

Efficient Deployment of Employees with Impaired Abilities – Concepts for Planning and Production

Dr. Lars Fritzsche, imk automotive GmbH

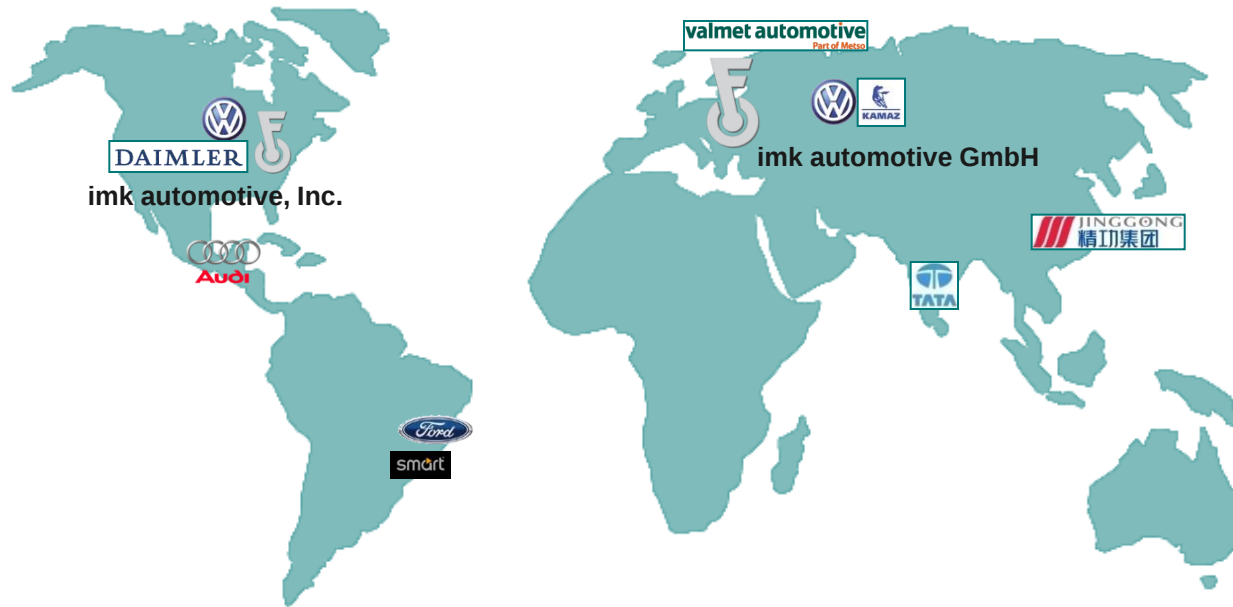
@ Automotive Circle International, Bad Nauheim, 24.02.2015



I	imk ... i nnovations – m ethods – k oncepts
II	Definition – Employees with impaired abilities
III	Production – Integration of workers with impaired abilities
IV	Planning – Concept for a standardized workplace design
V	Conclusions



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February 2015



Trainings, Analyses, Concepts and Optimization in Ergonomic Work Design

- **Audi AG, Central Planning Department Ingolstadt (2012)**
Ergonomic validation of manual work in assembly and body shop using the ema5 software
- **Daimler AG, Assembly Planning Sindelfingen (2014)**
Concept for efficient deployment of employees with impaired abilities in E-class assembly
- **Porsche AG, Central Planning Department Stuttgart (2014)**
Ergonomic evaluation of new Panamera G2 assembly during K8 workshop
- **Volkswagen AG, Central Planning Department Wolfsburg (2012 – 2014)**
Ergonomic work design and development of new methods and concepts for body shop and assembly
- **Volkswagen Nutzfahrzeuge, Hannover plant (since 2012)**
Ergonomic work design for VW commercial vehicles in the entire production process (press, body, paint, assembly)
- **Volkswagen Sachsen GmbH, Chemnitz plant (2014)**
Concept specification “Modular work place for efficient deployment of employees with impaired abilities“
- **Volkswagen Sachsen GmbH, Zwickau plant (since 2010)**
Prospective ergonomic work design for ramp-up of the Golf-A7 and Passat-B8 in Zwickau plant
- **Volkswagen Group of America, Chattanooga plant, TN, USA (2010 – 2012)**
Prospective ergonomic work design for the new Chattanooga plant (in assembly, paint, and body shop)
- **Daimler AG (since 2014)**
Licensed coach for training in “Basic ergonomic work design and EAB assessment method“
- **Volkswagen Coaching GmbH / jetzt VW Group Academy (since 2010)**
Licensed coach for basic training in Volkswagen “AP-Ergo“-tool for ergonomic work design



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Employees with impaired abilities are people...

