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Hydraulic Weighting System Support Transported By Dump Truck Substantiation

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Abstract: The paper looks at the solution of a problem concerning the number of movements linked to weighing frequencies, which consists of developing the device for measuring the freight mass directly attached to the dump truck. According to the concept of using hydraulic sensors the recommended system is worked. This consists of a hydraulic sensing system with higher pressure oil pipelines of both the left and right pipe-line, hydraulic ram hydro pressure pipelines, a weight thorned petroleum pressure gage, a three-run distributive tap, an hydraulic ram for an oil tap, an oil pump, a low pressure gas pipeline, a rear pipeline and an intermediate stream. Oil pump is available with a working valve. The hydraulic sensors of left and right longerons are linked in parallel via a three-running dispensing tap and a bilateral action valve to a hydraulic high-pressure oil pipeline. The hydraulic sensors for the weighing of freight equipment operate in a similar way to hydraulic ram. The dependence which enables to determine the main device parameters for the left and right sensors based on the passed quantity of working flubid, Reynold number and pressure decreases in all elements of the hydraulic system, such as the internal diameter of the oil pipeline for liquid supply. The dependence is provided. The proposed device can be used in specific practical application in combination with the system for fixing the freight weight transported.

Keywords: Dump truck, Efficiency of the transport and technological processes, Hydraulic sensors, Weighing of freights.

INTRODUCTION

One of the main components of any output is transport operations. A significant number of different products are transported by trucks. Weighing cargoes borne by vehicles is therefore necessary. To this end, drivers should move to permanent weighing points that often settle at a significant distance from a work location. The adverse effect of this occurrence is to minimize jobs, increase consumption of fuel, increase wear on equipment and car components, etc. This condition has an adverse effect. Additional transport is also required, as an increase in the operating volume contributes to fatigue for mobile machine operators, and has an adverse effect on driver health at the general work level [1–3]. Tiredness (exhaustion) can be a direct cause of a road accident or a negative condition that makes drivers ' acts more difficult in an emergency. In our view, an issue of moving numbers associated with cargo reduction can be optimally addressed by designing the system for the determination of the cargo mass directly attached to the truck. This is a matter of course.

Structure and operation of the device:

The weighing devices of the freight transported by the dump truck are offered by the authors. The function of the system provided is based on the hydraulic sensor theory. The unit (fig. 1) consists of hydraulic sensors 1, 13 left and right logons, high pressure oil pipeline hydraulic sensor system2, high pressure oil pipeline hydromantic sensor 9, weight-pressure hydraulic tube 12 throated oil pressure gauge, distributive tap 10 three-running, dump truck hydraulic ram 8, tap-operated petroleum pump 3, petrol tank 7 and low pressure petroleum pipeline 8 [4][5].

Sensors hydraulic 1. The three-running distributive tap 10 and the bilateral action valve 11 are parallel to 13 left and right logons in 8 High Pressure Oil Pipeline 9.

1. **Hydraulic sensors of the right longeron;**
2. **Hydraulic sensors' system of high pressure oil pipelines;**
3. **Oil pump;**
4. **Operation tap;**
5. **Low pressure oil pipeline;**
6. **Return piping;**
7. **Oil tank;**
8. **Hydraulic ram of the dump truck;**
9. **High pressure oil pipeline;**
10. **Three-running distributive tap;**
11. **Bilateral action valve;**
12. **Oil pressure gauge;**
13. **Hydraulic sensors of the left longer on.**

