MTM
a worldwide Standard of Work Performance

Dunajcsik Zoltán

Ergonomic risk analysis applications at the industry

European Conference on Applied Ergonomics 30th May, 2013

MTM 1 | MTM 2 | MTM UAS | MTM MEK | MTM VISUAL | MTM ALKALMAZÓ | MTM IE Basic

MTM
a worldwide Standard of Work Performance

Methods -
Time
Measurement

the
Method
determines
the
Time!

1948, Maynard, Schwab, Stegemerten

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MTM
a worldwide Standard of Work Performance

- MTM is an analytical tool for directly analyzing manual work processes.
- MTM offers a worldwide uniform standard for businesses to use in describing and quantifying manual work processes.
- MTM is a tool for developing standardized building blocks from the MTM basic system (MTM-1). These building blocks are used to economically describe, quantify and design a wide range of work processes.
- MTM enjoys the greatest worldwide distribution as an instrument of industrial engineering and time management.
- In addition, building block systems were developed based on MTM-1 for application in different process types (mass production, batch production and one-of-a-kind and small variable batch production).
- MTM has gradually been transformed from a predetermined time system to a **productivity management system**.

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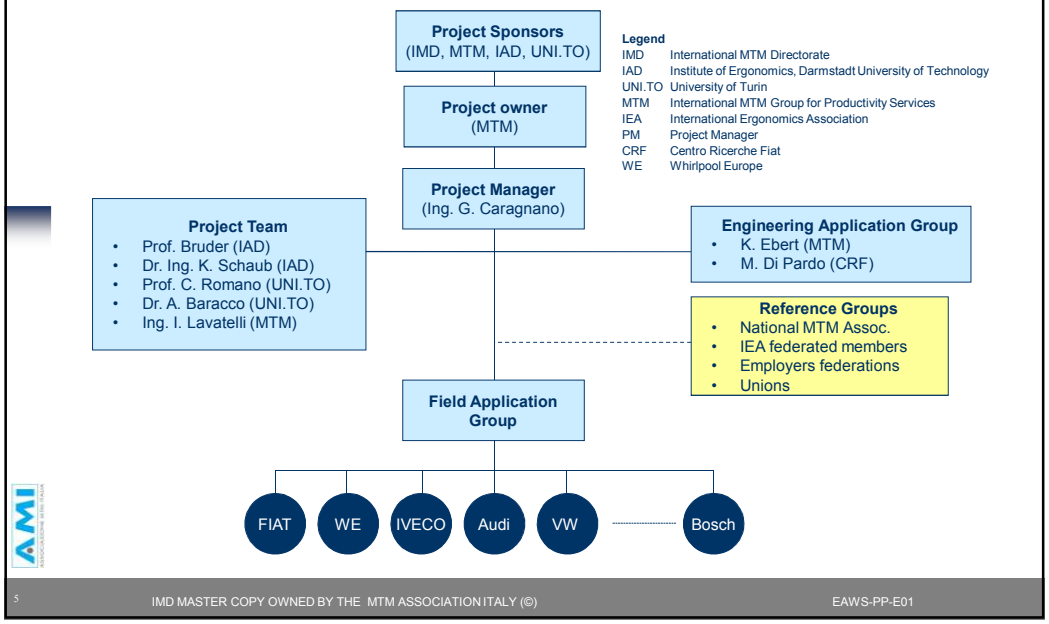
EAWS – Project issues

- Companies need an ergonomic first level analysis tool (screening) to evaluate the biomechanical load over the whole body
- This tool must be accepted and recognized by any involved part (companies, workers, unions, authorities, etc.)
- User deviation must be minimized by having an objective identification and measurement of actions, wrong postures and applied forces
- This tool must be usable during the stages of product/process design

4 IMD MASTER COPY OWNED BY THE MTM ASSOCIATION ITALY (©) EAWS-PP-E01

EAWS – Project organization



What is Ergonomic Assessment Worksheet ?

EAWS is a 1st level system for screening ergonomic risk due to biomechanical overload.

Up to a certain extent EAWS can also be used as 2nd level analysis tool, since it is quite analytical and detailed. EAWS gives the necessary information to redesign the work task, making the second level systems seldom necessary.

Note

1st LEVEL systems: risk evaluation systems which require a quick screening checklist.

