THE PROCEEDINGS BOOK

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EDITOR

Prof. Dr. Osman ERKMEN

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3D SCANNING TO DETECT THE DAMAGE CAUSES OF PETROLEUM STORAGE TANKS

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ABSTARCT

Increasing the volume of energy production (in particular, under martial law) requires to minimize the petroleum products consumption, which necessitates increasing the efficiency of liquid hydrocarbon storage in tanks and their operation and reducing their negative impact on the environment. The environmental pollution problem by petroleum products is becoming particularly relevant in the context of petroleum product transportation increasing volumes. Transportation of petroleum products by rail and road is accompanied by risks of leaks that pollute the environment. Round-the-clock missile attacks have led to an increase in accidents at petroleum storage tanks and their damage, which has a negative impact on the environment [1].

Ukraine has 18 commercial sea ports and 12 port points on the coast of the Black and Azov Seas. According to statistics, before the war in Ukraine, from 2 to 10 thousand tons of petroleum products were annually spilled into the Black Sea due to accidents. After the war, it is predicted that the annual volume of petroleum products transported in the Black Sea may increase to 220-250 million tons, which increases the risk of further sea pollution.

Aim is to prevent petroleum products from entering the environment due to increasing the ecological safety level of liquid hydrocarbon storage in tanks. This issue could only be solved through constant monitoring of the tank condition and its damage using 3D scanning technology [2,3].

However, the main problem limiting the damage detection method implementation is the lack of scientific, technical and scientific-methodological developments in the studied area. It is necessary to develop a method to detect the causes of tank damage.

During tank 3D scanning, positive results could be achieved, including:

1) accuracy of digital data in terms of finding the location and damage size;
2) a high degree of automation and human intervention minimization during data collection and analysis;
3) accelerated access to information about the tank condition and the ability to verify them.

Thus, laser 3D scanning significantly increases the efficiency of data collection on the petroleum storage tank condition. This technology provides a clear and detailed three-dimensional image, which allows experts and researchers to obtain high-quality visualization, as close as possible to real conditions. With the help of 3D scanning, it is possible to accurately measure the geometry of objects, based on the coordinates of the scanned points. The time required to inspect the object is significantly reduced - instead of several hours, it could be only a few minutes. The scanning process could be performed by one specialist, while traditional measurement methods usually require the participation of several people to work with measuring instruments and monitor the accuracy of measurements.

In addition, laser scanning could be performed at any time of the day, regardless of ambient lighting, which ensures the stability and accuracy of the results and, in turn, facilitates further data analysis and identification of the damage causes, which is critically important for the petroleum storage safety. The introduction of 3D scanning into the process of identifying the damage causes to petroleum storage tanks will make it possible to more accurately determine the deformation and tank damage and respond to potential threats in a timely manner. It is also worth emphasizing the importance of introducing 3D scanning in forensic examination not only for inspecting the scene of the incident (in the event of a road accident, etc.).

REFERENCES

Sierikova O., Strelnikova E., Kriutchenko D., Gnitko V. Reducing Environmental Hazards of Prismatic Storage Tanks under Vibrations. WSEAS Transactions on Circuits and Systems, Vol. 21. 2022**.** P. 249-257. DOI: 10.37394/23201.2022.21.27

Haleem, A.; Javaid, M.; Singh, R.P.; Rab, S.; Suman, R.; Kumar, L.; Khan, I.H. Exploring the Potential of 3D Scanning in Industry 4.0: An Overview. *Int. J. Cogn. Comput. Eng.* **2022**, *3*, 161–171.

Feng, P.; Zou, Y.; Hu, L.; Liu, T.Q. Use of 3D Laser Scanning on Evaluating Reduction of Initial Geometric Imperfection of Steel Column with Pre-Stressed CFRP. *Eng. Struct.* **2019**, *198*, 109527.