Quantitative and qualitative study on the state of stresses and strains of the strength structure of a crane bridge

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Abstract: - In heavy-duty material handling equipment, major concern is optimum utilization of material for equipment construction without sacrificing the design parameters. To understand this aspect and also to validate the design, as this kind of equipment are vital part of any manufacturing industry, finite element analysis is one of the best method that can be used extensively. This paper work provides a modeling of the structural strength of a crane bridge, in operation for 15 years in the continuous casting department of a steel plant. Due to the importance of the cranes bridge within the technological processes in which they are involved, either from the point of view of steel consumption or functionality, their resistance calculation, during the design phase and after a certain operation period, constitutes a permanent field of investigation which aims a faithful schematization to be used in further modeling, appropriate for our target.

Modeling will be done with the aid of a COSMOS/M software in two numerical variants using beam3 and shell 3 type finite element. This paper work is meant for checking out the limit state of the structure subject to normal operation, which involved the evaluation of its reaction while under working in terms of quantity and quality. In quantitative terms, we have revealed that the structure had reserves of strength; qualitatively speaking it had confirmed the validity of modeling.

Key-Words: - crane bridge, modeling, strength, structure, finite elements, shell.

1 Introduction

The proceedings used to calculate the cranes bridge strength structures are influenced by the evolution of the optimization concept. The difficulties of the practical use of the deterministic and probabilistic concepts, mentioned in the studies regarding the calculation methods of the strength structures [7], [8], justify the application of the semi probabilistic optimization concept, with its afferent calculation method: the limit state method. Within this calculation method, the determination of the bearing capacity of the structure elements is based on the differentiated safety factors.

The concepts and notions that the calculation method are defined by the norms [11], [12]. The method resides in providing the reasonable elements and the strength structures referring to the limit states who involve either loosing the feature of providing the use conditions or enabling some possible damage for people or goods [4], [8].

According to [4], [8], the limit resistance states are divided into two categories:

- final use limit states (they reach the highest values of the bearing capacity);
- normal use limit states (if the equipments reach these limits, they might damage the working of the equipment or of an element).

If we are able to define the two states, then we are able to calculate the strength structures during the designing and the working, [8].

This situation is explained by the current trend in the calculation of strength structures which is designed to complete coverage of all factors involved in their behavior while in service, in order to ensure the most efficient solutions in terms of strength, durability, and savings. In both situations you need to have a physical and mathematical modeling as accurate as possible. Most of the time, the strength structures who have not been statically determined, cut to the right sized, and checked out by the classic methods of the material strength cause the over sizing, because specialists use approximate measurements in order to decrease the number of mathematical calculation. There are many published