2nd LEVEL systems: risk evaluation systems which require a detailed analysis with index calculations. They are applied where a possible risk has been already detected by a 1st level system.

EAWS - Aims

- Documenting and evaluating work conditions, regarding the operator's workload
- Ensuring favorable ergonomic conditions
- Compliance with labor legislation (national and international), e.g.
  - EU Machinery Directive (2006/42/EC, former 98/37/EC, orig. 89/392/EEC))
  - EU Framework Directive (89/391/EEC).
- Developing an extension of the Automotive Assembly Work-Sheet (AAWS) in accordance with all parts of EN 1005 standard and the corresponding ISO standard (11226 and 11228)
- Making this tool usable in any kind of company, from mass production to one of a kind production
- Providing a useful communication tool for product/process design

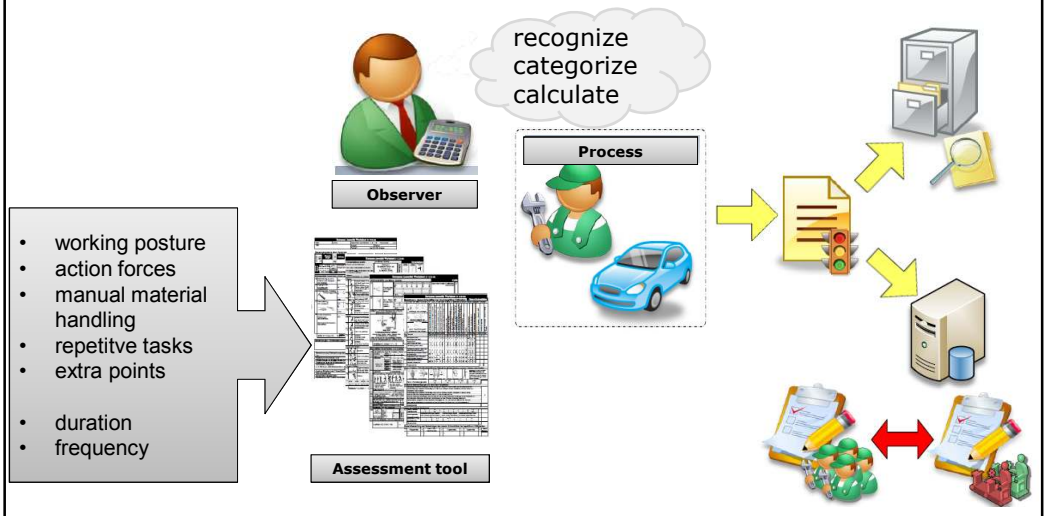
EAWS - Aims

- Developing a free tool without any kind of copyright
- Linking EAWS to MTM
  - MTM-2 : mass production systems
  - UAS: batch production systems
  - MEK: one of a kind production systems

EAWS main users

Company	Tool name	Status	ERGO-MTM
OPEL/GME	NPW	Implemented in 1997	N
Porsche	DesignCheck	Implemented in 1998	N
Daimler	EAB	Implemented in 2000	N
Bosch	BkB, EAWS	Implemented in 2005	N
Bosch Rexroth	EAWS	Implementation in progress (ITA)	N
Audi	APSA	Implemented in 2006	N
Karman	AAWS	Implemented in 2007	N
Smart	EAWS	Implemented in 2008	N
MAN	AAWS Cargo	Development in progress	N
FGA	EAWS	Implemented in 2008	Y
IVECO	EAWS	Spain implemented in 2010-11	Y
FPT	EAWS	In progress	Y
VW	EAWS	Implementation in progress	N
Denso T-S	EAWS	Implemented in 2008	N
Lamborghini	EAWS	Implemented in 2010	N
Beretta Armi	EAWS	Implemented in 2010	Y
Chrysler	EAWS	Implementation in progress	Y
VM Motori	EAWS	Implementation in progress	Y
SEAT	EAWS	Implementation in progress	N

Ergonomic assessment process



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Source: Introduction to EAWS (Ergonomic Assessment WorkSheet) Workshop Dipl.-Ing. Torsten Wagner – IAD, 2012

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Application notes

- Works best for short cycled tasks (cycle time ≤ 5 min)
  - For cycle time above 30 minutes the amount of tasks often exceeds the capabilities of the observer and makes a „pen and paper"-analysis of a certiain section impractical
  - No peek loads for long periods
- Calibrated to assembly tasks (automotive industry)