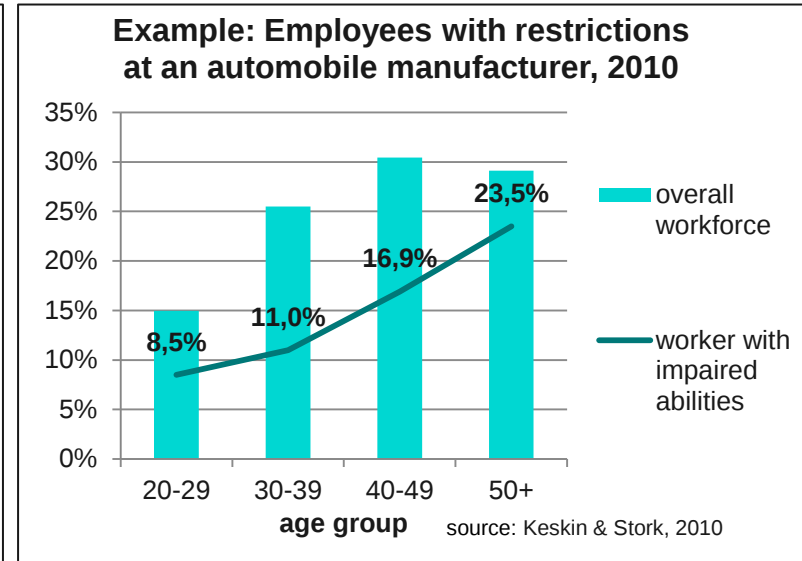
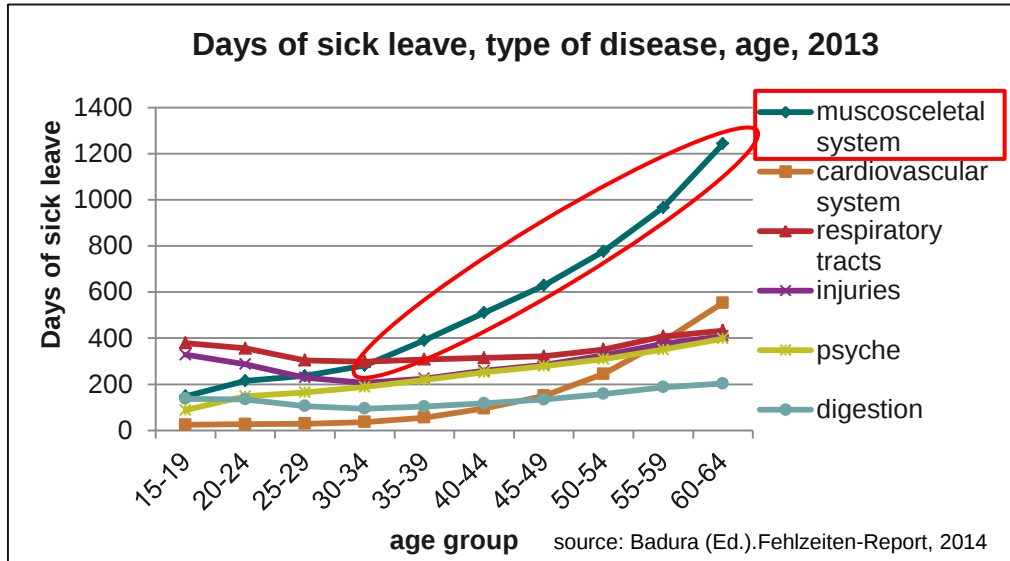
... with **temporary** or **long-term** restrictions in their **physical or mental** performance

- Mostly, these people cannot perform their regular job anymore, which results in **productivity losses** for the company.
- To ensure a value-adding work task it is necessary to provide these employees with a **job/workplace that is adapted** to their specific abilities and needs.
- Challenge: many **different types** of restrictions that mostly occur in **combinations**.

