**Dan Lämkull**

Dr. Dan Lämkull is a Research Leader and Method Developer within Manufacturing Engineering in the Department of Virtual Methods and IT at Volvo Cars. He has been involved in Virtual Manufacturing research and development for more than twenty years. He worked as a consultant in Computer Aided Production Engineering from 1993 to 1999, with assignments for example, ABB Robotics, FIAT S.p.A., Opel AG, SAAB Automobile, Scania Trucks and Buses, Volvo Cars and Volvo Trucks. His current research includes Digital Human Modelling, Assembly and Disassembly Simulation, Laser Scanning – Plant Hybrid Model, Virtual Operator Training, Lean Plant Design/Layout and Discrete Event Simulation with automated data management.

He received his MSc in Industrial Ergonomics from Luleå University of Technology in 1993 and his PhD in Virtual Manufacturing/Ergonomics from Chalmers University in 2009, after having attended Volvo Cars' industrial PhD programme during 2004-2009.

He is a core member in the research network VEC (Virtual Ergonomics Centre - www.vec.se) and currently he is Researcher/Co-Supervisor and Project Leader for Volvo Cars in the project entitled CRoMM - Creation of Muscle Manikins (Vinnova Reg.no: 2012-04584) and Project Manager for the VINNOVA-funded project StreaMod (Reg.no: 2013-04726); Streamlined Modeling and Decision Support for Fact-based Production Development - Integrating automated data management, simulation model building, and optimization.

**Volvo Car Group**

The first mass-produced Volvo car rolled off the production line in Gothenburg in 1927. Since then, we have delivered a steady stream of cars equipped with world-leading innovations. Today, we are one of the most well-known and respected car brands in the world with sales in about 100 countries. In 2010, Geely Holding acquired Volvo Cars. We produce premium cars with the following body types: Sedans, Estates/Sportswagons, Cross Country vehicles, SUVs and Convertibles. Our cars are characterised by intuitive, human-focused, functional Scandinavian design and good craftsmanship.

The head office, product development, marketing and administration functions are mainly located in Gothenburg, Sweden. Since 2011, Volvo Cars has had offices in Shanghai and Chengdu, China. The new China headquarters in Shanghai includes a Technology Centre and functions such as sales and marketing, manufacturing, purchasing and product development.

Volvo Cars has a vision named 2020-20; In 2020 Volvo Cars shall be able to introduce a new car model, from idea to a realized product with a flawless production, in 20 months. One important enabler for achieving this vision is an efficient simulation workflow process for product and process simulation. Within the Manufacturing Engineering organization several task forces have been started to meet the demands originating from the vision 2020-20. Five of these task forces cover the following topics:
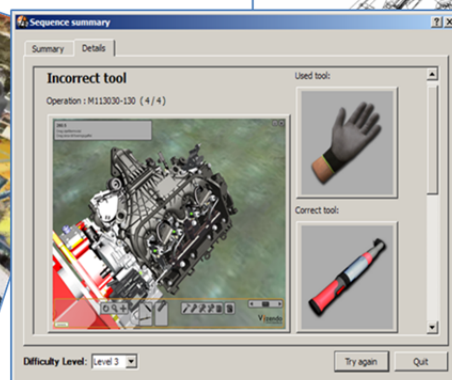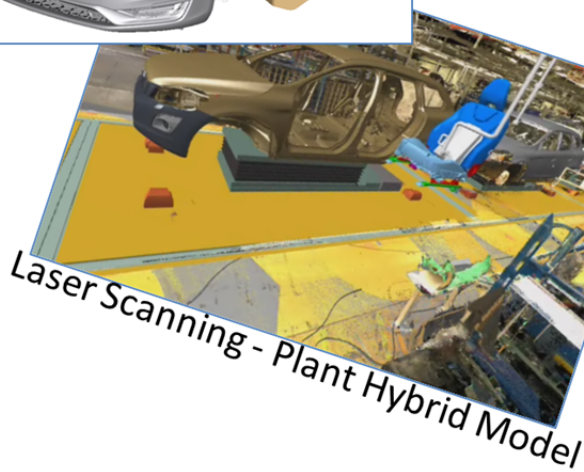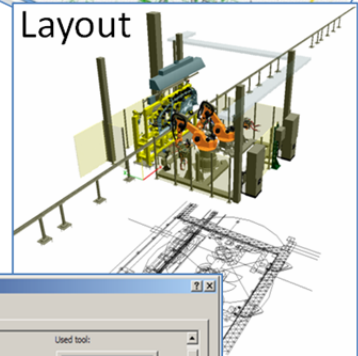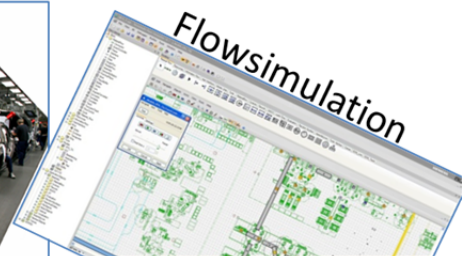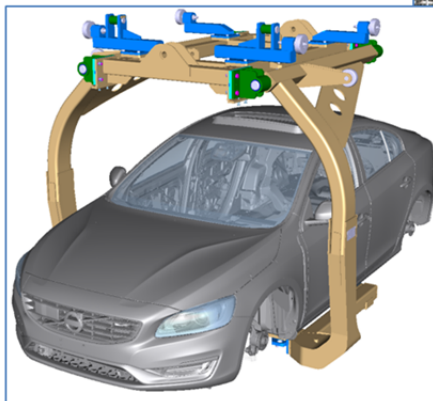
1) Layout

2) Flowsimulation (Discrete Event Simulation)

3) Laser Scanning – Plant Hybrid Model

4) Digital Human Modelling and Station By Station Verification

5) Virtual Operator Training

VIRTUAL MANUFACTURING - ENABLER FOR LEARNING FACTORIES

This presentation will give a short introduction in all of these topics and show how Virtual Manufacturing/Simulation is used to verify flawless production of future car models far before the start of production. The presentation is heavily related to the Final Assembly area since this is the area where I mostly have been working during my years as a Method Developer and Researcher within Virtual Manufacturing. However, Volvo Cars is also extensively working both within the Stamping, Body in White and Paint areas with virtual methods. Volvo Cars generated the very first off line programmed car model for the Body in White and Paint related plant areas in the late 19-eighties; and it is in the Body in White and Paint areas where the implementation of Virtual Manufacturing has come as furthest. It is now time for the Final Assembly area to further improve and implement Virtual Manufacturing in the work process to verify a flawless production process before any physical parts are delivered. This is a challenging task since Final Assembly includes humans in a much higher degree than all other, earlier mentioned, areas.

- How can we assure a process that is free from problems without verifying the processes with physical prototypes and with operators from the plants?
- How can we accurately and rapidly simulate and verify the performance of a brownfield or a greenfield plant?
- How can we verify an assembly task's ergonomics condition before a real human is performing the assembly?
- How can we prepare and train our operators before the new car models are arriving the plants?