

# Innovative methods for training (and design) in OSH based on ICT and Virtual Reality technologies

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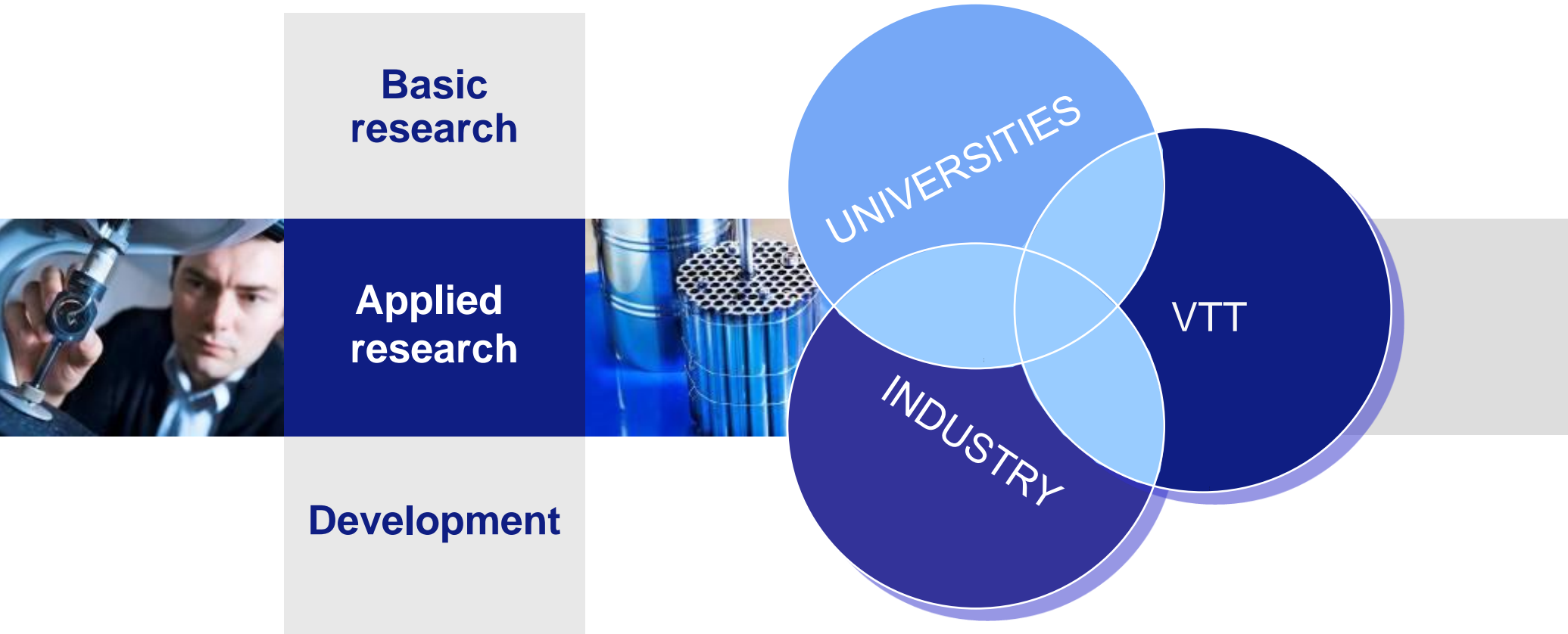
Human-Machine Interaction and Virtual Engineering

VTT Technical Research Centre of Finland

## Content of the presentation

- VTT's general presentation
- Human-Machine Interaction and Virtual Engineering teams presentation
- Innovative methods for training (and design) in OSH based on ICT and Virtual Reality technologies

## VTT's status as performer of R&D work



# VTT Technical Research Centre of Finland

## VTT IS

- the biggest multitechnological applied research organisation in Northern Europe

## VTT HAS

- polytechnic R&D covering different fields of technology from electronics to building technology
- clients and partners: industrial and business enterprises, organisations, universities and research institutes

## VTT CREATES

- new technology and science-based innovations in co-operation with domestic and foreign partners