Level of work design	Typical restrictions
Work organization	• N/A night shifts • N/A rotating shift systems • N/A cycled production lines
Work place	• N/A manual load handling • N/A trunk bending • N/A over shoulder work • N/A force application (hand/arm)
Work environment	• N/A exposure to noise/vibration

Employees with Impaired Abilities

Current Challenges

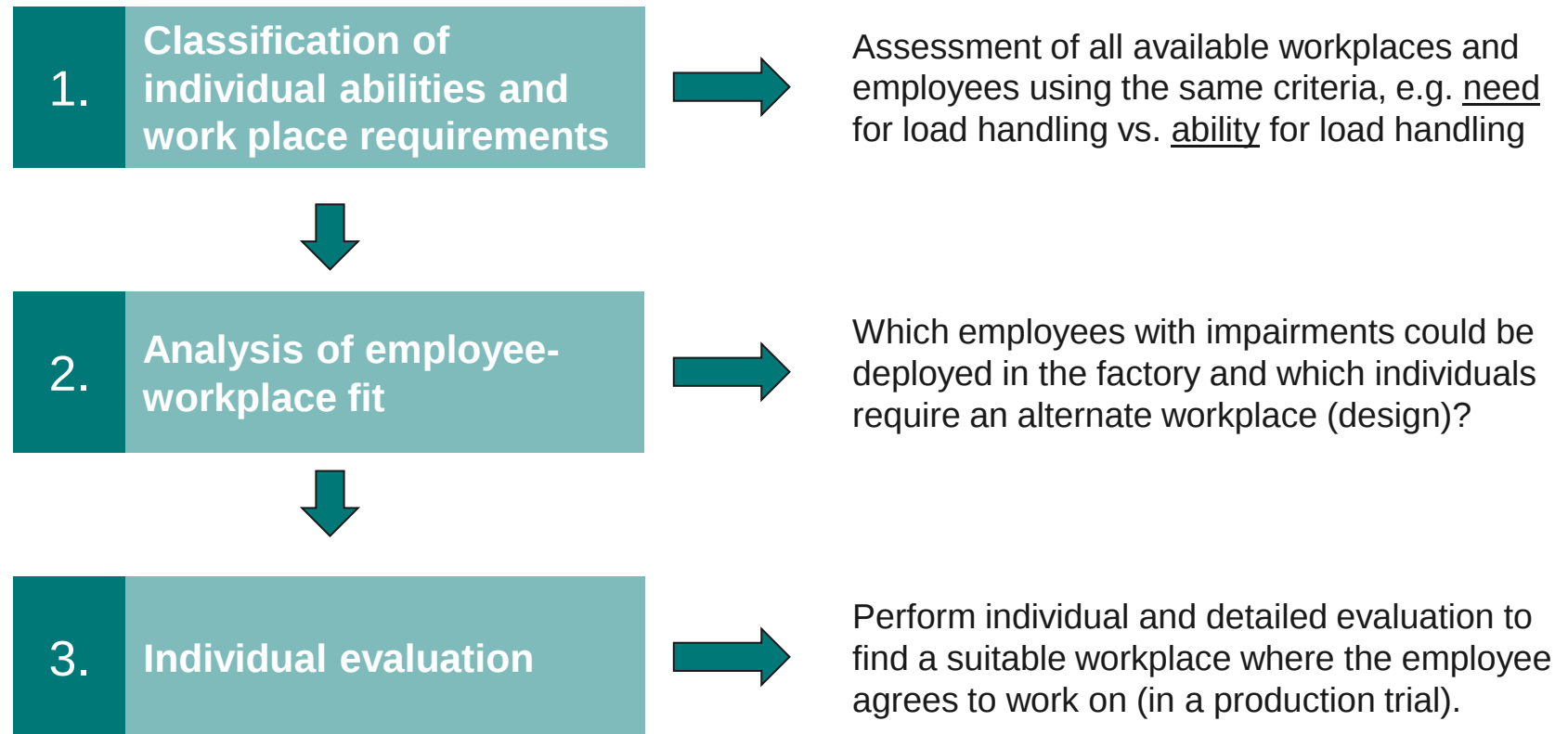


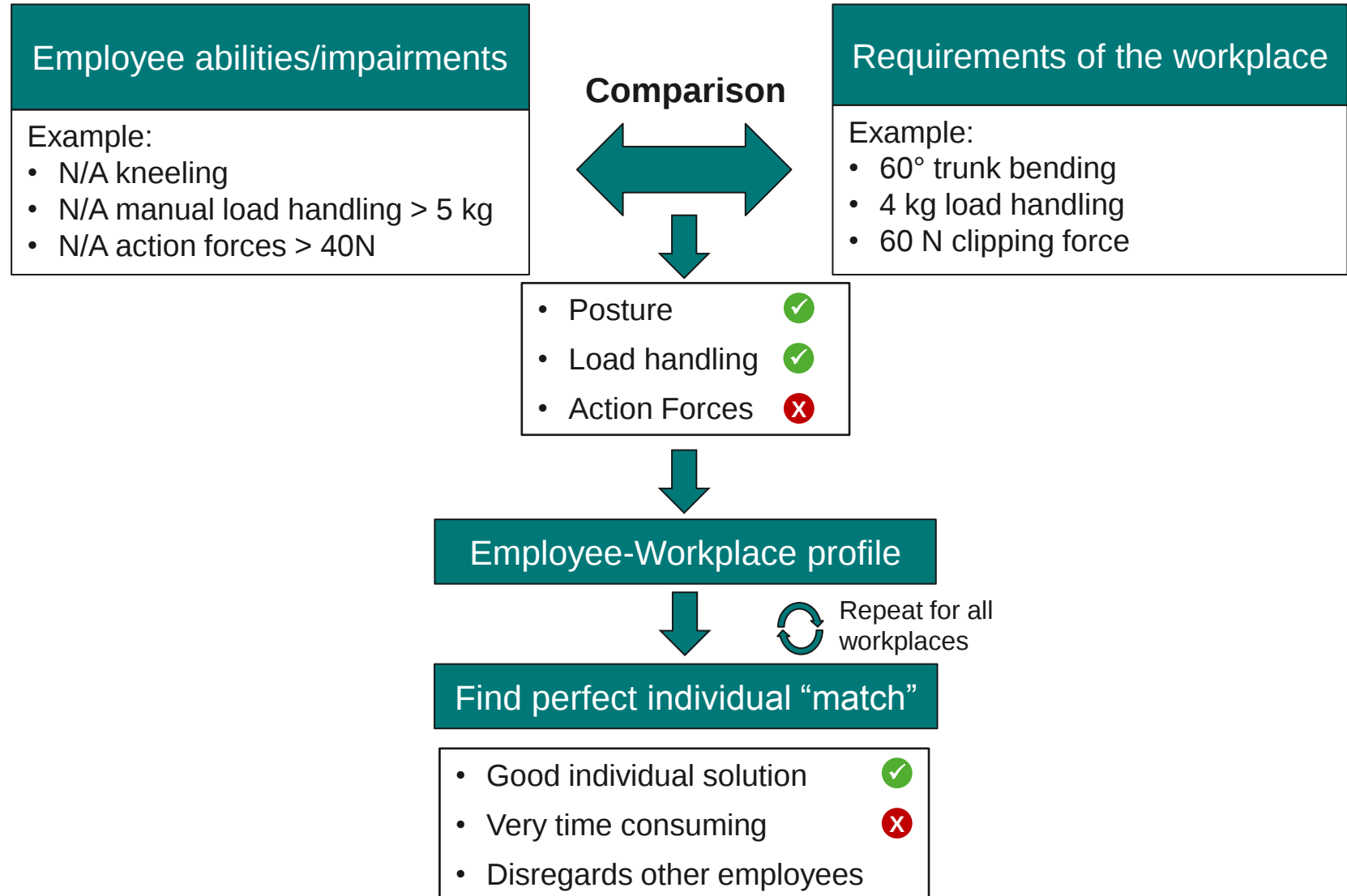
- increasing average **age** of workforce in Europe
- increasing share of **musculoskeletal diseases** with growing age
- increasing proportion of employees with **impaired abilities** with growing age

