

Ministry of Transport of Ukraine
GA “Ukrzaliznytsya”

Southern Railways
Locomotive Depot Lozovaya

**Installation of catalyzer of mark KT-14Д in the fuel system of diesel locomotive of series
ЧМЭЗ
Carrying out of operational tests**



CONTENT

	Page
1. General Provisions	3
2. Object of Tests	3
3. Purpose of Tests	3
4. Means of Measurement Techniques	5
5. Methods of Tests	5
6. Results of Tests	6
7. Conclusions	7

1. GENERAL PROVISIONS

The tests were carried out on the basis of the separated subdivision “Locomotive Depot Lozova” of Southern Railways at the address: 64600, Lozova city, the 38th Gvardiiska division St., house 7. м

The agency operational tests of the fuel catalyzer КП14-Д (hereinafter referred to as the КП) before and after its installation on the engine of the locomotive of series ЧМЕ3 were carried out on 14.11.2013 and 15.11.2013 by the commission appointed by the Order of SS “Locomotive Depot Lozova”.

The ground for carrying out the tests is the order of Field Service of Locomotive Economy of Southern Railways.

The tests were carried out according to ГСТУ 32.0.08.11 “The order of development and putting the products for production for the needs of railway transport”, other field regulatory acts.

The commission on carrying out the tests followed in its work the Program and the methods of operational tests.

2. OBJECT OF TESTS

The fuel catalyzer КП14-Д (photo 1) for diesel engines of internal combustion developed by LLC “Scientific-Production Firm “Eko-Avto-Titan” and manufactured by LLC “Plant of Gas Equipment “Alpha-Gaspromkomplekt” installed on the locomotive of series ЧМЕ3 No. 2796 according to the scheme set forth on pic. 1.

КП is designed for improving the technical-economic indices and decrease of the content of contaminating waste by way of catalytic preparation of fuel before its burning in the engine cylinders.

Upon the tests was used the diesel fuel GASOIL (the analogues ДПЛ-0,10-62 ДСТУ 3868-93, the content of sulfur 0.0926%).

