Interactive Preproduction Planning and Ergonomic Assessment with ema® – Introducing the “Editor for Manual Work Activities”
Agenda

1. imk automotive, Inc.
2. ema® Approach
3. ema® Application
4. imk Services
imk Guiding Principles

innovations
- are our passion.
  Creative thinking is embedded in our company culture. Innovation enables us to generate long-term competitive advantages for our customers.

methods
- are our foundation.
  They assure quality and ensure our project deadlines. We continuously improve our performance by developing and extending our range of methods.

koncepts
- are our result.
  They are created by the interaction of innovation, methods, and professional experience. Our success is defined by measurable customer success.
Worldwide dedicated to the success of our customers.

Automotive industry, mechanical engineering, industrial commodities, renewable energies, information systems, and aerospace industry.
Cross-industry consulting and engineering solutions.

**Product Development**
Dr. Jens Trepte
- Battery-electric Vehicles
- Mechatronic Systems
- Structural Components

**Production Process Development**
Carsten Otto
- Process Design
- Manual Production & Assembly
- Body In White

**Information Technology**
Gerson Heuwieser
- Software Development
- Training
- Support & Service

**Consulting**
Ingolf Grüßner
- Production Strategy
- Product & Production Optimization
- Ergonomics

**Strategic Development**
Dr. Wolfgang Leidholdt
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The Next Generation of Work Planning

Human work planning on its way into the 3D Virtual Factory?

How to achieve better results with less effort?

MTM / UAS Basic activities

<table>
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<tr>
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<th>Place</th>
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<th>Medium</th>
<th>Difficult</th>
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<td>80</td>
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</table>

Fasten or Loosen: Code 20

Body Motions: Code 25

- Walk/Run: Code KA
- Bend, Squat, Kneel, Incl. Incl. Code KB

Visual Control: Code VA

Process times: Code
- Process time restricted: Code PTU 1
- Process time unrestricted: Code PTH 1
- Process time: Code PT 1

Dr. Lars Fritzsche, imk automotive, Inc., Interactive Preproduction Planning with ema

The 14th Annual Applied Ergonomics Conference 2011
Today's digital human models cannot understand standardized work instructions.

Each particular movement has to be taught manually by highly qualified engineers.

Compiling dynamic simulations of human work is complicated and costs a lot of time.

Simulation models do not provide suitable tools for analyzing assembly time and ergonomics.
What is ema®?

- ema® is the evolution from the unskilled digital human model to the virtual craftsman.
- ema® is providing the human model the skills to understand and act according to standard work instructions.

How is that possible?
What is ema®?

The production planner is not a Pixar™ animator!

Instead of teaching each single posture, ema® uses complex operation steps, e.g.

- get and place object
- use hand tool / screw
- ingress / egress car
- etc. (~300 operations)

Not: Step(s) forward → stand upright → bend → hand to the object → pick → object to body → step(s) sideways → turn → step(s) forward → bend → object to target → let loose → hand back

But: take part out of box and place to corresponding appliance
Complex operation steps are based on intensive research studies recording experienced workers with motion capturing technologies.
What makes ema® unique?

ema® brings human life into the virtual factory.

- ema® understands work instructions.
- ema® moves just like real humans do.
- ema® is based on MTM standard times.
- ema® allows reliable ergonomic evaluations.
- ema® can be adapted to any PLM infrastructure.

ema® enhances simulation quality, enables quick simulation updates, and saves up to 90% time.
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ema® GUI for Task Definition

- Drag & drop to define work process
- Automatic calculation of MTM-time
- Library of complex operations
- Parameter specification
ema® GUI for Ergonomic Evaluation

Posture analysis (type, duration, percentage)

Total risk score

Detailed timeline (e.g., spine flexion)

Additional workload (forces, weights, extra scores)
ema® Video Example: Deck Lid Assembly

Dr. Lars Fritzsche, imk automotive, Inc., Interactive Preproduction Planning with ema®
Standard features of ema® V1.0

- Library of elementary complex operation steps
- Full integration into PLM infrastructure of DELMIA V5
- Intuitive graphical user interface in German & English language

Analysis functions of ema® V1.0

- Collision avoidance based on bounding volumes
- Plausibility check regarding the logical sequence of operations
- Automatic determination of walking paths and grip points on objects
- Calculation of standard times (MTM1) and automatically generated times
- Full ergonomic assessment based on standard “Automotive Assembly Worksheet”
- Synchronization points for the temporal coordination of activities for multiple workers
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imk Services in the United States

Experts in integrating human Workforce into efficient production processes.

- Ergonomic analysis and consulting
  - Preventive production planning:
    identification of ergonomic weaknesses in the design of products, processes, and equipment
  - Optimization of series production:
    improvement of ergonomic conditions to keep workers’ health and increase efficiency
- Customized trainings in Ergonomics
- Customized pilot applications of ema
- Digital Production Planning / 3D validation
- Lean manufacturing & Industrial engineering
Ergonomic workplace design for ramp-up of entire VWGoA Chattanooga plant.

- Ergonomic evaluation of all manual work in Assembly, Body, Paint, and Logistics
- Status visualization on “Ergonomic Map”
- Development of counter measures for improving ergonomic conditions (e.g., work process optimization, tools & parts design)
- Follow-up workshops to test and facilitate implementation of counter measures
- Documentation and continuous status reporting to Plant Management
We’re here to help! For more information please contact:

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Senior Ergonomic Consultant

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