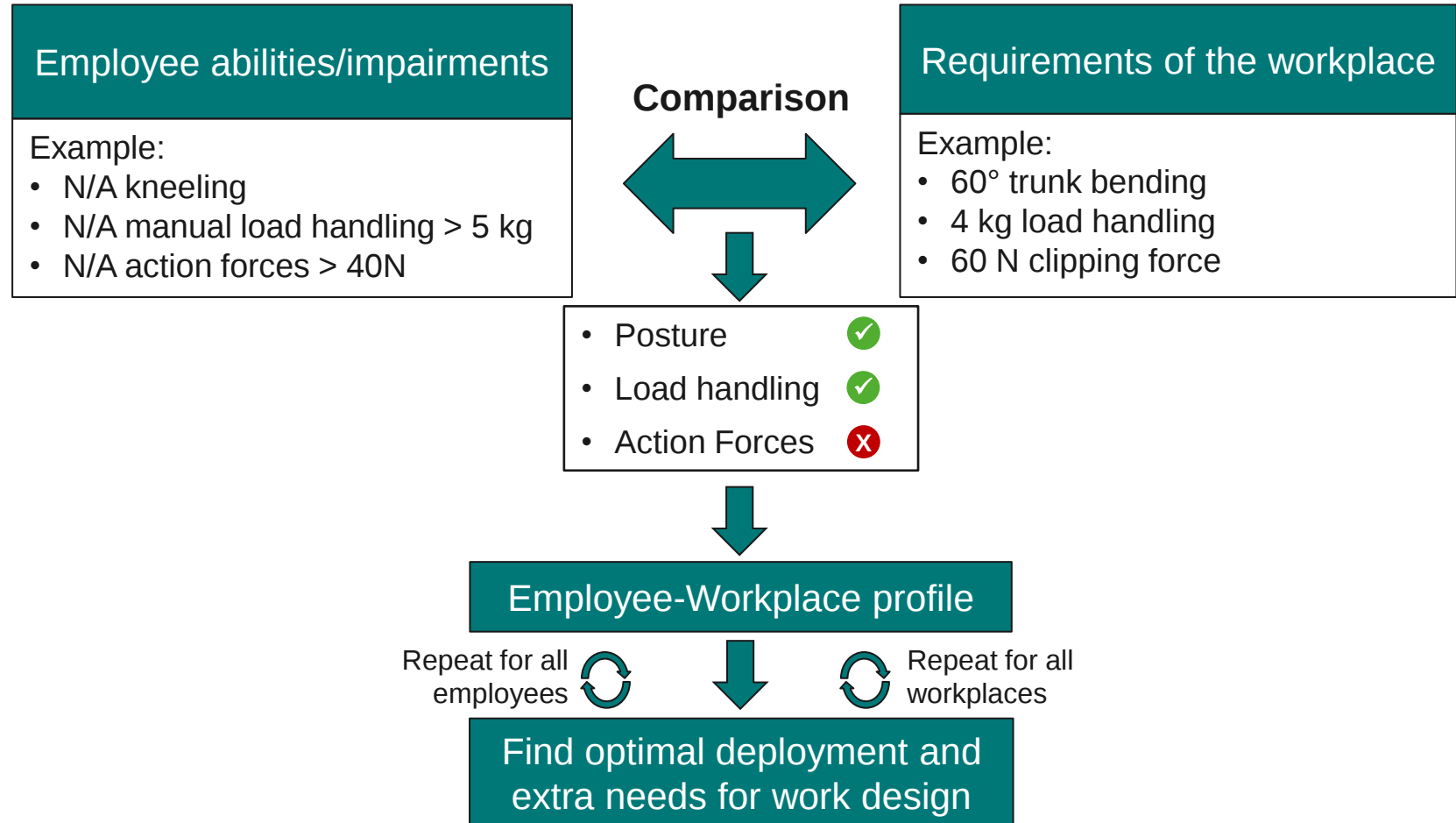
1. How can companies integrate these employees into existing production processes?
2. What measures can be taken to design work places for such employees, minimizing the physical and psychological stress in order to enable a productive performance?



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“EDGA“

Ergonomic Deployment and Gap Analysis

		Workplace [WP]					
Employee [#]	#1	WP-162	WP-138	WP-114	WP-81	WP-65	WP-27
	#2	WP-62	WP-81	WP-101	WP-94	WP-51	
	#3	WP-62	WP-201	WP-188			
	#4	WP-22	WP-25	WP-86			
	#5	WP-72					
	#6						



Workplace in the same organizational unit



Job rotation with the marked workplace is possible



Redesign of the work place in 1 criteria (e.g. load handling) is necessary



No potential workplace in the current organizational unit for the employee

“EDGA“-Tool:

- Identify possible workplaces for all restricted employees at once
- Define search area (organizational unit, shift, cyclic/non-cyclic work)
- Assign main workplace and possibilities for job rotation
- Allow deviation in certain abilities (e.g. load handling > 5 kg) to check needs for ergonomic redesign
- Low-cost: based on Excel-VBA-script, runs on every Windows PC
- Input required: data about employee abilities and workplace requirements as Excel-file