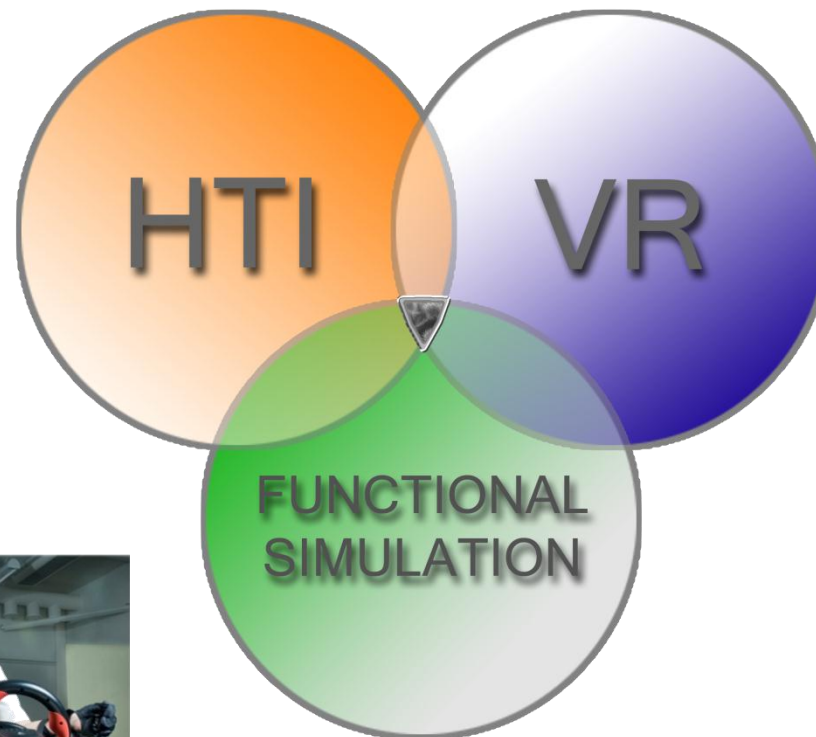
- Turnover 245 M€
- Personnel 2,700
- 77% with higher academic degree
- 6,200 customers
- Established 1942
- VTT has been granted ISO9001:2000 certificate.

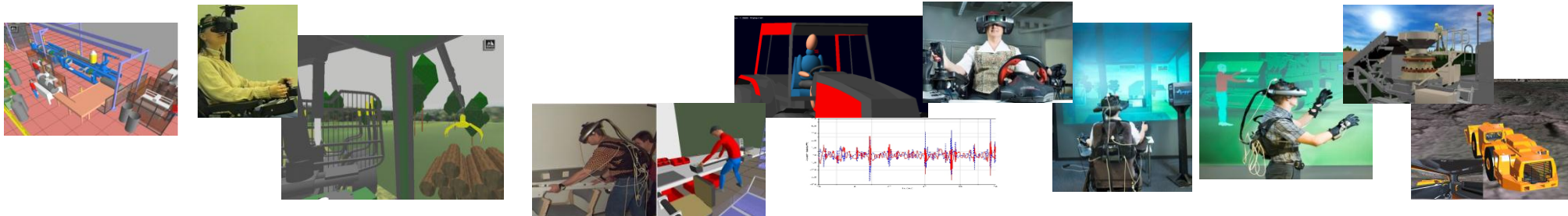
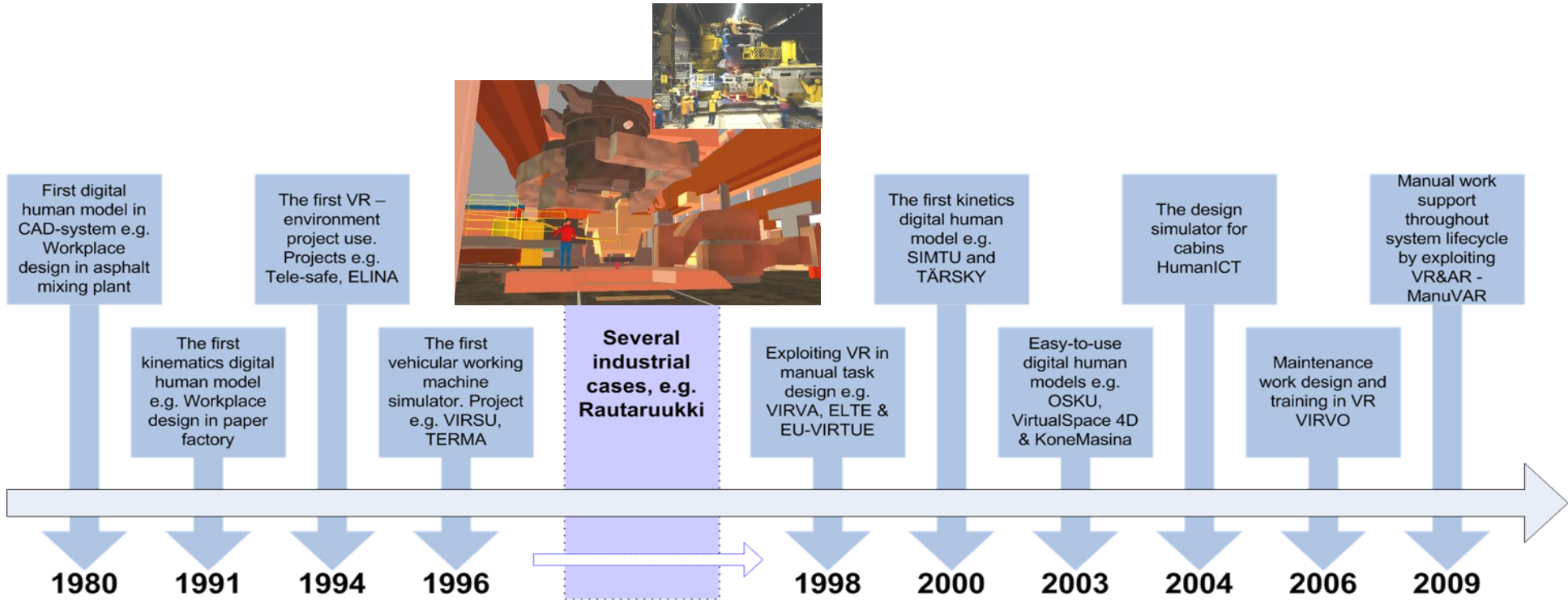
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## *Mission Statement*

