TIS WÚ KOŠICE A



INTRODUCTION

Since the 80s of the last century, ZTS VVÚ KOŠICE a.s. have been continuously contributing to the development of robotics in Slovakia. They were pioneers mainly in the field of heavy duty robotics, teleoperators, telerobotics and induction controlled robotic vehicles (AGVs). They later extended their activities into the filed of specialized robots for nuclear power plants, for anti-terrorist combat, and for precise handling in nuclear research.

It is important to note that all robots and teleoperators supplied by ZTS VVÚ KOŠICE a.s. are being employed in demanding, life or health threatening conditions. These include high temperature, dustiness, contaminated liquids or radioactivity.

In the process of finding ways to tackle these extreme conditions, top-level experts have grown up in the company, both in the field of machinery and electronics and in the development of software.









Heavy duty hydraulic teleoperators THT

Manipulators with rated load capacity from 500 to 5000 kg, with "Master-Slave" type control. Noise-proofed, airconditioned operator cabin. They are used for handling heavy loads or tooling in foundries, forging plants, metallurgical plants, etc.

In recent years THT have been supplied to MEZ Vsetín, Vítkovice, Zetor Brno.



Heavy duty hydraulic teleoperator THT 500

Heavy duty column robots TSM

Column manipulators with rated load capacity between 200 and 5000 kg, operating in cylindrical coordinates, controlled in 2 to 5 axes.

Two robots were recently supplied to NPP Temelín.



Heavy duty column robot TSM 500

Robots for nuclear power plants - Type MT-A

The unique design concept of these robots was ruled by the demanding application conditions in radioactive environment with necessity of subsequent decontamination.

The manipulator has 6 degrees of freedom, rated load capacity 80 kg and hydraulic drive applied without exterior hoses, with distribution inside the manipulator arms.

The hybrid control system includes a "Master-Slave" system, initial demonstration system as well as a robotic system with wide comfort of adaptivity to the environment based on a dynamic model.

Two recently supplied MT80s are employed at SE-VYZ Jaslovské Bohunice.









MT 15 for fragmentation

MT 15 for decontamination

MT 80 manipulation arm

Hot chamber dual-arm manipulator

Manipulator type TSR-500 is a universal application for handling objects of various dimensions, various physical properties and for handling materials with high radioactivity level.



SORTIMENT DODÁVANÝCH ROBOTICKÝCH SYSTÉMOV

Kalorobot K-1/Kalochod







Evaporator Dismantling and Fragmentation

Prior to starting with the fragmentation of the piping it was necessary to take samples of the medium inside it in order to decide about the manner of the subsequent decontamination and handling of the fragments. The next step was the fragmentation of the insulated piping situated between the front wall (with the technological opening) and the evaporator by cutting it with a reciprocating saw into lengths of approx. 400 mm. Some of pipes were cut by hydraulic shears.

When the connecting rods and pipes were removed from the space between the wall with the technological opening and the evaporator and the space was empty, enabling better manoeuvring possibilities for the MT80, dismantling and fragmentation of the evaporator could begin, starting from the front (accessible) section in the following order:

- Insulation sheathing front section
- Cover and jacket front section
- Wash water and pulp piping –interior section
- Cover and jacket rear section
- Insulation sheathing rear section
- Pedestal location of the heating element
- Heating element





Mobile teleoperators

This category has seen most marked development - from heavy duty tracked manipulators applied in forging plants and for burning slab defects, through teleoperator MT-15 "Terier" on tracked chassis employed at NPP Jaslovske Bohunice as a first impact reconnaissance means capable of analysing the type and level of contamination and at the same time carrying out operations necessary for emergency elimination of the problem situation, up to the latest addition into the family – mobile teleoperator "Scorpio" with only 136 mm height, capable of finding and disposing of (water canon) IEDs placed in the chassis of even the lowest passenger cars. The first and also successful employment of "Scorpio" was within the security operations for the Bush-Putin summit in Bratislava, where its original construction aroused the interest of American specialists.



Mobile teleoperator MT-15



Mobile miniteleoperator "Scorpio"

Mobile teleoperators

Next in line was the mobile robot "Retriever" designed for checking the interiors of aircraft, trains, buses, etc., with the aim of inspecting objects placed inside and detecting possible explosives.

Mobile robot Retriever-TT (track and telescopic) is a modification of the original wheeled Retriever robot. It has a tracked chassis and telescopic second arm.



Retriever-TT (track and telescopic)

Mobile robot "Retriever"

Mobile Robotic KIT

It is designed for the development of applications for autonomous robotic systems based on data obtained from sensors, cameras, and GPS.









Robotic vehicles

Robotic systems employed in in-plant logistics for the supply of input material, for inter-operational transfer of semi-finished products and for transfer of finished products to the warehouse, known as AGVs (Automatic Guided Vehicles). The systems usually consist of 5 to 20 trucks which are characterized by constantly increasing level of adaptivity. They can be induction or laser guided.



Robotic vehicle for in-plant logistics



Modification of robotic vehicle





Robotic Transfer and Positioning System

The European level of robotic equipment from ZTS VVÚ KOŠICE a.s. was also confirmed by winning the international tender (participated by 77 companies) for the supply of four robotic system sets for precise positioning of cryomagnets in the LHC project at CERN Geneva.

The load capacity of each set is 37 000 kg, trajectory accuracy +/-0,1 mm. The satisfaction of CERN with the supplied equipment was confirmed by the order of a fifth set and the subsequent award of the **"GOLDEN HADRON**, plaque to the company as the best supplier to CERN for 2005.



Robotic system for precise positioning of cryomagnets

Actuating System for Cryomagnet Triplets Positioning

The following project –Actuating System for Cryomagnet Triplets Positioning at LHC. 134 actuators and electronic systems were delivered in 2008 for optimisation of hadrons collision efficiency via precise aiming of the beam in last 3 magnets at the level of +/- 0.01mm.







134 positioning systems at LHC project in CERN

Actuating system for precise positioning

And again Actuating system for precise positioning but this time for the prototype of new CLIC project where positioning of the girder with load has to be carried out with tolerance of **+/-0.0005mm**. Two versions were ordered – linear and cam type. During tests in 2011 both of them showed excellent results.







Robotic system for precise positioning of cryomagnets

Supporting system for the RF-structures positioning and stabilisation in CLIC two beam prototype modules of CLEX

The latest challenge – Complete Supporting system for the RF-structures positioning and stabilisation in CLIC two beam prototype modules of CLEX. Precision again **+/-0.0005mm**. Finalisation is expected in March 2013.

So, fingers crossed.





Supporting system with precise robotic positioning in CLIC – CLEX project

7. FP Projects and Fields of Interest for H2020

Robots as autonomous mobile agents

Objectives:

- autonomous, cognitive behavior in unknown environment
- contextual thinking and strategic planning of work
- understanding of the objects, events and processes in the environment
- collective work of multiple robots on a single mission
- automatic replanning
- precise intelligent drives, with increased power density







FURBOT



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