AXIOM TECH

Digital Human Modelling and Simulation in Tecnomatix

Feb 15th, 2018, Slovenia, Ljubljana

Presenter: David Sámek

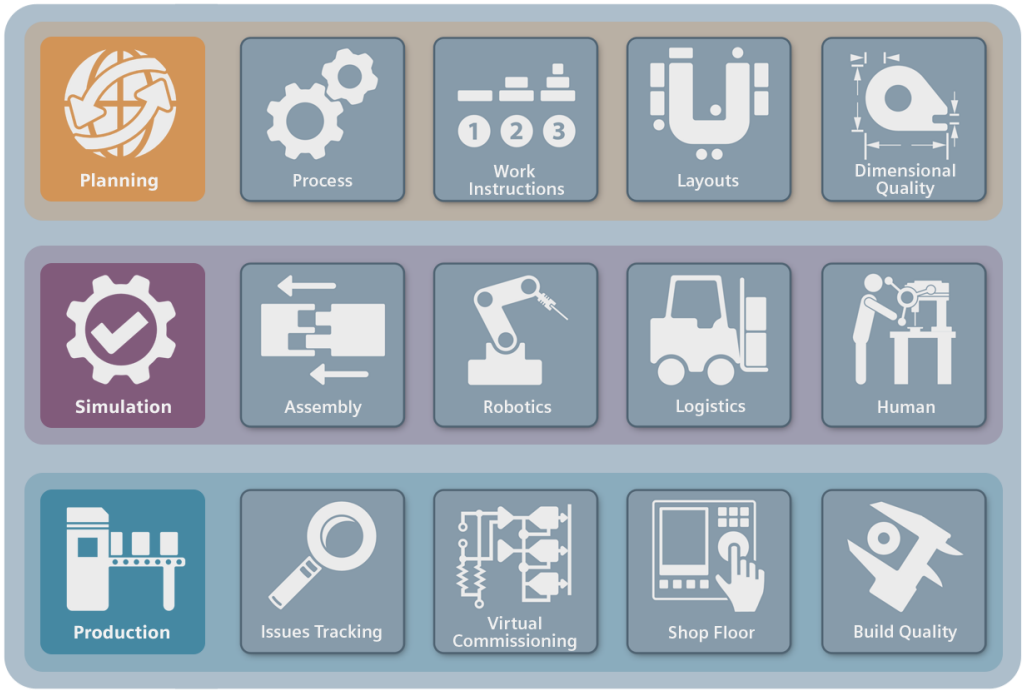
Solution Partner PLM

SIEMENS

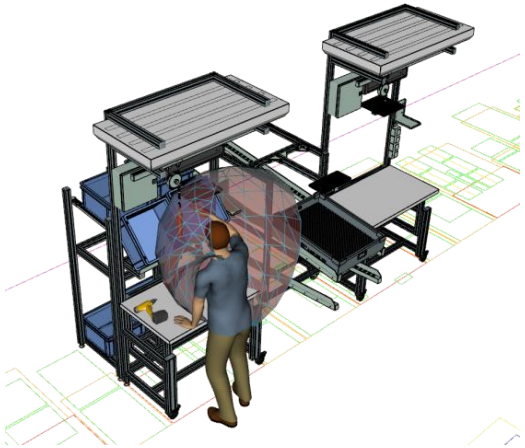
Outline

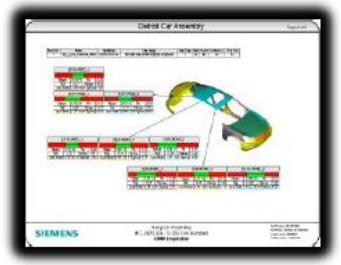
- Tecnomatix introduction
- Digital Human Modelling and Simulation
- Human performance tools
- Feasibility Tools
- Motion Capture & Virtual Reality
- Task Simulation Builder
- Human – Robot Collaboration
- Conclusion