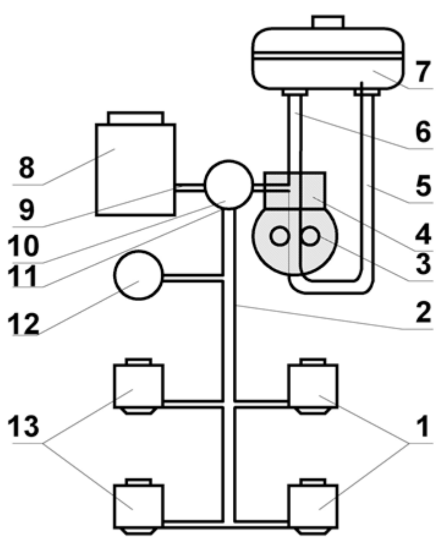

Figure 1. Schematic diagram of the device for weighing of freights

Similar to the hydraulic ram operation is the principle of the hydraulic sensors of the cargo weighting device. The hydraulic train must be raised for the free exit of hydraulic sensors by the hydraulic track to its maximum height before weighing the freight cargo. The distributive tap is positioned in position I for this reason (fig. 2). The power start is then turned on and the oil is transferred from a tank to the pump via a low pressure pipe. The hydraulic ram and hydraulic sensors are pumped from here through the high-pressure pipeline. The three-run tap is installed at position II at the maximum output of the hydraulic sensors. The pump starts working, the power departure is switched off. In case of excess pressure, oil circulates via the protection high pressure valve of the working tap in a hydraulic sensor system [6–8].

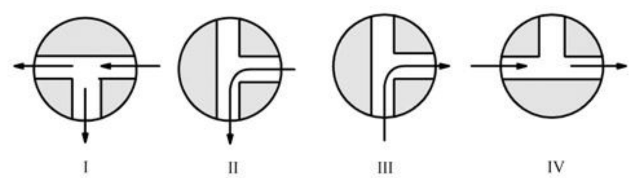

Figure 2: Positions of the three-running tap.

A bilateral action vapor (position III) is automatically mounted in the hydraulic sensor system the minimum pressure corresponding to a "zero" point in an oil pressure gage. The distributive tap is transferred to position IV after the gage hand is in zero position. The oil volume in the hydraulic sensors system remains constant in this case. In an oil tank, a high pressure oil pipeline and reverse piping are forced out under the influence of body weight oil from the hydraulic rod via the three-wheeled distributive tap [9][10]. The body leans at the ends of the hydraulic sensor rods in the extreme lower position at four points. The pressure of the gage hand is equivalent to the empty weight of the body. Upon loading a body, the weight of the pressure is also set on a gage number. The distributive tap shall be moved to position III for installation of a body in the transport role. Weight oil is powered from hydraulic sensors under the control of the corporal and fills an oil tank. The three-run tap is placed in position IV before the truck is loaded, and the body is raised normally [11] [12].

1. hydraulic sensors;
2. chassis frame;
3. installation frame;
4. bracket;
5. body;
6. ipping axis;
7. wooden laying

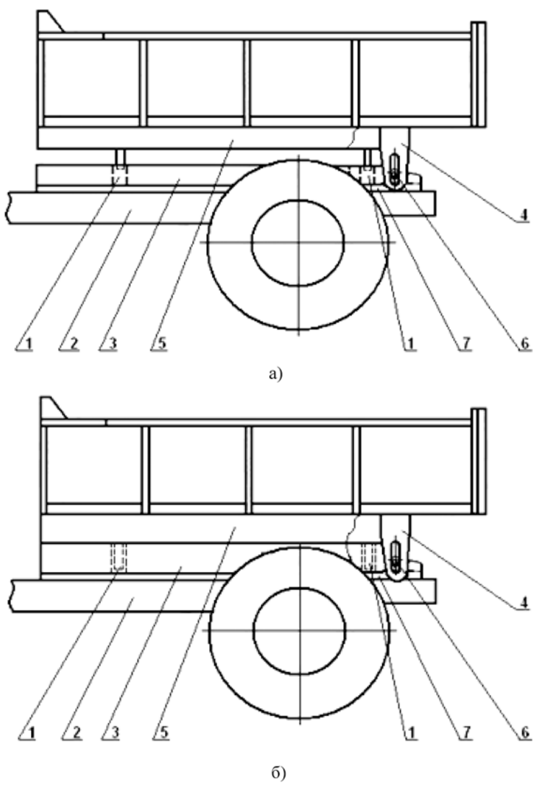

Figure 3. Schematic diagram of a body (a) when weighing; (b) in transport position

In all lines, the flow rates are the same and equal to the pump output flow for the considered system.

The rated force on the hydraulic sensor rod in view of power loss on the cylinder friction:

$$F = \frac{F_f}{\pi \cdot \eta_{mec}},$$

where F_f – full weight of a body with freight, N;
η_{mec}= 0.95 – mechanical coefficient of power loss on friction between the piston and the cylinder.
The specified force is also defined from the following expression:

$$F = p \cdot A, \quad (3)$$

where p –hydraulic pressure in the cylinder created by the pump, Pa; A – piston-face area, sq. m.

