



Introductory Lecture

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The purpose of the Congress "Mechanised Tunnelling: Challenging Case Histories" is to launch the 2005-06 Master Course which is supported by ITA/AITES.

The International Tunnelling Association (ITA-AITES), having recognised that the didactic programme of the 2003-2004 Master Course, which is at present under way, has been well organised, has decided to directly support the new edition which will yet again be held at the Politecnico di Torino.

The new 2005-2006 edition will be held in English to allow students from different countries to attend the course. Experts involved in the carrying out and management of excavation using full-face machines and work sites is increasing. The special qualifications that are necessary for these roles cannot be supplied in the shorter University courses.

The Master Course in fact will involve 400-450 hours of face-to-face lessons and at least 3 months of an on site *stage*.

A scheme of the subjects that will be developed in the new course is here synthetically described.

The reason why we decided to carry out this Course lies in the fact that the future of tunnel construction is surely in mechanised excavation: guarantees of safety, quickness and reduction of the costs, all make up the qualification elements of this construction methodology.

The increasing use of mechanised tunnel excavation to new and very different environments leads to new and interesting study, application, technological development and control motives.

The Congress guidelines concern all the frontier aspects of mechanised excavation, that is, all aspects, whether geomechanical or managerial, that have been practically dealt with in recent works and which, because of their particularity, constitute a milestone in the development of this activity.

The Congress will in fact focus on the performance of TBMs and not only on the description of tunnel works in order to show how mechanical equipment has responded to design predictions.

In order to coordinate the scientific format of the papers, the speakers are requested to also emphasise certain aspects, such as:

- preliminary geological knowledge (whether sufficient or not)
- geological risk sharing criteria between the owner and the contractor when boring with TBMs
- details on the selection of TBM equipment
- technical and practical countermeasures in the case of difficult excavation conditions
- evaluation of TBM performances in the case of difficult excavation conditions
- evaluation of TBM performances and innovation against further errors
- the influence of the transportation system of the excavated material on the performances

- the influence of the cost of a TBM on its selection
- the influence of site logistics on TBM performances
- the influence of the management of the personnel on the “learning curve” and therefore on TBM performances
- the importance of the “Availability Factor” on the evaluation of TBM performances
- what are the residual responsibilities of the TBM manufacturer and what should the criteria of risk sharing be?

In conclusion, it will be interesting to analyse the main lines of development of the machines, which will follow four principal directions:

- 1) GIGANTISM: increasingly larger machines to reduce the number of tunnels and to increase the “performances” of the tunnels in that: the number of lanes is increasing in tunnels and “multipurpose” tunnels are being excavated with the creation of refuges and shelters for emergency situations;
- 2) EASY TO INSTALL, TO DISMOUNT AND TO TRANSPORT MACHINES to make it easier to transport them from one site to another so as to extend their use for short tunnels;
- 3) MACHINES THAT ARE ABLE TO WORK IN MIXED FACE CONDITIONS (faults, tectonic contacts, karst) and DUAL MACHINES (i.e. HR/EPB or EPB/SS) that are able to bore long stretches of tunnels in very different “geo” formations;
- 4) INCREASE IN THE COUNTERPRESSURE AT THE FACE that the machines are able to exert in order to pass increasingly deep water tables.

As already mentioned in the list of special factors that contribute to the success of tunnel excavation using TBMs, the most recent excavation works have yet again highlighted that the human factor plays a significant role in the performance of a site with boring machines. Long high level integrated specialisation preparation courses are therefore necessary which neither the companies nor the producer of machines can autonomously arrange: a response to this request that has proved satisfactory is the University Master Course held at the Politecnico di Torino which will become an international course with the fifth 2005-2006 cycle.

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**POST GRADUATE MASTER COURSE ON
“TUNNELLING AND TUNNEL BORING MACHINE”
FIFTH CYCLE (2005-2006)**

Course	credits
GENERAL TUNNELLING ASPECTS	12
“GEO” INVESTIGATIONS AND ROCK MASS CHARACTERIZATION	
CONVENTIONAL TUNNELLING (D & B) <ul style="list-style-type: none"> • Tunnelling Methods • Rock Support Design • Ground Reinforcing / Treatments 	
FULL FACE MECHANIZED TUNNELLING <ul style="list-style-type: none"> • General aspects of bored tunnelling • Design of bored tunnels • Selection of equipment • Hard rock tunnelling • Soft soil tunnelling • Tunnelling in mixed ground conditions: <ul style="list-style-type: none"> – mixed face TBMs – dual TBMs • Construction management of bored tunnel machinery and equipment • Risk assessment • Ground & Surface monitoring in Urban Environments • Microtunnelling 	28
SELECTION OF TUNNELLING METHOD	8
CONTRACTUAL ASPECTS AND REGULATIONS	
SAFETY	
ENVIRONMENTAL ISSUES IN BORED TUNNELS	
GEOGRAPHICAL ASPECTS OF MECHANIZED TUNNELLING	
Technical visits + stage	21
Degree thesis work	7
TOTAL CREDITS	76