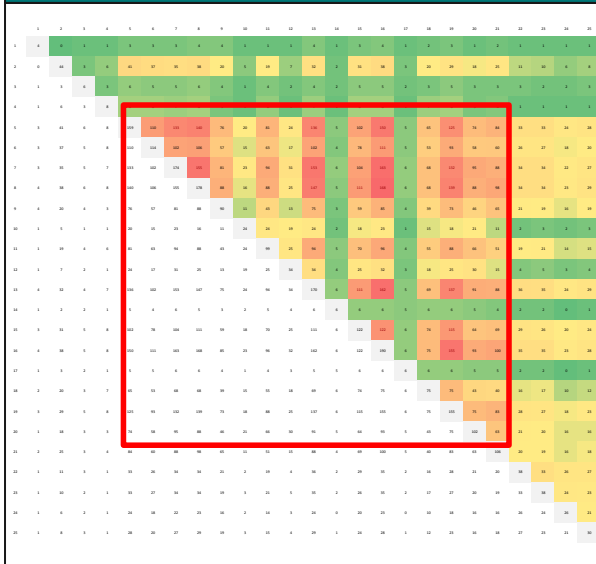
Search area organisational unit	
☒ Only search within team.	
☐ Only search within cost-center.	
☐ First of all search within cost-center, afterwards everywhere.	
☐ Search everywhere from the start.	
Search area shift	
☒ Search worker and workplace only inside shift group.	
☐ Search worker and workplace in- and outside shift group.	
Filter cyclotime	
☒ Assign all workers and workplaces.	
☐ Assign only cycle-dependent workers and workplaces.	
☐ Assign only cycle-independent workers and workplaces.	
Allow deviant abilities / requirements	
Allow deviation in 0 ability-categories.	
Category 1:	
Category 2:	
Category 3:	
Category 4:	
Category 5:	
Category 6:	
Start requirement analysis	
Worker on workplace	Workplace toplist
Load new workers	
Add new workers	Refresh list of workers



Agenda

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Heat-map of the most common restrictions



The Heat-map analysis shows, which combinations of restrictions are most common among the companies' workforce.

This allows to define specific requirements for workplace design.

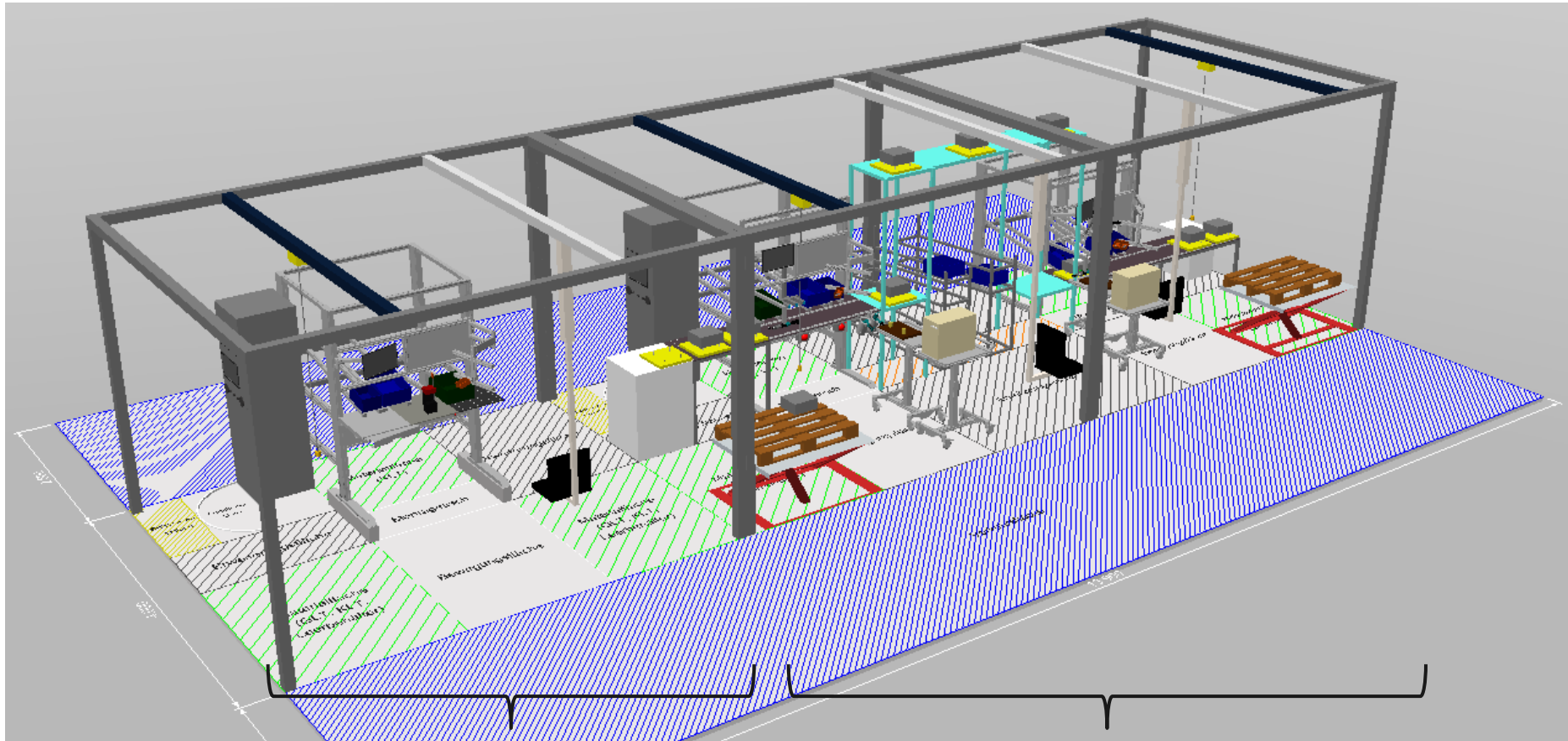
General requirements for workplace design