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Soruce: Introduction to EAWS (Ergonomic Assessment WorkSheet) Workshop Dipl.-Ing. Torsten Wagner – IAD, 2012

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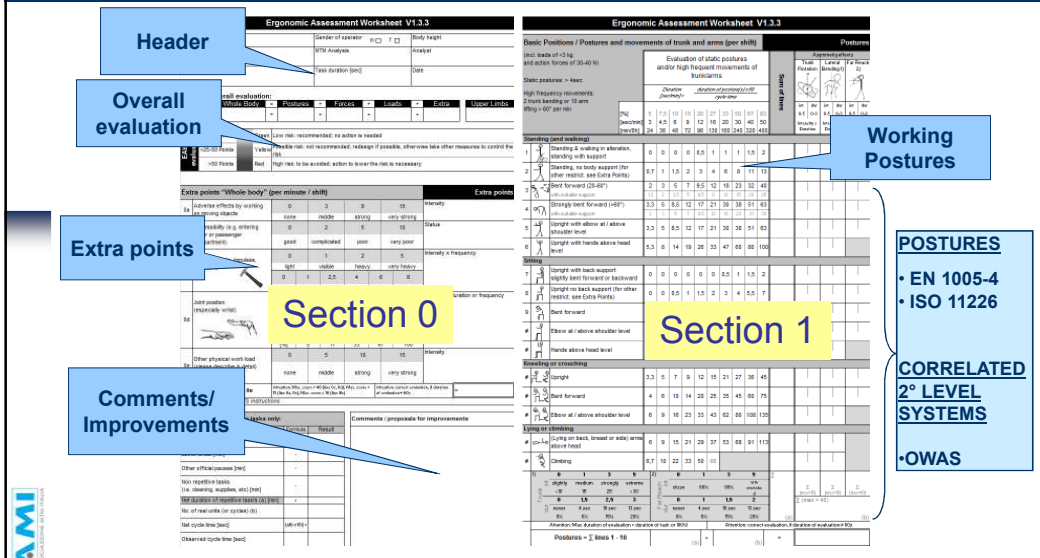
EAWS – First and second page



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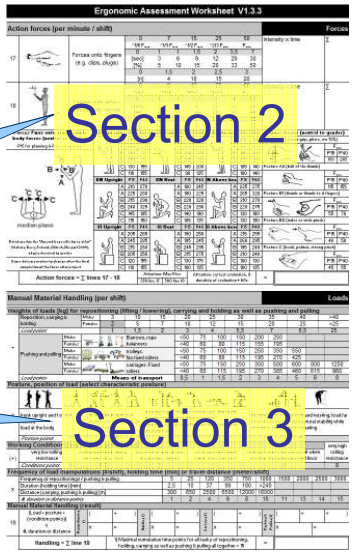
EAWS-PP-E01

EAWS – Third page



Action Forces

Manual materials handling

ACTION FORCES

EN 1005-3
ISO 11228-2

CORRELATED 2° LEVEL SYSTEMS

RULA; SCHULTETUS

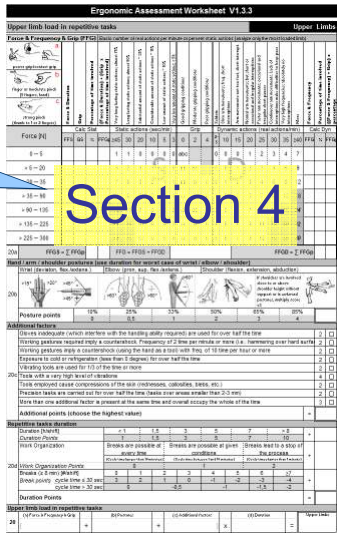
MANUAL MATERIALS HANDLING

EN 1005-2
ISO 11228-1/2

CORRELATED 2° LEVEL SYSTEMS

NIOSH;
SNOOK & CIRIELLO

EAWS – Fourth page



Upper limb load in repetitive tasks

HIGH FREQUANCY AND SMALL LOADS ON UPPER LIMBS

- **EN 1005-5**
- **ISO 11228-3**

CORRELATED 2° LEVEL SYSTEMS

- **OCRA**
- **SI (Strain Index)**
- **HAL/TV (*)**

Left lamp (EAWS) – Whole body

Factors rising occupational risks:

Physical factors:

- Moving heavy loads
- Unfavourable postures
- Repetitive tasks
- Heavy loads
- Etc.