Using formulas (2) and (3), we will receive dependence for determination of the hydraulic sensor cylinder diameter:

$$D = \sqrt{\frac{4F}{\pi \cdot p}} = \frac{4F_f}{\pi^2 \cdot \eta_{mec} \cdot p}.$$

The final diameter value is selected from the GOST 6540-68 standard.

Because the weighting device is mounted on the dump truck's hydraulic ram system, calculation is necessary for checking if a hydraulic system parameters are provided by the available pump. The pump head should be defined for this reason.

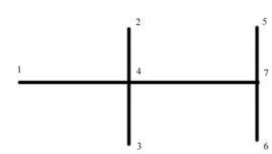

Figure 4. Design scheme of hydraulic system of the device for weighing of frights

$$H_1 = H_4 + \sum h_{1-4}; \quad (5)$$

$$H_4 = H_7 + \sum h_{4-7}; \quad (6)$$

$$H_4 = H_2 + \sum h_{2-4} + H_3 + \sum h_{4-3}; \quad (7)$$

$$H_7 = H_6 + \sum h_{1-4} + H_5 + \sum h_{5-7}. \quad (8)$$

Then:

$$H_1 = H_2 + \sum h_{2-4} + H_3 + \sum h_{4-3} + H_6 + \sum h_{1-4} + H_5 + \sum h_{5-7} + \sum h_{4-7} + \sum h_{1-4}. \quad (9)$$

Considering that lengths of oil pipelines $l_{2-4} = l_{4-3} = l_{5-7} = l_{4-7}$, head losses in sections are equal.
As pressure on hydraulic cylinders of sensors are equal $H_2 = H_3 = H_5 = H_7$, then:

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$$H_1 = 4(H_2 + \Sigma h_{2-4}) + \Sigma h_{1-4} + \Sigma h_{4-7} \quad (\text{}$$

Head loss (Σh) in a section of hydraulic system is determined by the following formula:

$$\Sigma h = (\xi_{fr} + \Sigma \xi_M) \cdot u^2 / 2g \text{, m;} \quad (\text{}$$

where u – fluid movement speed (average value for the cross-section), m/s;
g – free fall acceleration, m /s^2;
$\Sigma \xi_M$ – sum of hydraulic resistance coefficients of butt joints and the connecting parts accepted according to the passport of manufacturers or by data, to the similar designed systems, it is possible to choose approximate values of

$$Re = \frac{u \cdot d}{\nu} \quad (12)$$

Where ν – coefficient of fluid kinematic viscosity, m^2/s.

Table 1. Hydraulic friction coefficient calculation.

Movement mode		Reynolds number	Definition of λ
The laminar		$Re < 2320$	$\lambda = 64 / Re$
The transitional		$2320 \leq Re < 4000$	Design of pipelines isn't recommended
	1st area	$4000 \leq Re < 10^5$	$\lambda = 0{,}316 \cdot Re^{0,25}$
The turbulent	2nd area	$10^5 \leq Re < 9{,}2 \cdot 10^5$	$\lambda = 0{,}11 \cdot \left(\frac{\Delta}{d} + \frac{68}{Re}\right)^{0,25}$
	3rd area	$9{,}2 \cdot 10^5 \leq Re$	$\lambda = 0{,}11 \cdot \left(\frac{\Delta}{d}\right)^{0,25}$

CONCLUSION

The dependencies obtained allow the description and the comparison of a needed pressure head with a standard pump head (installed in the system) and conclusions on re-equipment needs to be drawn. Furthermore, the need for additional mobility adjudicates driver safety in the general work environment, given that the increasing number of mobile machine operators ' operations are tired. Fatigue (exhaustion) can immediately cause a road accident or complicate the driver's actions in emergencies as a result of adversity. A wide-ranging practical application is available in conjunction with the system for fixing the freight mass transported (counting). It will allow its use to reduce the transportation route so that transport and technical processes can be improved efficiency and safety.