Developing customers Human-Machine Systems and workplaces by utilising Virtual Environments and Functional Simulation





## Virtual Engineering Laboratory - Tampere

Powerwall: **4 x DepthQ DLP** stereo projectors

VR / Visualization: **Virtools 5.0**

Motion Capture: **Vicon T20** (10 cameras)

AR / Head Mounted Display: **eMagin Z800**

Motion Platform: **MeVEA 3DOF** (Max 500kg)

Visualization PC x 1:

- 2 x Quadro FX 5800 (NVIDIA)
- Intel Core i7 975 EE
- Corsair 6GB PC3-12800
- Asus P6T Deluxe V2
- Transcend 64GB OS HDD





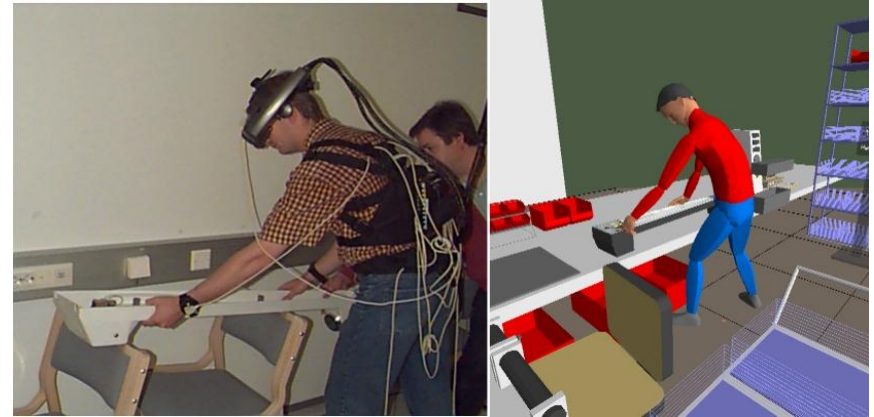
## Current Research Projects

- EU – ManuVAR – Manual work support throughout system lifecycle by exploiting virtual and augmented reality (*Coordinator*)
- EU – VR-HyperSpace - The innovative use of virtual and mixed reality to increase human comfort by changing the perception of self and space
- EU-Effisec – Efficient Integrated Security Checkpoints
- EU-Custompacker - Highly Customizable and Flexible Packaging Station for mid- to upper sized Electronic Consumer Goods using Industrial Robots
- SE-PLM – System engineering in PLM
- LEFA - New Generation Human-Centered Design Simulators for Life Cycle Efficient Mobile Machines
- COFEX - User Experience Simulator for Vehicular Working Machine
- INDUSPACE – Virtual models for industrial spaces
- ITER – DTP2 - Divertor test platform 2 in fusion reactor