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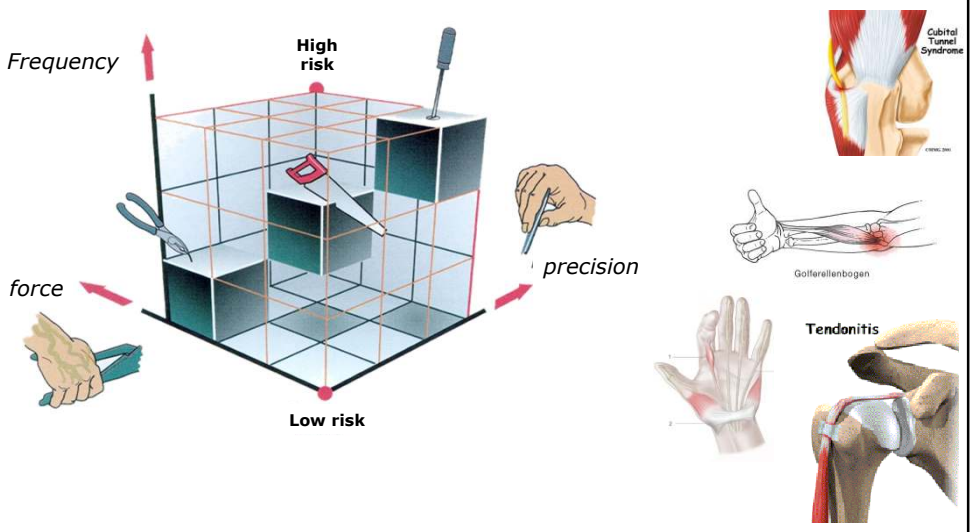
Right lamp (EAWS) – Upper limbs



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Load of the upper limbs - Examples

Sorting of goods
High frequency

Insertion of finger strength

Using clips
High precision

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Soruce. Dr. Steffen Rast
2011. Juli 7. | 25. ERGONÓMIAI NYÁRI EGYETEM

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Design with MTMergonomics®

- Based on MTM-analyses, an ergonomic risk can be identified already during the planning phase
- Pro-active evaluation of processes and design
- Consideration of a total strain situation
- Overall evaluation of physical strains
- One person is responsible for the planning and ergonomic evaluation of processes
- Result: traffic light evaluation of the ergonomic risk for the worker

Summary

Whole body	
Body posture	50,0 Points
+ Forces	0,0 Points
+ Loads	0,0 Points
+ Extra points	0,0 Points
Total points	50,0 Points

Upper limbs	
Task	0,0 Points
+ Hand/Arm/Shoulder	0,0 Points
+ Further factors	0,0 Points
* Duration	9,0 Points
Total points	0,0 Points