- Possibility to sit down
- Standing/Walking in upright posture
- Arms below shoulder level
- No squatting or kneeling
- No manual load handling > 3 kg
- No action forces (finger, body) > 40 N
- No exposure to vibrations (hand/body)

Concept for modular, standard workplace design

Modular standard work cell

Example: Pre-assembly line designed with ema

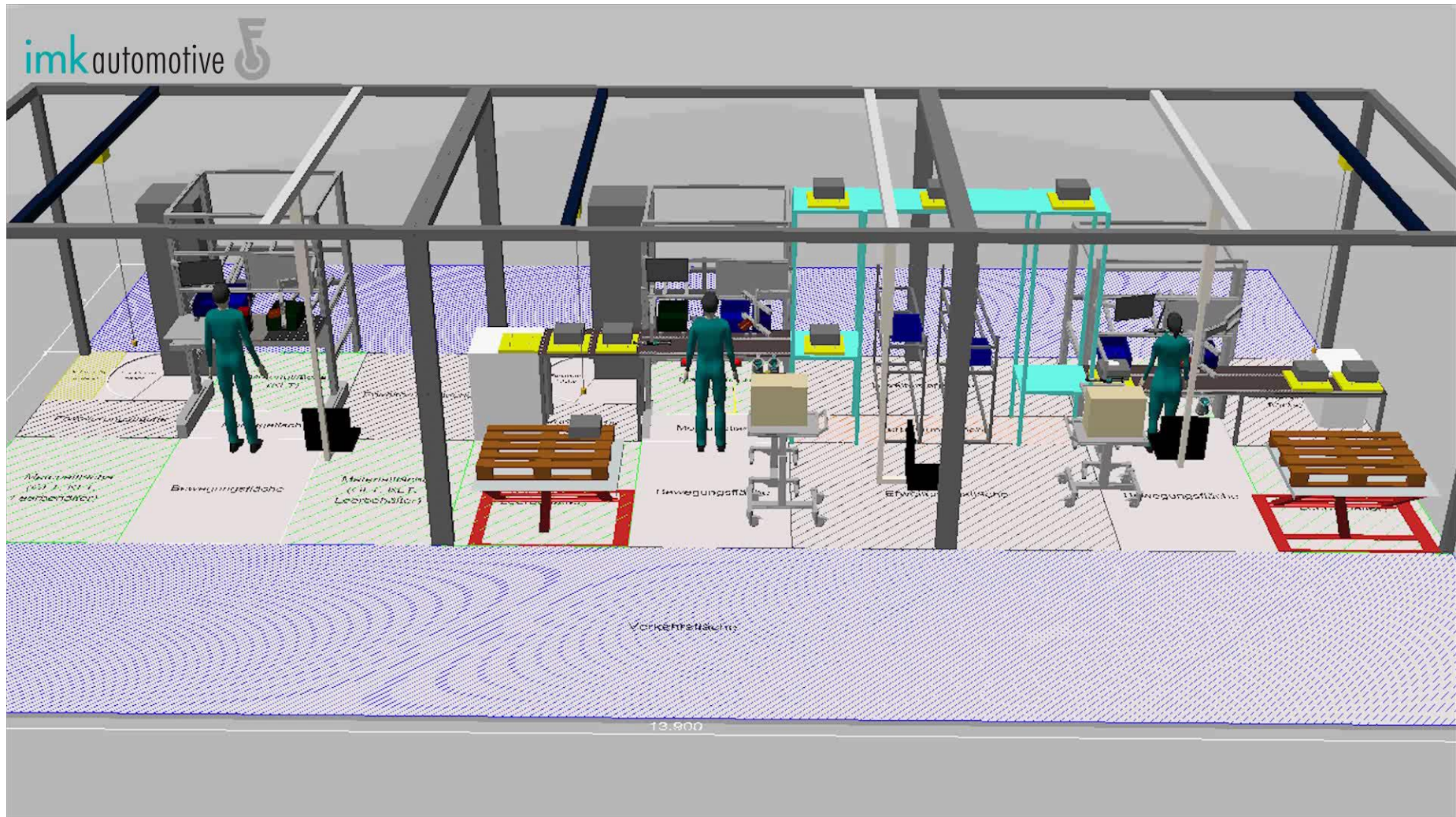


separated work cell for simple
assembly tasks

interlinked workplaces with
decoupling buffer

Modular standard work cell

■ Example: Pre-assembly line designed with ema



Modular standard work cell

Example: Pre-assembly line designed with ema⁵

Work cell 1:

95th percentile male



overall score summation:	5.5
posture score summation:	5.5
posture scores	2
twist score	0.7
bend score	0
reach score	2.8
force score summation:	0
finger forces	0
body forces	0
load score summation:	0
repositioning	0
holding	0
carrying	0
pushing & pulling	0
extra score summation:	0
influences by working on moving parts	0
accessibility	0
vibrations, momentum, forces	0
joint postures	0
other stresses and strains	0

Work cell 2:

50th percentile male



overall score summation:	5
posture score summation:	5
posture scores	2
twist score	2.1
bend score	0
reach score	0.6
force score summation:	0
finger forces	0
body forces	0
load score summation:	0
repositioning	0
holding	0
carrying	0
pushing & pulling	0
extra score summation:	0
influences by working on moving parts	0
accessibility	0
vibrations, momentum, forces	0
joint postures	0
other stresses and strains	0

Work cell 3:

5th percentile female



overall score summation:	5
posture score summation:	5
posture scores	2.2
twist score	0.9
bend score	0
reach score	1.6
force score summation:	0
finger forces	0
body forces	0
load score summation:	0
repositioning	0
holding	0
carrying	0
pushing & pulling	0
extra score summation:	0
influences by working on moving parts	0
accessibility	0
vibrations, momentum, forces	0
joint postures	0
other stresses and strains	0

(ergonomic evaluation based on EAWS V. 1.3.3 with ema⁵)

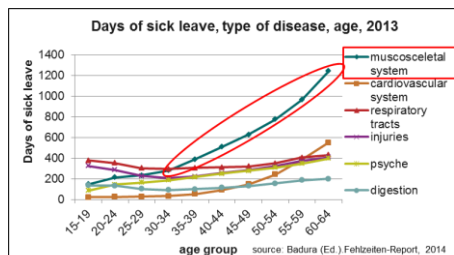


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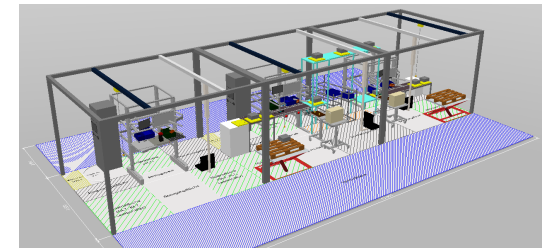
Conclusions

Facing the Challenge of “Impaired Abilities“ with Smart Tools

- **The challenge** of the increasing proportion of older employees and workers with impaired abilities is still growing and leads to **significant losses in productivity**.
- **Tools for analyzing** the companies' capacity to integrate employees with restrictions in existing production lines and estimate their gaps are now available (**EDGA**).
- **Standard components** should be considered in **production planning** for designing new work stations that are suitable for all employees, regardless of their restrictions.
- In general, an **ergonomic workplace design** can avoid the aggravation of existing diseases and the development of new work-related diseases **for all employees**.



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Thank you very much for your attention!



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