



2ND WORKSHOP ON APPLIED AND SUSTAINABLE ENGINEERING MEASURING APPARATUS LOCATED IN UNCONVENTIONAL HYDROJETTING TECHNOLOGY CENTER

Jozef A. Borkowski, Michał Bielecki, Marzena Sutowska, Monika Szada-Borzyszkowska, Unconventional HydroJetting Technology Center, Koszalin University of Technology, Poland

Wiesław Szada-Borzyszkowski, Faculty of Wood Processing Industry in Szczecinek, Koszalin University of Technology, Poland

GENERAL INFORMATION

The Unconventional Hydrojetting Technology Center (CNTH) was formed in 1.06.2006 on The Koszalin University of Technology as the separated posefaculty science unit. Integration of economy and science environment through creating science-research grids and supporting interdisciplinary activities in aid of hydrojetting technology development determines the principal aim of The Unconventional HydroJetting Center which helps to create content-related and innovative back-up facilities in range of high-pressure water jet utilization. The CNTH's operations are adjust for international activities however in the first place we offer our competences to polish institutions, companies and organizations.

The real beginning of activities in field of hydrojetting technology in Koszalin dates back to 1987 when prof. Jozef Borkowski formed one of the first in Poland half private research-science institution: BORTEX Hydroabrasive Comp. Ltd.. This company was equipped with set of high-pressure technological devices which made up the full cutting system - Streamline Hydroabrasive - produced by American Company Ingersoll-Rand. The main aim of statutory activity of BORTEX was promotion of technological progress in field of hydrojetting processing but especially popularization of high-pressure abrasive water jet cutting technology.

Dominant subject area of research activities of this Center was hydrojetting erosion caused by high-energetic water jet, with mono- and multiphase structure, showing especially among other things in theoretical study of erosion basis which was caused by high-pressure abrasive-waterjet assisted by cavitation development and cryogenic application controll. Knowing mechanisms deciding about high-pressure water jet erosion helped in working out effective method of forming abrasive slurry jet and taking up study over high-pressure abrasive-water stream with lower pressure application, including microprocessing realized according to analogical MicroBorJet system, as well as processing with originally worked out various kinds of high-pressure ice-water and hybrid jet: abrasive-water-ice jet (CO 2).

The Unconventional HydroJetting Technology Center is presently unique in the world and the only one in Poland research institution dealing with basic and research studies, aiming to complex utilization of high-pressure waterjet as versatile erosion tool. Principal objective of this Center is transfer of the newest world's technologies utilizing high-pressure waterjet energy and leading studies over hydrojetting technologies and integration of science sphere and economy through innovative creating in aid of hydrojetting technology development and their practical applications. The Center's activities are adjust on international activity but in first place we offer our service to the polish institutions and organizations, especially small and medium companies.

Currently The Unconventional HydroJetting Technology Center owns several complete pump units and high-pressure hydromonitors with solid technological fittings, mostly made in Germany, Japan and America. Those devices were built to realize determinate technological processes including original BorJet and MicroBorJet systems used to slurry jet cutting and many others connected with it research stations. Center possesses also specialist investigative and measuring apparatus as well as apparatus used to evaluation of processed surfaces such as complex three-dimensional surface analyzer Talysurf CLI 2000, Taylor-Hobson.

MEASURING INSTRUMENTS TO SPECIALIST STUDIES

Surface structure measurements

• Talysurf CLI 2000 Taylor Hobson is technologically advanced (3D) profilograph equipped with four measuring gauges utilizing three different measuring methods using: CLA, laser and inductive gauge. Some of the advantages of this kind of measurement: high accuracy and reflection speed of real studied surface in "cyber surface" of computer memory. Thanks to specialist software TalyMap Universal obtained dates can be variously processed visualizing and pulling out essential geometric surface structure (GSS) properties. Sample's surface with 200x200x200 mm dimensions and 15 kg mass can be measured using such profilograph. Profile mapping accuracy average: for laser gauge, in vertical axis, less than 1 pm with 10 mm range, for inductive gauge 2 nm with 2,5 mm range.



Microscopic research

Scanning, electron microscope Quanta 200 Mark II, except work courses conventional (high vacuum) and low vacuum, offers also possibilities of observation of optional type preparation in vacuum regime ESEM™. Electron optics provide resolution above 3 nm, range of sharpness setting 3-5-99 mm, magnification 6-M000000x. Moreover X-ray system of EDS Genesis XM 2i spectrometer enables precise accuracy and quantitative analysis of chemical composition in chosen micro areas.



Particle size measurement

Laser particle sizer type Analysette 22 MicroTec plus two semiconductor lasers (green / IR) is provided with an inverted optical system, a Fourier for automatic adjustment of both laser beams and modern detector of the scattered light (2 segments, 57 elements) that allows identification of up to 108 classes of particle size. Modern software taking into account the complete calculation of the Mie theory and Fraunhofer allow you to perform high-speed measurement of wet particle size of 0.08 - 2000µm.



Image recording

Camera fast Phantom V 12.1 production of Vision Research Inc. with a rate of 1 million frames per second with a resolution of 1280 x 800 pixels at a sensitivity of 6400 ISO / ASA, with a minimum exposure time (tripping the shutter): 300 ns, with automatic exposure control and image registration by schemes Pre-trigger and post-trigger with a capacity of 16 GB RAM internal memory.



The digital camera to a TV monitor pipelines Supervision ModularMainlineSystem production iPEK Special-TV consisting of a steerable truck type SVR 95 and include a rotary-tilt color camera TV Supervision 513-0900-00 type SVC 110 CCD with 440 000 pixels, cable wound in a semi-automatic winder Supervision 508-0900-01 type SVA 500 combined with sound control and recording. Multi-purpose systems for television cameras to monitor pipelines according to the analog control system: a set of Comfort production RICO-EAB and a set of focused on small camera KS 40 SW production Braunmann

SUMMARY

The Unconventional HydroJetting Technology Center (CNTH) is the research-science unit with european statut of Center of Advanced Technologies obtained within framework of consortium RIMAMI.

CNTH is the only one such unit in Poland dealing with the complet science and technology issue concerning with water jet. The Center assures:

The newest hydrojetting Technologies.

Twenty year of experience.

Highly qualified personnel.

Realization of research projects on the highest level.

World-class fleet of machinery and measurement equipment.