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## **ENGINE TEST BENCH AS A SOURCE OF DANGER FACTORS IN EXPERIMENTAL RESEARCHES**

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## **МОТОРНИЙ ВИПРОБУВАЛЬНИЙ СТЕНД ЯК ДЖЕРЕЛО ФАКТОРІВ НЕБЕЗПЕКИ У ЕКСПЕРИМЕНТАЛЬНИХ ДОСЛІДЖЕННЯХ**

**Introduction.** As well known, the main porpoise of any kind of scientific researches is a creation of newest intellectual product of fundamental of applied nature, which characterized by scientific novelty, originality and practical value. In this connection, that product on its way between initial idea and form of some kind of competitive goods, which implemented in serial production, necessarily passes the stage of experimental researches of its working characteristics. That fact causes the necessary of development of special programs and methods, designing and manufacturing of experimental samples and also creating and improving of laboratory equipment – stands, plants, measuring instruments. But any experimental researches of objects that related with energy plants, except co-called mental experiment, characterized by some kind of danger factors. Therefore scientific research works aimed on identifying, analysis and maximal reducing or elimination of danger factors, sources of which are experimental plants and stands, are relevant because life and health of researchers and laboratory staff are the values of much higher order, than any kind of scientific knowledge. **Analysis of recent publications.** In Department of Piston Power Plants (DPPP) of A.N. Podgorny Institute for Problems in Machinery of NAS of Ukraine (IPMash NASU) was developed modular diesel particulate matter filter (DPF) with new nonconventional construction and bulk natural zeolite in cassettes of stainless steel mash – DPF IPMash. Several variants of DPF construction are embodied in the form of operating layouts of its filter elements (FE). Their working characteristics under real operation conditions was obtained on engine test bench (ETB) of DPPP [1]. The scheme of ETB shown in Fig. 1 and its appearance – in Fig. 2. **Porpoise of research** is description of structure of ETB for following identification and analysis of factors of industrial, ecological, fire and explosive danger of carriage of experimental researches on ETB. **Formulation and solving of problem.** ETB as himself is a complicated system of follows interrelated power plants. 1) Bench contains electrical load machine made by firm VSE-TIN with dynamometer of direct current of type DS 742/4-N in which structure is control cabinet of type VH 136, two-machine unit (motor-generator) of type IDP 942-1 and remote control panel [2]. 2) On board of bench installed an autotractor diesel engine 2Ch10.5/12(D21A1) [3] as the object of study. 3) System of measuring instruments of ETB consists of following devices: sensors, appliances and informational channels, which measure and control the adjustment, regime and other parameters of diesel engine, load devise and other units of the bench [4]. 4) Diesel engine and load devise are installed on welded steel fundament frame that rests on a concrete base. 5) Transmission of the bench is mechanically connect flywheel of diesel engine and flange of rotor of loading devise with spline shaft and is covered by protecting casing. All of these structure units of ETB characterized by definite set of factors of industrial, ecological, fire and explosive danger. The motor experiments provided in accordance with programs and methodics of DPPP and also provisions of GOST 18509-88 and GOST 14846-

87 [5, 6]. The programs of motor research is developed on basis of standardized 13- and 8- regime stationary test cycles that are models of exploitation of automotive and tractor diesel engines, respectively, and are described in UNECE Regulations # 49 and # 96 [8, 9]. They was adapted to abilities of laboratory of DPPP and features of it process are described in [1]. To providing the engine bench researches of DPF IPMash the exhaust system of ETB was modernized by the way of adding to it the place for installing of experimental samples (insert for sample retention (ISR)), the new sampling systems of exhaust gases (EG) for determine its toxicity and opacity and also for measuring of gas dynamic parameters of EG flow. The scheme of modernized ETB exhaust system shows in [1, 4]. The danger factors of experimental studies on ETB is expedient to consider for each of it single units apart. That will be the porpoise of following studies [7]. **Conclusions.** In present research considered structure, composition and features of engine test bench of DPPP of IPMash of NASU as a source of factors of industrial, ecological, fire and explosive danger. In following researches will be determined and analyzed that danger factors for each of it single bench units apart. It is the loading device, transmission, diesel engine 2Ch10.5/12, measuring instruments and experimental samples of DPF. Also it will be proposed the list of actions for ensuring industrial, ecological, fire and explosive safety of experimental studies on ETB.

