18th Industrial Summer School

9 - 13 July 2007, Woodbury Park, Exeter, United Kingdom

The main task of any engineer, planner and manager is to make decisions. At every stage and every level in the machine life, they have to make a single choice decision from a number of alternatives courses of action presented.

Some decisions benefit reliability, but at the same time increase cost. Others reduce the cost reduce maintainability and availability, or increase Not-Fault-Found rate or Turn-Around-Cycle, for example. Daily engineers and managers strive for decisions that will enhance both the in-service performance and cost benefit of their projects. Hence, there is always a trade-off to be made between designer's "ideals" and machine's in-service reality.

With the continuous increase in complexity of modern machines and technologies, relying solely on the innate ability of designers and project managers to make critical decisions has become ineffective. Perhaps the main reason is that is the presence of uncertainty, as whenever a decision is made it will only affect what is to happen in the future. So the designers, managers and planners are always considering predicting the future consequences of their current decisions.

The aim of the Summer School is to equip the decision-maker with knowledge of existing methods for predictions of in-service reliability, cost and effectiveness, used from the conceptual design stage to the day-to-day-running of the machine, or fleet of machines.

Analytical and Simulation Methods for the Prediction of

Machine In-Service Reliability Cost Effectiveness

Used by many understood by a few
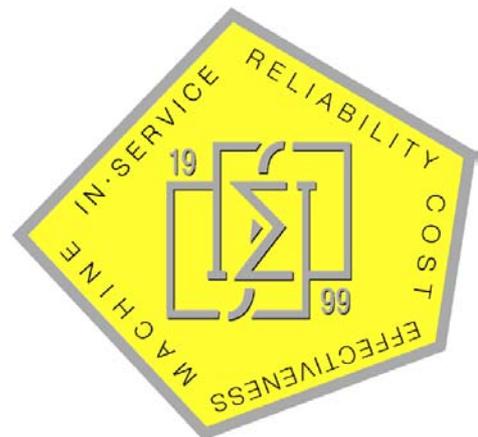
MIRCE Akademy

Engineering Design Alternatives
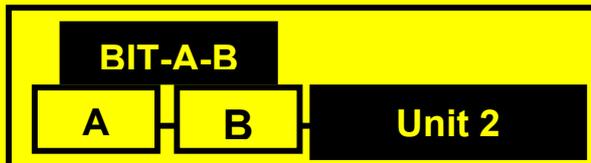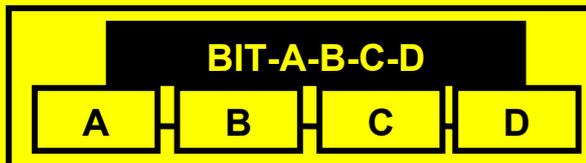
- Which is the best solution for the given design requirements and budget, why and by who much?

- Would you have chosen the same alternative, for example, for Nigeria and Siberia?

- Would you have chosen the same alternative, for example, for Siberia in summer and winter?

The participants of the Summer School will:

- Gain an appreciation of the power and place of prediction methods in support of engineering design and in-service management decision-making processes.
- Come to understand which method should be applied and when, as well as the level of efforts required for it.
- Gain an understanding how the methods can be used, in principle, through **Hands-on** case studies used (see above picture), without need for the extensive knowledge of statistics and probability theory.

The Summer School host is Dr Jezdimir Knezevic, the Founder and President of the Akademy. He is well known to thousands of practising engineers and managers that attended his courses and programmes in over 40 countries on all five "in-service" continents. His passion for the subject helps students to overcome the fear of maths and help them to be what they are, good engineers, planners and project managers.

Summer School Programme

Day 1:
- Concept of Machine Life
- Concept of Failure Event/Process
- Concept of Maintenance Tasks and Policies
- Concept of Support Tasks and Strategies
- Concept of the Duration of:
  - Functionable Life, also known as Time To Failure, TTF
  - Maintenance Task, also known as Time To Repair, TTR
  - Support Event, also known as Logistics Delay Time, TTS
- Concept of In-service Cost (operation, maintenance and support)
- Concept of In-service Effectiveness (Availability, Throughput, ..., etc.)

Day 2: Overview of **Statistical Methods** for the calculation of In-service Reliability, Cost and Effectiveness figures of merit based on the historical data for the following statistics:

- **Mean Time Between**
  - Failure Events
  - Maintenance-Failure Events
  - Support-Maintenance-Failure Events
- **Mean Number of:**
  - Failure Events
  - Maintenance-Failure Events
  - Support-Maintenance-Failure Events
- **Mean In-service:**
  - Operational Cost
  - Maintenance Cost
  - Support Cost
- **Mean In-service Reliability**
- **Mean In-service Availability**

Each participant will calculate the above listed measures of the machine in-service performance using the data provided. EXCEL will be used as a "number crunching tool".