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# Method to exploit VR with Participatory design and training



## Factory design and training worker to understand process (1996-1998)



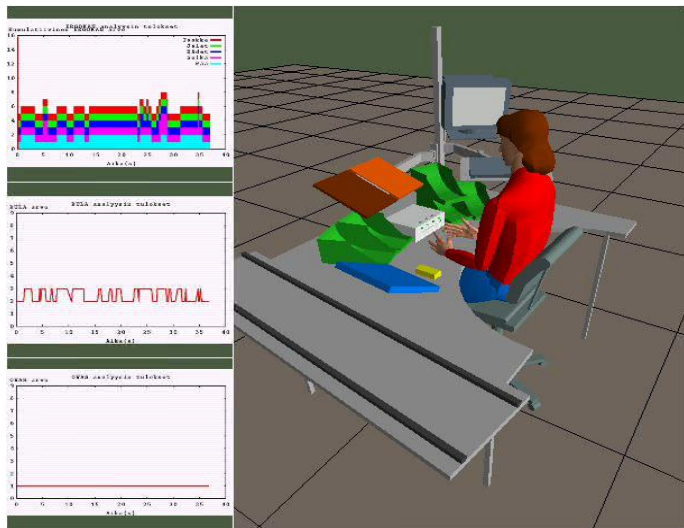
- Main findings:
  - Several mistakes in design
  - => Fixed before implementing
  - Safety work procedures
  - Training emergency situations