TECNOMATIX



Solutions to cover manufacturing challenges

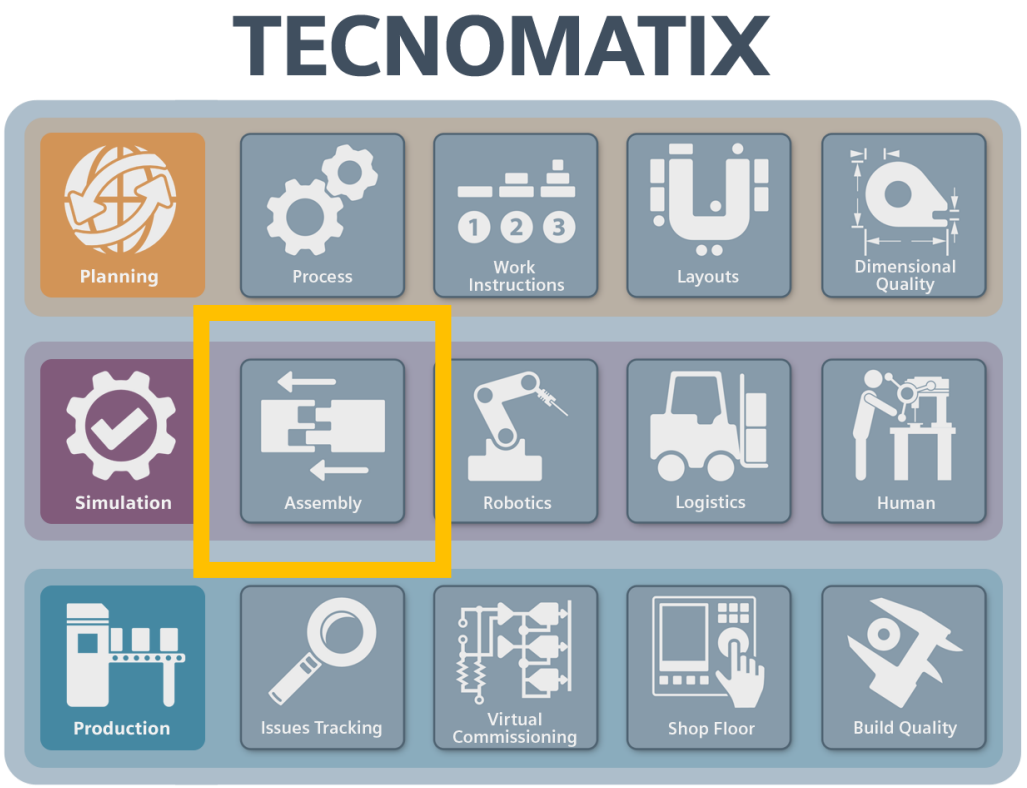




TOP 16 CAR PRODUCERS

TOP 16 PRODUCERS	DESIGN	PLM	PRODUCTION
BMW		TEAMCENTER	TECNOMATIX
Daimler	NX	TEAMCENTER	TECNOMATIX
Fiat	NX	TEAMCENTER	TECNOMATIX
Ford		TEAMCENTER	TECNOMATIX
General Motors	NX	TEAMCENTER	TECNOMATIX
Hyundai			TECNOMATIX
Honda		TEAMCENTER	TECNOMATIX
Chana	NX		
Chrysler	NX	TEAMCENTER	TECNOMATIX
Mazda	NX	TEAMCENTER	TECNOMATIX
Nissan	NX	TEAMCENTER	TECNOMATIX
PSA			
Renault			TECNOMATIX
Suzuki	NX	TEAMCENTER	TECNOMATIX
Toyota			TECNOMATIX
VW/Audi		TEAMCENTER	TECNOMATIX

Tecnomatix Assembly



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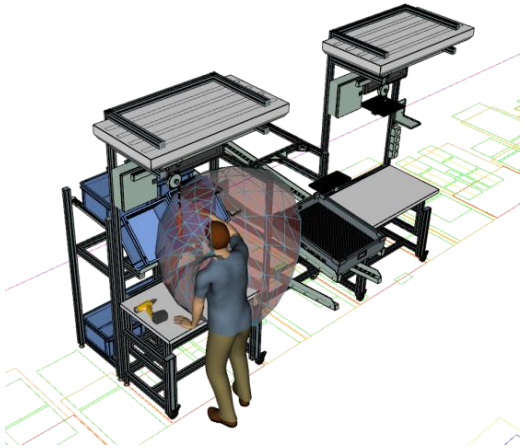
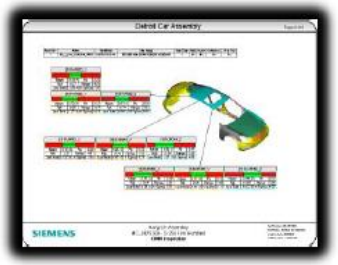
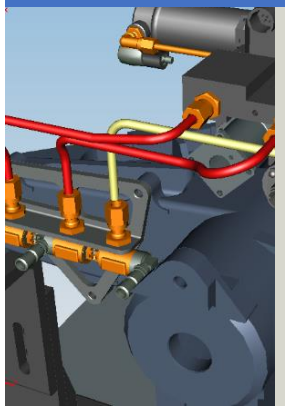