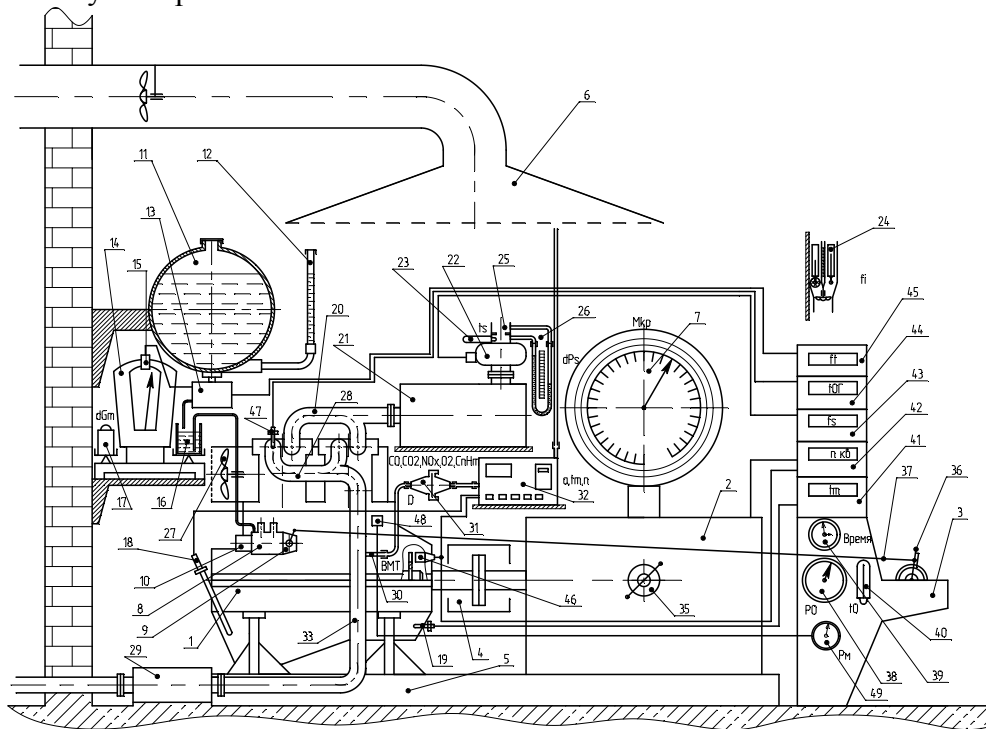


Fig. 1. Scheme of Engine Test Bench:

1 – diesel engine D21A1 (2Ch10.5/12); 2 – load machine (motor-generator IDP 924-4); 3 – remote control panel; 4 – cardan shaft with protecting casing; 5 – welded steel fundament frame; 6 – exhaust ventilation; 7 – dynamometer DS 742-4/N; 8 – high pressure fuel pump; 9 – all regimes regulator of crankshaft; 10 – coupling for variation of angle of advancing of fuel injection; 11 – fuel tank; 12 – sensor of fuel level in tank; 13 – electric-hydraulic automatic valve for fuel topping; 14 – laboratory scales of 2<sup>nd</sup> class VLR-200; 15 – optical sensor; 16 – consumption tank of fuel consumption measurer; 17 – references weight; 18 – oil dipstick or oil temperature sensor in sump of diesel; 19 – oil temperature sensor in sump of diesel TM100V; 20 – exhaust collector of diesel; 21 – intake receiver of diesel; 22 – rotary gas counter RG-100; 23, 40 – mercury thermometer TL-4 №2 (0 – 50 °C); 24 – psychrometer; 25 – choke orifice of intake air consumption measurer; 26, 34 – differential U-shape hydraulic manometer; 27 – ventilator of diesel cooling system; 28 – exhaust collector; 29 – EG noise muffler; 30 – EG toxicity sampler; 31 – filter holder for EG smokiness determination; 32 – 5

components gas analyzer Autotest-02.03P; 33 – exhaust tract; 35 – unconnected coupling of loading machine; 36, 37 – control handle and metal cable; 38 – barometer-aneroid BAMB-1M; 39 – timer; 41 – appliance A-565; 42, 43, 45 – frequencymeter-chronograph F-5040 or F-5041; 44 – appliance A-566; 46 – TDC marker; 47 – resistance thermometer TSM; 48 – oil pressure sensor; 49 – manometer MO

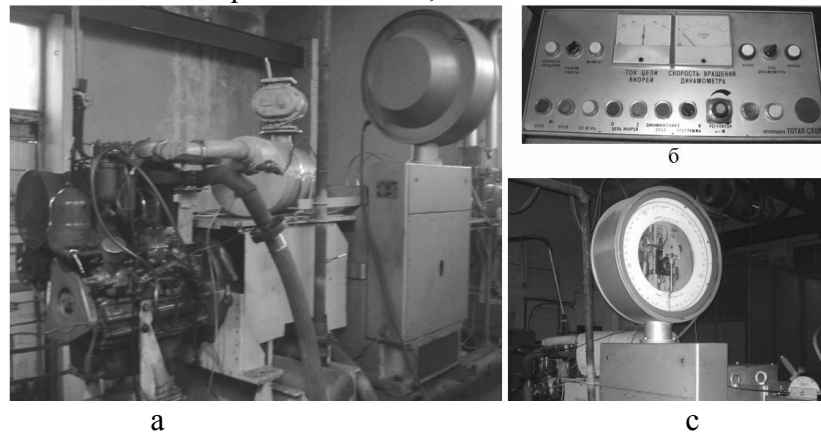


Fig. 2. Engine Test Bench:

a – general view of bench; b – remote control; c – loading device with dynamometer

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