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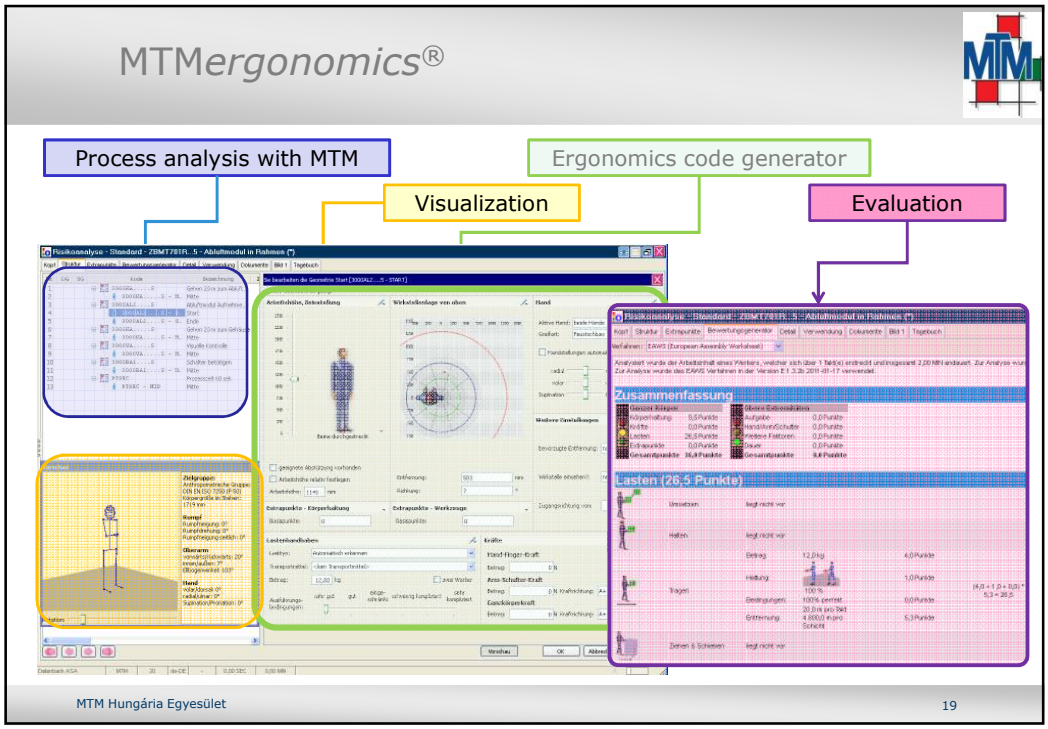
MTMergonomics®
Process analysis with MTM
Ergonomics code generator
Visualization
Evaluation
Zusammenfassung
Lasten (26,5 Punkte)
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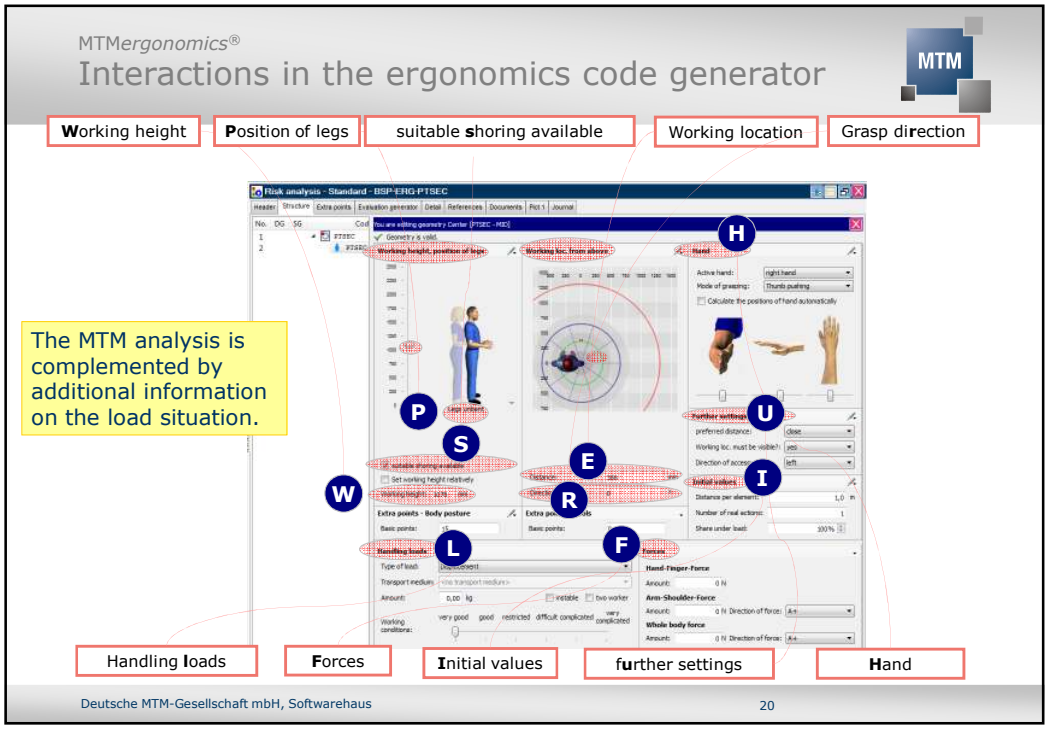
MTMergonomics®
Interactions in the ergonomics code generator
Working height
Position of legs
suitable shoring available
Working location
Grasp direction
The MTM analysis is complemented by additional information on the load situation.
Handling loads
Forces
Initial values
further settings
Hand
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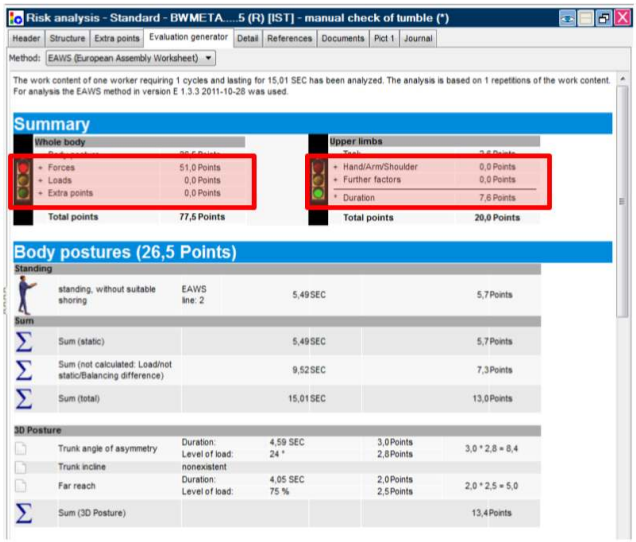
MTM*ergonomics*®