⇒ Estimation of saving  
200 000 €

## Work design and training in VR (1999-2002)



- Improved work tasks:
  - Safety
  - Ergonomics

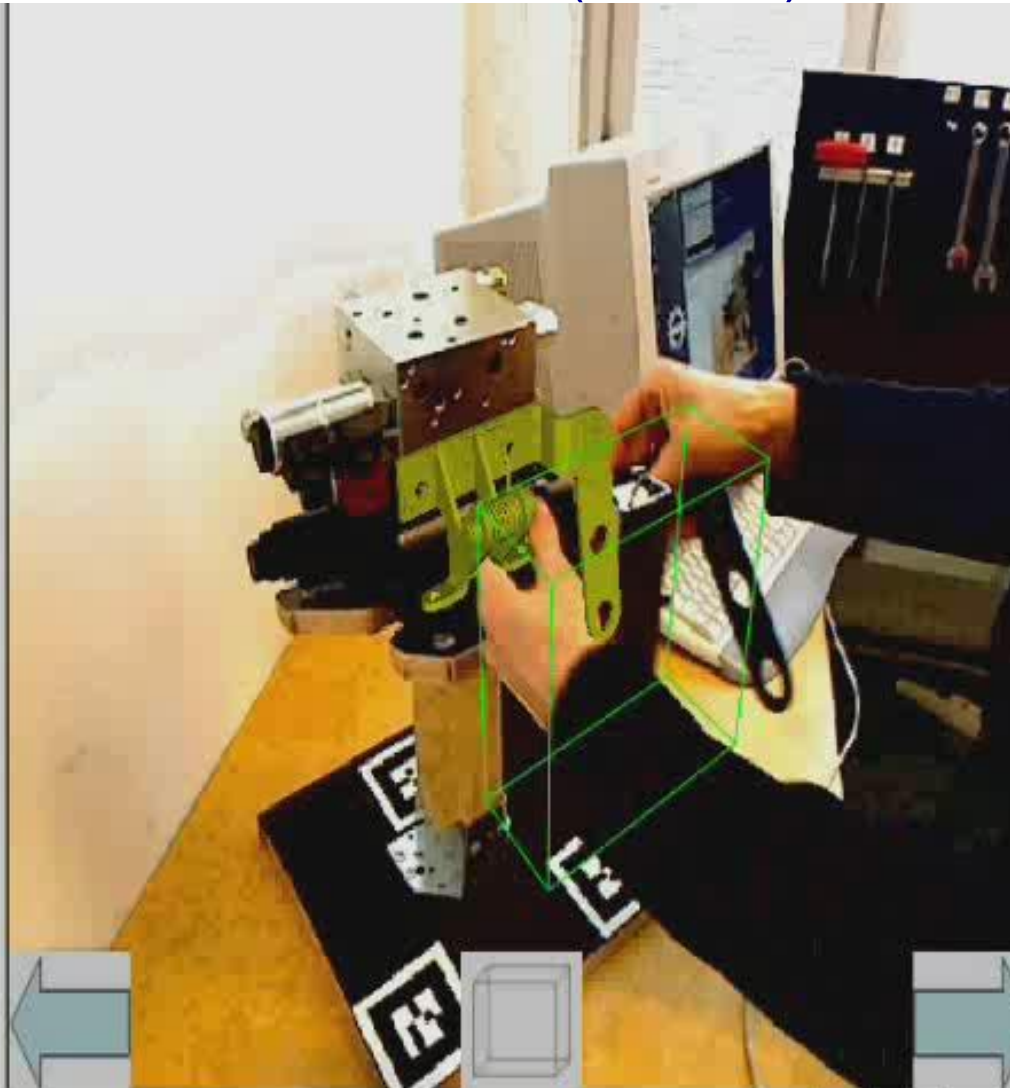


## Augmented assembly - training and support for assembly work (2007-9)

Work Phase: 13

TYÖNTÖVARREN TUKI:

Asennus liitososaan  
kiinnitys (2 kpl M10x20mm  
kuusioruuvi ja 2kpl M10 aluslevy)



- Implemented to real production line
- Less errors
- Better ergonomics
- Faster cycle-time

## Maintenance work design and training in VR (2007-10)



- Case - rock crusher
- Still confidential
- Improved maintenance work tasks:
  - Safety
  - Ergonomics
- Real benefit
  - Training maintenance procedures
  - Maintenance holes position
  - Parts re-design for better manual maintenance

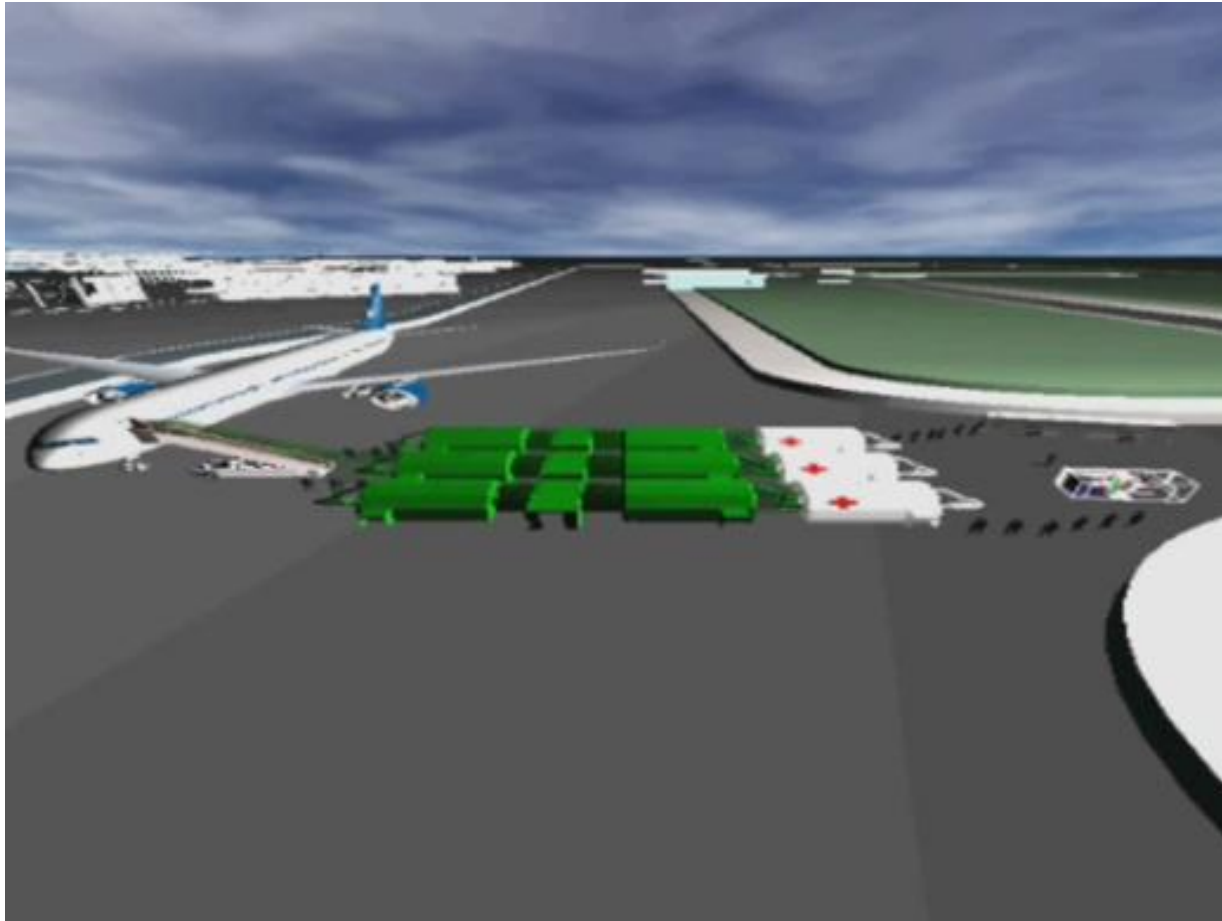
## Design and training crain operations (2009 – 11)