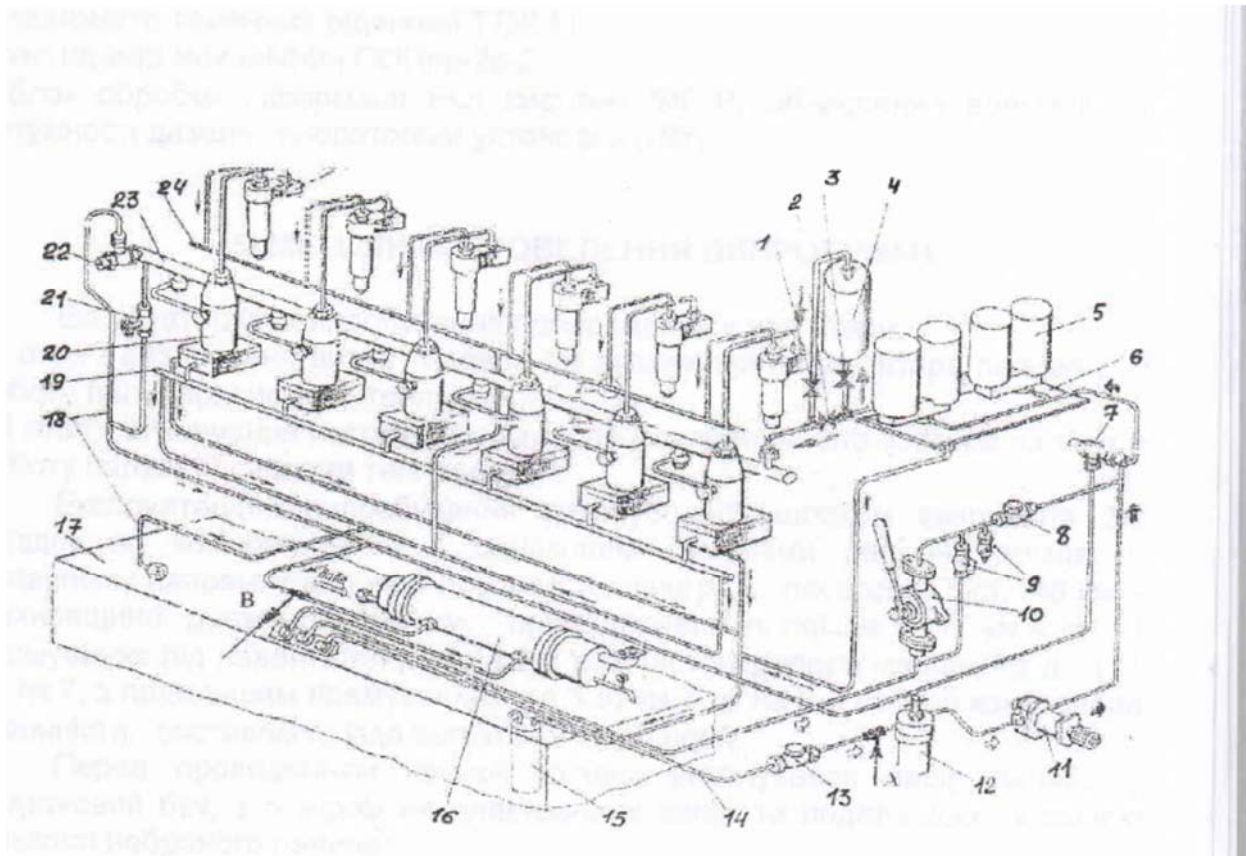






3. PURPOSE OF TESTS

The purpose of the tests is to verify the efficiency and confirm the cost-effectiveness of using the fuel catalyzer КП-14Д in the conditions of real operation with the load of locomotive ЧМЕЗ No. 2796 on the fixed section Lozova-Krasnograd of the stage Post 146 km. - Sakhnovshchyna, which has a prolonged rise of 8.6 degrees.



Pic. 1 Fuel system of the locomotive ЧМЕЗ with the built-in fuel catalyzer КП-14Д:

- 1 - output valve 2.3 - input valves; 4 - fuel catalyzer;
- 5 - fine fuel filter; 6 - dish under the filter;
- 7 - safety valve; 8,13 - check valves; 9 – crane
- 10 - hand pump; 11 - fuel and pumping pump;
- 12 - coarse filter; 14 - suction pipe;
- 15 - mud cure; 16 - fuel-heater; 17 - fuel tank;
- 18 - drain pipes; 19, 24 - drain manifolds;
- 20 - high pressure fuel pump; 21 – valve; 22 - bypass valve;
- 23 - fuel collector; 25 - injector;

4. MEANS OF MEASUREMENT TECHNIQUES

Upon the tests were used certified in the established order devices:

- standard measuring instruments of locomotive: the remote tachometer for measuring the engine speed of the crankshaft, the kiloammeter measuring current in power circuits, the speedometer CJI-2M;
- additional fuel tank (installed for the period of testing);
- electronic platform scales of the TCS series;
- technical liquid thermometer ТТЖ-М;
- stopwatch mechanical СОПп-2а-2;
- information processing unit of the БОИ БIC system, calculation of the electric power of the diesel-generator set (kW).

5. METHODS OF TESTS

The operational tests were carried out in two stages:

- Stage I – the determination of fuel consumption before switching on the fuel catalyzer in the operation of the fuel system of the locomotive;
- Stage II – the determination of fuel consumption after switching on the fuel catalyzer in the operation of the fuel system of the locomotive.

The operational tests were carried out by performing 3 trips at each stage with the same conditions for conducting the train, in the odd direction of the Lozova-Krasnograd section, the Post 146 km-Sakhnovshchyna with the length of 16.7 km, the train departing from 147 km 4 pc, and following in load on the 6th position of the driver's controller to 131 km 7 pc, followed by the movement of up to 130 km 7 pc at the 0th position of the driver's controller, the train with the weight of 369 tons, 18 axles.

Prior to each trip, fuel was collected into the additional tank, with the measurement on the electronic balance, and then the amount of fuel collected was fixed.

After the end of each trip, the remainder of the fuel was taken from the additional tank, followed by measurement and fixation of the residual amount of fuel.

The difference between the amount of collected and residual fuel is the actual fuel consumption for a separately executed trip.

6. RESULTS OF TESTS

- Stage I (without catalyzer) on 14.11.2013

- 1) trip No. 1 – the fuel consumption constituted 73.6 kg;*
- 2) trip No. 2 - the fuel consumption constituted 63.7 kg;
- 3) trip No. 3 - the fuel consumption constituted 65.3 kg;

The total fuel consumptions by the results of the Stage I constituted 129.0 kg. (without taking into account the consumption for the trip No. 1).

The average fuel consumption by the results of the Stage I constituted 64.5 kg. (without taking into account the consumption for the trip No. 1).

*Note: the trip No. 1 was not taken into account in the results of consumption upon carrying out of the first stage, because upon its execution arose the overrated fuel consumption for the reason of the first collection of diesel fuel in the additional tank, which was empty before carrying out the tests. After execution of the first trip, in the fuel tank remained the residue amount of fuel, which was located in the “unachievable zone”, which did not give the possibility of full discharge of fuel without dismantling of the additional tank. The measurements of the fuel upon execution of the further trips were executed without taking into account the residue fuel in the additional tank.