REFERENCE

[1] N. Podoprigora, V. Dobromirov, A. Pushkarev, and V. Lozhkin, “Methods of Assessing the Influence of Operational Factors on Brake System Efficiency in Investigating Traffic Accidents,” in *Transportation Research Procedia*, 2017.

[2] M. S. Dmitriyev, M. L. Khasanova, and A. V. Raznoshinskaya, “Substantiation of Hydraulic System for Weighing Freights Transported with Dump Trucks,” in *Procedia Engineering*, 2017.

[3] C. Li, Y. Mao, J. Zhou, N. Zhang, and X. An, “Design of a fuzzy-PID controller for a nonlinear hydraulic turbine governing system by using a novel gravitational search algorithm based on Cauchy mutation and mass weighting,” *Appl. Soft Comput. J.*, 2017.

[4] I. Mughal, K. Z. Jadoon, P. Martin Mai, S. Al-Mashharawi, and T. M. Missimer, “Experimental measurement of diffusive extinction depth and soil moisture gradients in a dune sand aquifer in western Saudi Arabia: Assessment of evaporation loss for design of an MAR system,” *Water (Switzerland)*, 2015.

[5] N. D. Woodman, W. G. Burgess, K. M. Ahmed, and A. Zahid, “A partially coupled hydro-mechanical analysis of the Bengal Aquifer System under hydrological loading,” *Hydrol. Earth Syst. Sci.*, 2019.

[6] M. Inthachot, S. Saehaeng, J. F. J. Max, J. Müller, and W. Spreer, “Hydraulic Ram Pumps for Irrigation in Northern Thailand,” *Agric. Agric. Sci. Procedia*, 2015.

[7] M. Moshelion, O. Halperin, R. Wallach, R. Oren, and D. A. Way, “Role of aquaporins in determining transpiration and photosynthesis in water-stressed plants: Crop water-use efficiency, growth and yield,” *Plant, Cell and Environment*. 2015.

[8] P. P. Sengupta and J. Narula, “RV form and function: A piston pump, vortex impeller, or hydraulic ram?,” *JACC: Cardiovascular Imaging*. 2013.

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 6, June 2017

[9] A. Pathak, A. Deo, S. Khune, S. Mehroliya, and M. Pawar, "Design of Hydraulic Ram Pump," *Int. J. Innov. Res. Sci. Technol.*, 2016.

[10] R. D. Balgude, S. P. Rupanavar, P. S. Bagul, and A. R. Ramteke, "Designing of Hydraulic Ram Pump," *Int. J. Eng. Comput. Sci.*, 2015.

[11] S. Sheikh, C. C. Handa, and A. P. Ninawe, "Design Methodology for Hydraulic Ram Pump (Hydram)," *Int. J. Mech. Eng. Rob. Res.*, 2013.

[12] Y. Li, B. Li, J. Ruan, and X. Rong, "Research of mammal bionic quadruped robots: A review," in *IEEE Conference on Robotics, Automation and Mechatronics, RAM - Proceedings*, 2011.

[13] Anupam Baliyan, Vishal jain, Manish Kumar, Achin Jain and Uttam Singh, "Performance Analysis of Amdahl's and Gustafson's Law under multicore Processor Architecture", INDIACom-2018, 5th 2018 International Conference on "Computing for Sustainable Global Development", 14th – 16th March, 2018, held at Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi (INDIA).

[14] Bishwajeet Pandey, Vishal Jain, Rashmi Sharma, Mragang Yadav, D M Akbar Hussain, "Scaling of Supply Voltage in Design of Energy Saver FIR Filter on 28nm FPGA", International Journal of Control and Automation (IJCA), having ISSN No. 2005-4297, Vol. 10, No. 12, December, 2017, page no. 77 to 88.

[15] Balamurugan Shanmugam, Visalakshi Palaniswami, "Modified Partitioning Algorithm for Privacy Preservation in Microdata Publishing with Full Functional Dependencies", Australian Journal of Basic and Applied Sciences, 7(8): pp.316-323, July 2013

[16] Jaganraj L, Balamurugan S. Empirical Investigation on Certain Anonymization Strategies for Preserving Privacy of Social Network Data, International Journal of Emerging Technology and Advanced Engineering. 2013 Oct; 3(10):55–63