- Better design for:
  - Work tasks
  - Cabin layout
  - Field of view
  - Extra cameras
  - Extra displays
- Safer work sequences
- Ergonomics
- Effectiveness



## Rescue personnel training for aircraft evacuation (2009)



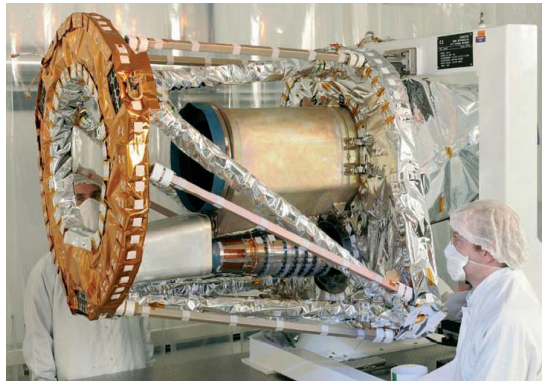
- Better understanding of situation
- Training safer procedures
- Design layout of cleaning tents

# ManuVAR – manual work support throughout system lifecycle by exploiting virtual and augmented reality

- EU FP7 NMP “Beyond lean manufacturing”
- Launched May 1, 2009
- 18 partners, 8 countries, ca. 80 participants
- VTT coordinator
- 3 years
- € 9.7M budget (~690 MM)
  - VTT’s share: € 1.7M (107 MM)