Evaluation



Evaluation generator

- **Display of result**
  - whole Body
  - upper limbs
- **detailed evaluation**
  - Points of posture
  - Points for forces
  - Points of load
  - Extra points
  - RSI points

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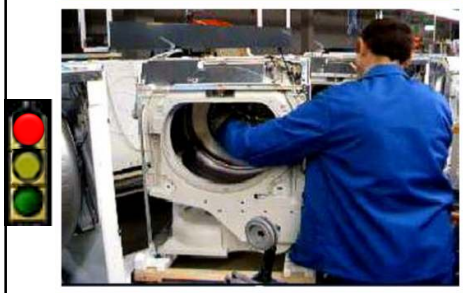
Design example

Turn drum

manual testing process	manual testing process
	
high loads upper limbs	Invest: approx. 80 € (Renovation screwer)
poor body posture (twisting)	Elimination of physical load
Only men can be used at WP!	Now feasible for women!
Reactive power rotate work piece carrier	20% reduction in execution time

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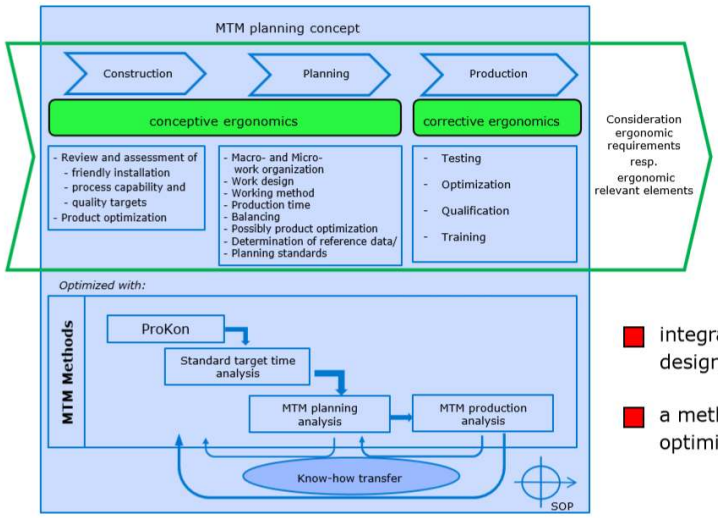
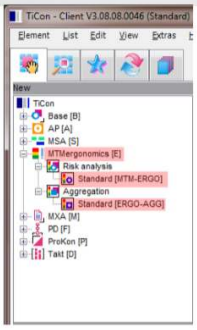
Holistic approach





- integrated and harmonized design of process chain
- a methodological consistent optimization concept

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Benefits and prospects

Ergonomics pays off.

MTM ergonomics®

for the company

- Multiple use of data reduces analysis effort
- efficient and ergonomic work processes
- lower absenteeism/ costs
- Increase the efficiency and quality
- Prevention and reduction of costs for changes

for the employee

- Reducing of physical load
- Increased working comfort
- Motivation and satisfaction
- an optimal working system resp. working environment release free potential

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