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INTRODUCTION IN DESIGN OF ABOVEGROUND CYLINDRICAL STEEL TANKS

Sofa, 2008

SUMMARY:

INTRODUCTION

The current thesis examines aboveground vertical steel cylindrical tanks made by carbon or low alloy steels with volume from 100 m^3 up to 100 000 m^3 for water, condensate, spirits, milk, oil and oil products. The tanks have welded shell and bottom and are not used when there is an additional internal pressure more than 2,5 кPa and negative pressure (vacuum) till 0,5 кPa. Maximum design temperature of the metal does not exceed 300 ^{0}C. When the design temperature is more than 100^{0}C the changes in mechanical properties of the steel must be considered.

The here described researches and the calculated correlations are valid for aboveground cylindrical steel vertical tanks for another stored product but are not valid for isothermal tanks and tank for storage of aggressive chemical products.

The current document generalizes the author's researches on the tank construction but also knowledge and experience of different organizations working in field of designing, execution, exploitation, inspection, repairing works and reconstruction of vertical steel cylindrical tanks.

During the preparation of the thesis, author made analysis and reported:

- accessible literature concerning the theme, as particular accent has been put on the European standards;
- experience in design, repairing works, mounting and exploitation of the tanks;
- results from the inspections of steel tanks;
- data obtained from the failures of steel tanks.

Referring the co-ordination of the Bulgarian and end European Union laws the author focused its attention on the last editions of the European standards in this field - EN 1993-4-2 и EN 14015:2004. After its admission as Bulgarian National Standards all steel tanks must be designed in accordance with its prescriptions and requirements.

On the other hand, the tanks which are in service now, are designed following another conception, standards and methodology. The author signed particular parts of them because of following reasons:

- to facilitate the transfer from the old Russian standards to new European ones;
- to compare the Russian and European methodology for tank's design and the calculated through them results;
- to aid the assessment of the conditions of tanks in service. In order to make a correct assessment of the real conditions of tanks and internal processes, we need to know design basis, rules and tradition according to which the tanks have been designed.

A minimum of requirements for safety and constructive integrity of new built tanks have been mentioned in this thesis. The mentioned here requirements are limited to the following elements:

Foundation construction, bottom, shell, roof, stair, platforms and handrails, attached assistant technological equipment and nozzles till faces of first flange.

The shared here ideas and scientific researches , obtained results and analyses can help the students specialty "Structural Engineering" in UACG, Sofia as well as the organization which:

- prepare documentations for design of new built tanks;
- produce and/or mount tank's construction;
- prepare documentations for design or repairing works, changes and reconstruction of the tanks;
- execute repairing works, changes and reconstruction of the tanks in service.

CONCLUSION

The steel tanks are engineer facilities which must be safety and reliable, and which work almost incessantly under maximum exploitation loads. The destruction of such a facility brings big material, ecological, technological and financial loss. Due to this reason to guarantee more safety of products storage and to prevent failures is a trend in all developed countries.

The intensive development of tank's construction in Bulgaria and abroad, and experience gained from tanks failure, help us to make a conclusion that tanks designed and constructed according to increased requirements for their endurance and exploitation safety are not perfect and supplementary researches are needed in the stages of design, construction and exploitation.

The tanks designed according to the last achievement of science and practice can be damaged and can be destructed due to action or the lack of action during the exploitation.

To increase tank safety we need to undertake different by their type but connected between themselves organizational, technological, constructive and chemical activities

To assure the steel tanks reliability during their exploitation is connected with:

- incessant extension of knowledge for real work of sheets construction and introducing the last achievement of science and practice;
- control on the quality of producing and mounting operations, necessary for tanks building;
- the devices mounted on the tanks must have high level of precision and sefety;
- periodical activities for outside, partial and entire tanks inspection for assessment of their real condition;
- expert assessment of the results obtained during the inspection;
- determination of remaining resource and admissible regime of exploitation of steel vertical tanks;
- execution of necessary repairing works of tanks or stop their exploitation if necessary;
- incessant training of all participants in design, producing, mounting, exploitation, inspection and repairing works of the tanks .

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