# ManuVAR cluster applications



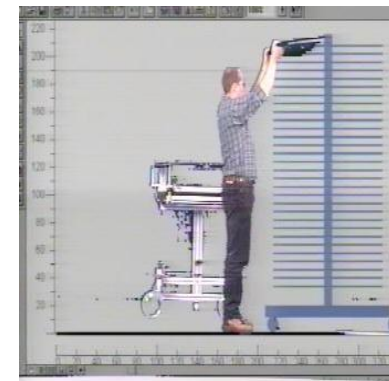
Thales Alenia Space

Satellite assembly



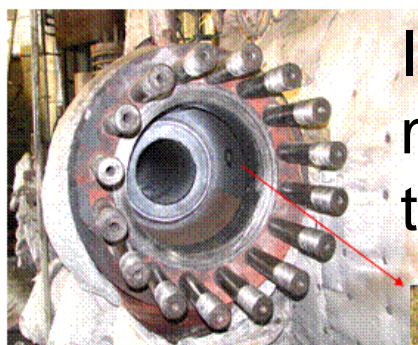
NEM Solutions

Remote training



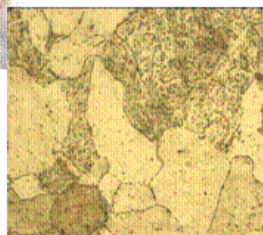
IPA

Manufacturing support



Industrial plant maintenance training

Tecnatom



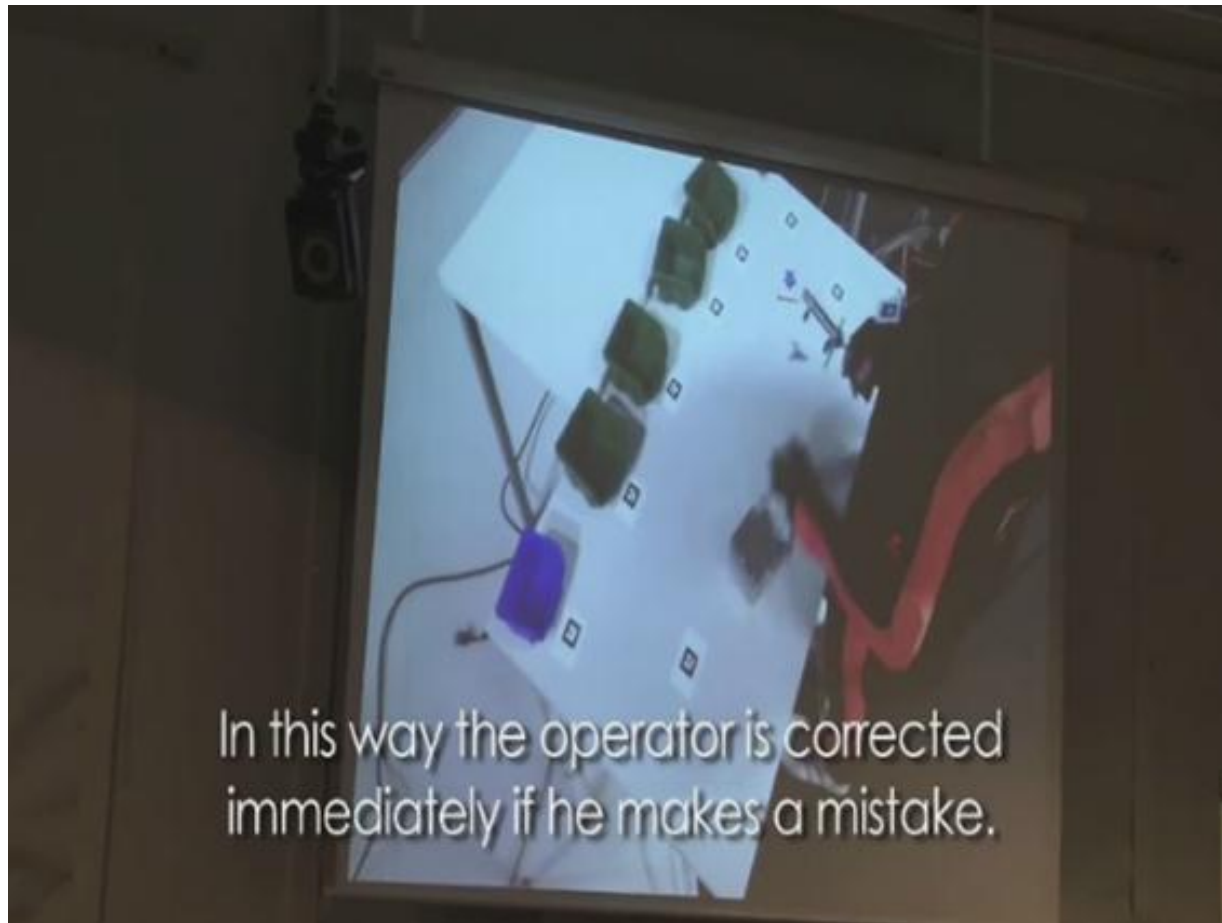
Metso Minerals

Maintenance of heavy machinery

## ManuVAR – Maintenance/inspections work training



## ManuVAR - Assembly work support



# References

**Patria**



**VALTRA**



**RUUKKI**



**NOKIA**  
Connecting People

**BAE SYSTEMS**



**SAGEM**  
moventas



Merivoimat  
Marinen | Navy

**INSTA**



**Thank you 😊**  
**Questions?**

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