

Summary of the habilitation thesis

STUDIES AND RESEARCHES REGARDING THE INCREASE OF THE TECHNICAL PERFORMANCE OF THE EQUIPMENT FROM THE PETROLEUM INDUSTRY

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The habilitation thesis entitled **STUDIES AND RESEARCH REGARDING INCREASE OF THE TECHNICAL PERFORMANCES OF THE PETROLEUM INDUSTRY EQUIPMENTS** presents the author's contributions in the field of theoretical, experimental and applicative researches obtained after acquiring of the PH.D. in 1994.

The paper is structured on three sections.

The first section, titled "*Scientific and Professional Achievements*", is divided into three chapters, namely studies and researches on die-tubular material modelling, experimental researches of the threaded joint of the drill string and engineering applications on modelling, simulation and process management Technological machining and assembly.

Chapter 1, entitled *Studies and researches on tubular die-material contact modelling*, presents a method for the geometric dimensioning of multidimensional tongs.

Multidimensional tongs are maneuver tools used for the screwing and unscrewing the tubular material: drill-pipes, casings, tubing, assembling reductions etc.

The design and testing of the multidimensional tongs, used for the screwing and unscrewing operations of the connections of the tubular material used in

drilling works, is needed for all working situations (all the tipodimensions of the tubular material on which it operates), the working positions (the assemblies and the relative orientations of the components) and the strain system (the external forces and the reactions in the contact zones of the die with the tubular material).

Accomplishing these needs means going through the following stages:

- the geometrical dimensioning of the tongs - consists in establishing the fastening interval, the minimum number of the articulate jaws and its constructional form as well as the relative positions of the elements;

- the functional dimensioning - consists in the technology of the fastening couple (unscrewing);

- the resistance dimensioning - consists in materializing the components of the tongs (jaws, shutter, linking bolt etc.).

Based on the working model presented, it establishes from the simulation of the working multidimensional tongs, the requirements and the restrictions which are posed in the working phases and the realization of the analytic model of the working situation by validation of the solutions proposed, based on a calculus algorithm. The analytic model proposed allowed constructive improvements of the tongs' elements in order to achieve the working condition at the specified working parameters (torque prescribed in the function of the tubular material diameter)

Simulating the operation of the multidimensional tong based on the proposed analysis model eliminates a number of costly experimental tests.

Following, it passes to the tribomodulation of the die tubular material. It presents the modulation of the phenomes which influences the right function of the multidimensional drilling tongs, by studying and experimental research of the factors that occur at the tubular die-element contact, factors referring mainly to the torque moment.

The methodology for realizing the study of the influential factors and tests includes the following phases: establishing the influential factors (external, constructive and interactional) determining the calculation pattern, making the test stand, conducting the tests, establishing the criterion of administrations of the

results obtained on the basis of limit conditions by triggering the phenome of friction at the contact of die tubular material

The researches made have determined the possibility of establishing the functional tongs depend on the application system, the actual working conditions and the characteristics of the contact between the die and the tubular material.

Chapter 2 named „Experimental Researches of Bolted Threaded Joints of the Drilling Seals, aimed to establish as a main target, based on the normative API, the conditions of appropriate operation of the threaded connections used for the assembly of the tubular material.

For assembly of the drilling pipes it uses the threaded joints made of an assembly of two conical elements threaded (pin and plug) which assures the tightness, transmittion of the torque moment and the axial force, and taking the bending moments appeared in the time of drilling operations. Those needs to assure the fast screwing and unscrewing and the safe assembly and disassembly of them in the maneuvering operations time. Ensuring those requirements are achieved by using tapered shoulder threads with a large step and a bisector of the profile angle perpendicular to the thread axis.

The variation moment of screwing during the assembly process of a threaded joint is influenced by a number of factors such as: the geometric shape of the joint, the rotational speed, the functional characteristics of the test machine, etc.

Those factors can influence positively or negatively the correct tightening and the right sealing of the joint. Those influences can be determined by correctly interpreting the screwing diagram, in coordinate torsional moment - rotation (the angle of rotation of the tubular material).

Chapter 3 entitled *Engineering Applications for Modelling, Simulation and Management of Processes of Mechanical Machining and Assembly Processes*. In this chapter, the author of the habilitation thesis intends to present some engineering applications regarding the modelling, simulation and conduction of the technological processes of mechanical machining and assembly, with the following themes: technological particularities in the manufacture of the shunting shaft;

Method for drawing the theoretical diagram of precision of mechanical processing;
Studies and researches on wear of cutting tools made of sintered metal carbides.

Section two contains "Career Development and Career Development Plans".

The third section of the habilitation thesis entitled „Bibliography” is consecrated presenting the resources which the paper cites, with an important contribution to personal papers.