- Stage II (with catalyzer) on 15.11.2013

- 1) trip No. 4 - the fuel consumption constituted 59.8 kg;
- 2) trip No. 5 - the fuel consumption constituted 58.3 kg;
- 3) trip No. 6 - the fuel consumption constituted 57.0 kg.

The total fuel consumptions by the results of the Stage II constituted 175.1 kg.

The average fuel consumption by the results of the Stage II constituted 58.4 kg.

Result of carrying out the measurements of fuel consumption:

By the results of carried out operational tests the average decrease of diesel fuel consumption after switching on the fuel catalyzer КП-14Д in the operation of the fuel system of the locomotive of series ЧМЕЗ No. 2796 constituted 6.1 kg, or 9.5%.

7. CONCLUSIONS

The commission notes:

- on the index of economic efficiency, decrease of fuel consumption after the КП switching on in the operation of the fuel system of the engine of the locomotive ЧМЕЗ No. 2796 constitutes in the average 9.5%.

- visually is noted the significant decrease of opacity, operation easing and decrease of the engine noisiness.

Members of the commission

Engineer on control of the systems “БІС-Р” and “Delta-SU” of the service of locomotive economy of the Southern Railways (signature) S.V. Antsypherov

Driver-instructor of the locomotive depot Lozova (signature) V.O. Iatsiuk

Chief of department of LLC “Scientific-Production Firm “Eko-Avto-Titan” (signature) V.O. Gaponov

Engineer-mechanic of LLC “Scientific-Production Firm “Eko-Avto-Titan” (signature) V.K. Vitiuk

In the tests participated:

- the Deputy-Director General of OJSC “Scientific-Research Institute of Technologies, Control and Diagnostics of Railway Transport” on DKR Omsk city, RF (signature) M.G. Makarenko

- the Director of Company LKS EKO Dynamics (USA) (signature) V. Khlon

Name	Sheet	Document No.	Signature	Sate	KB2.966.001 AB	Sheet 8

ACT

By the commission in the composition of:

The representative of LLC "Scientific-Production Firm "Eko-Avto-Titan" Vitiuk V.K.,

The Deputy-Chief of the locomotive depot on repair Kravchenko A.V.,

The Senior Technologist of the locomotive depot Sobolev A.A.,

The Master of the diesel-aggregate shop of the locomotive depot Sharko A.Iu.

Was examined the state of the elements of the 1st set of the conrod-piston group of the locomotive ЧМЕ3 No. 4378 dismantled upon carrying out the current repair of TP-1, after the operation of the diesel locomotive with the fuel catalyzer КП-14Д.

The fuel catalyzer was installed in the locomotive ЧМЕ3 No. 4378 on 25.05.12.

As a result the following was established:

1. Was carried out the measurement of the diameter of piston and bush of the cylinder, the parameters constituted:

Diameters of piston:	Diameters of bush of the cylinder:
309,11/309,11	310,10/310,06
309,52/309,50	310,01/310,07
309,53/309,51	310,00/310,00

2. Upon issuance from the repair TP-3 on 31.08.10 of the locomotive ЧМЕ3 No. 4378 the parameters of the said piston and bush of the cylinder constituted:

Diameters of piston:	Diameters of bush of the cylinder:
309,17/309,16	310,05/310,02
309,52/309,56	310,00/310,04
309,55/309,56	310,00/310,00

3. The wear of the bush of the cylinder constituted 0.05 mm, the wear of the piston constituted 0.06 mm.

Commission conclusion: the inspection of the elements of the conrod-piston group of the locomotive ЧМЕ3 No. 4378 was made visually, in accordance with the requirements of the instruction ЦТ-0187. The above-mentioned wear of the elements of the conrod-piston group for the period of operation from August 31, 2010 till February 12, 2014 is natural. Visible traces of overheating of the compression rings, the piston and the bush of the cylinder were not detected. As a result of the inspection, the commission believes that the experimental fuel catalyzer installed on the locomotive ЧМЕ3 No. 4378 does not influence the technical state of the elements of the conrod-piston group of the diesel engine.

Chairman of LLC "Scientific-Production Firm "Eko-Avto-Titan" (signature) Vitiuk V.K.

Deputy-Chief of the locomotive depot (signature) Kravchenko A.V.

Senior Technologist of the locomotive depot (signature) Sobolev A.A.,

Master of the diesel-aggregate shop of the locomotive depot (signature) Sharko A.Iu.

Seal: Ukraine, Limited Liability Company "Scientific-Production Firm "Eko-Avto-Titan",

Identification code 3190933