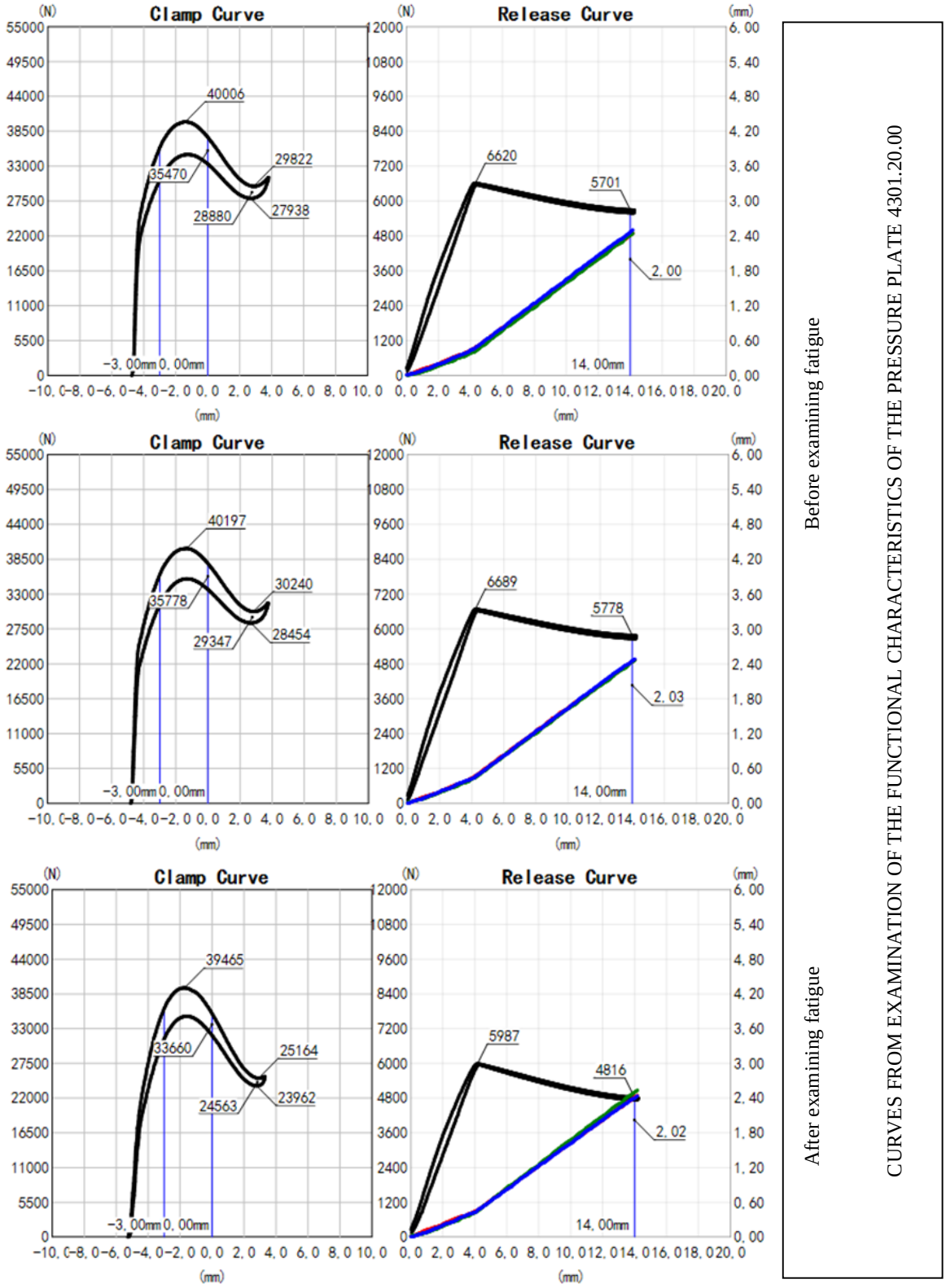

Figure 2 Testing for existing product

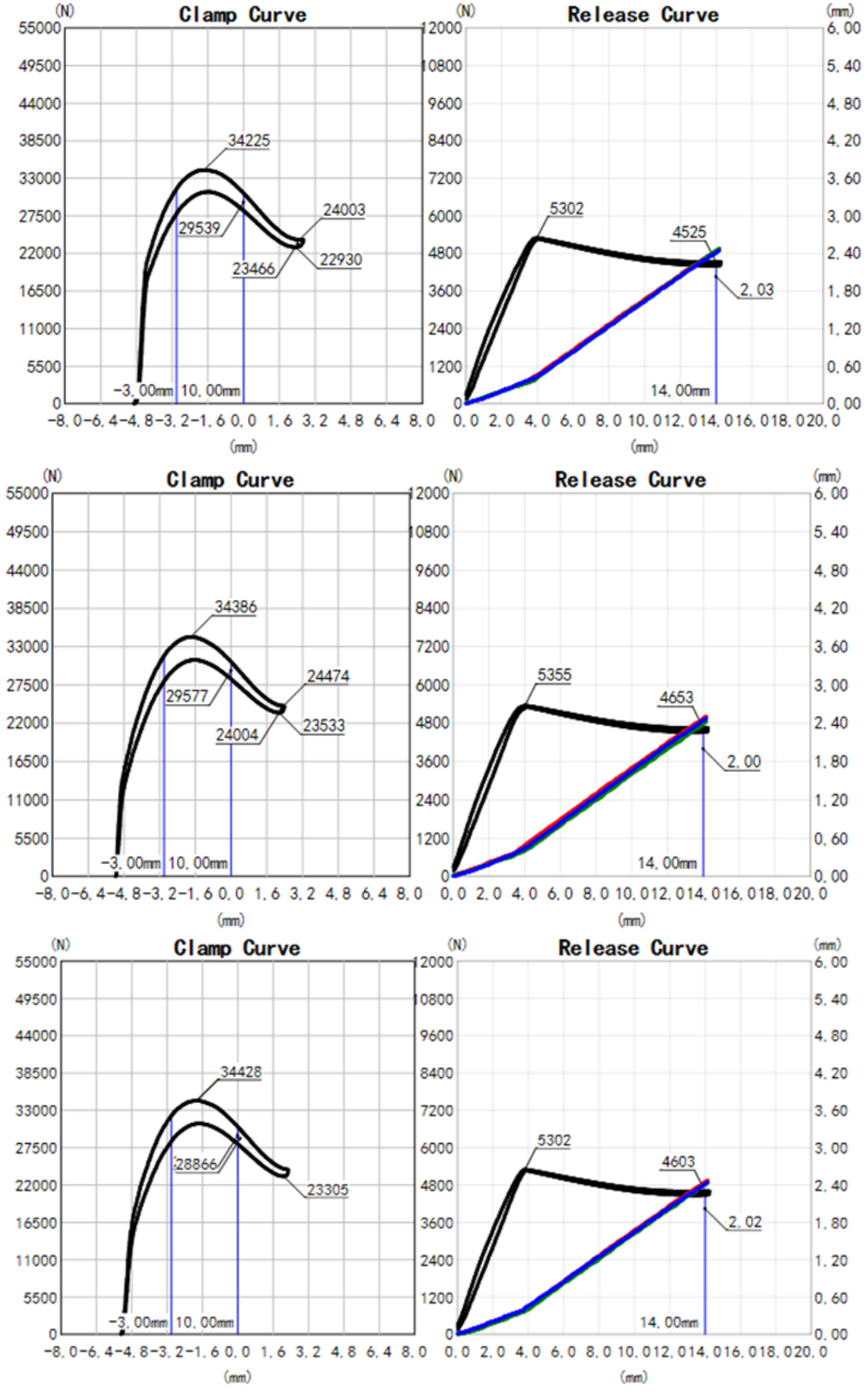

Figure 3 Testing for new product

4. DYNAMIC FATIGUE TESTING OF THE MATERIAL

The dynamic fatigue test of the material was well tolerated by both attacking bodies, after which it can be concluded that both attacking bodies meet the necessary conditions: they withstood the required number of load cycles (1,000,000) without there is a major distortion of the initially measured parameters and the permanent dynamic endurance is met.

The conclusions from the dynamic fatigue test material for the two attacking bodies are shown in comparison on Table 2.

Table 2: Material testing

TEST II — DYNAMIC FATIGUE TEST OF A CLUTCH COVER

04-21

a)WITHOUT ROTATION

CATALOGUE No 4301.20.00

NUMBER OF THE SAMPLE	1	2	3	4	5	6
DURABLE DYNAMIC PERSISTENCE ($N.10^5$) cycles	>1.0					

NOTE: The tested attack body is a product of regular production. The attack body endured the required number of cycles, without a major disturbance of the initially measured parameters.
Rating: The attack body satisfies

TEST II — DYNAMIC FATIGUE TEST OF A CLUTCH COVER

01-22

a)WITHOUT ROTATION

CATALOGUE No. 4304.20.00

NUMBER OF THE SAMPLE	1	2	3	4	5	6
DURABLE DYNAMIC PERSISTENCE ($N.10^5$) cycles	>1.0					

NOTE: The tested attack body is a product of new production. The attack body endured the required number of cycles, without a major disturbance of the initially measured parameters.
Rating: The attack body satisfies

5. CONCLUSION

The created new product presented in this paper is a 430 mm clutch attack body for cargo vehicles of the MAN company, marked with catalog number 4304.20.00, with which it will further appear within the rest of the products of this factory. The developed product is considered optimal because the product development was carried out based on the optimization of the existing performance of the attack body with the catalog number 4301.20.00, as presented in this paper.

The optimality of the product is confirmed by its verification, i.e. comparing the output results of the experimental measurements for the two performances of the attack body, presented in this paper.

The general conclusions are:

- In terms of fatigue, the new attack body behaves better. This is concluded on the basis that for the new attack body the functional parameters after fatigue loading deviate less from the same parameters measured before fatigue.
- The new attack body has a lower pressure force and disengagement force. This means that the new attack body for the clutch will be intended for vehicles with less power, but also less torsional moment by about 20% compared to the existing attack body

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