Day 3: Overview of Analytical Methods for the prediction of In-service Reliability, Cost & Effectiveness figures of merit based on the predicted data for components, design configuration, operational scenario, maintenance and support plan, for the following statistics:

- **Expected Time Between**:
  - Failure Events
  - Maintenance-Failure Events
- Support-Maintenance-Failure Events

- **Expected Number of:**
  - Failure Events
  - Maintenance-Failure Events
  - Support-Maintenance-Failure Events
- **Expected In-service:**
  - Operational Cost
  - Maintenance Cost
  - Support Cost
- **Expected In-service Reliability**
- **Expected In-service Availability**

Each participant will calculate the above listed measures of the machine in-service performance using the data provided. EXCEL will be used as a "number crunching tool".

Advantages, disadvantages and limitations of the analytical methods will be presented and discussed with the participants.

Day 4: Overview of the Monte Carlo Simulation Methods for the prediction of In-service Reliability, Cost & Effectiveness figures of merit based on the predicted data for components, and given design configuration, operational scenario, maintenance and support plan for the following statistics:

- **Expected Time Between**
  - Failure Events
  - Maintenance-Failure Events
  - Support-Maintenance-Failure Events
- **Expected Number of:**
  - Failure Events
  - Maintenance-Failure Events
  - Support-Maintenance-Failure Events
- **Expected In-service:**
  - Operational Cost
  - Maintenance Cost
  - Support Cost
- **Expected In-service Reliability**
- **Expected In-service Availability**

Advantages, disadvantages and limitations of the Monte Carlo simulation methods will be presented and discussed with the participants.

Each participant will calculate the above listed measures of the machine in-service performance using the data provided. EXCEL will be used as a "number crunching tool".

Day 5: Participants will be divided into groups to practically apply the knowledge gained through a case study. It addresses several design alternatives, of the future machine regarding:

- Machine Architecture
- Engineering configurations
- Maintenance policies
- Support strategies

The purpose of the analysis is to determine the best solution of the future in cases where the optimisation criteria are, some of or the combination of, the following:

- **Maximum:**
- MTBF
- In-service Reliability
- In-service Availability
- **Minimum:**
- Number of Failures
- Time out of Service
- Whole Life Cost/LCC

At the end of the Summer School participants will be able to select the best design alternative based on the objective numerical values calculated for each of them. Also, they will be in the position to arrange all of them in the order from best to the worst and to numerically define the size of their differences.

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Registration Form

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Phone +44 (0) 1395 232 653
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Email: quest@mirceakademy.com   Web site: www.mirceakademy.com

THIS FORM MAY BE PHOTOCOPIED

Summer School Prices (in GB Pounds £)			
	Fee	VAT	**Payable**
• **Participants**	1295.00	226.63	**1521.63**
• **MIRCE-Fellows**	1250.00	218.75	**1468.75**
• **MIRCE-Students**	995.00	174.13	**1169.13**

The Price includes:

- Tuition
- Supporting Materials
- Lunches
- Light Refreshments
- Summer School Dinner
- Visit to Nigel Mansell World of Racing

Value Added Tax (VAT)

Unless special exemption exists, under UK Customs and Excise regulations delegates from all countries are required to pay UK VAT @ 17.5% on all courses taking place in the UK. Non-UK delegates may be able to recover VAT incurred via the relevant tax authority in the country of origin of the delegate.

PERSONAL DETAILS (Please print clearly)

Surname _____

First name _____

Organisation _____

Department _____

Position _____

Address _____

_____

_____

Postcode _____   Country _____

Tel _____   Fax _____

E-mail _____

Special requirements   Yes ☐   No ☐

Please specify

I understand and accept the registration terms and conditions as shown

Signature _____ Date _____

PAYMENT DETAILS

☐ Please invoice my organisation
(Note: UK MOD personnel can pay by BACS through the DBA – Contractor No. will be supplied with invoice)

For the attention of _____

Purchase Order No. _____

☐ Please find enclosed a cheque for £ _____
   (made payable to MIRCE Science)

   ☐ Please charge credit card

☐ Visa   ☐ MasterCard   ☐ Amex

Cardholder _____

Card No. _____

Expiry Date _____

Cardholder's Signature _____