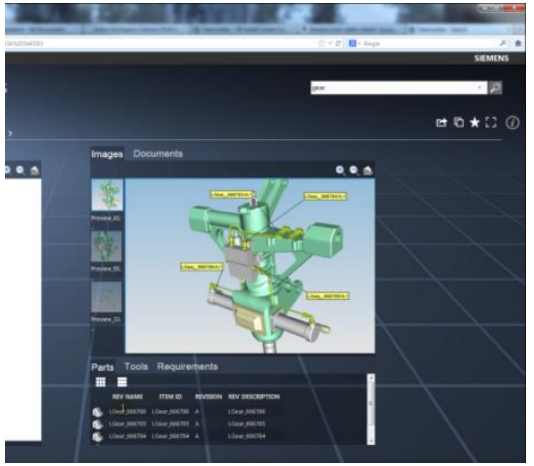


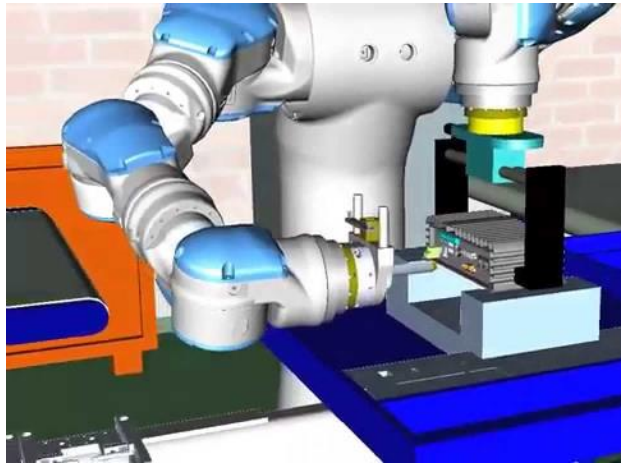
Assembly Planning

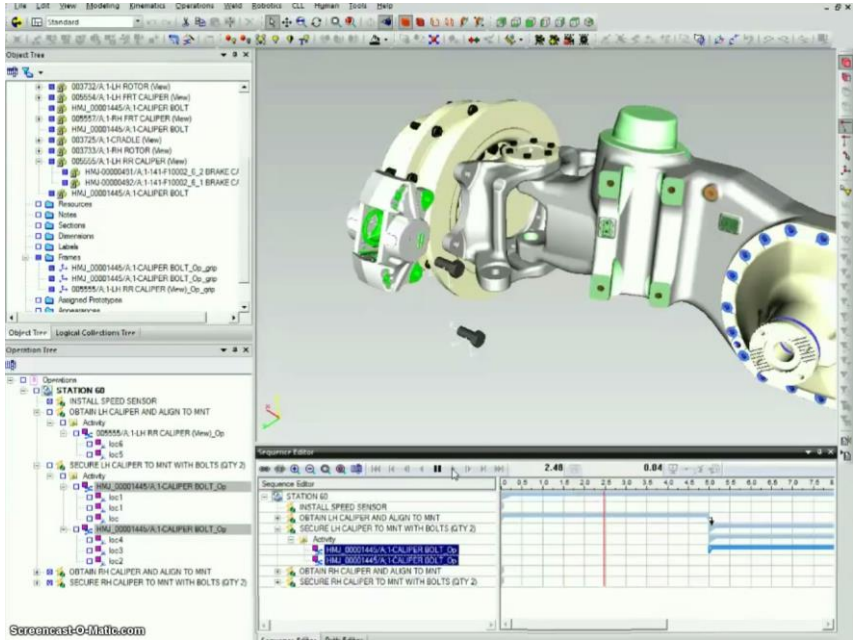
Assembly / Disassembly

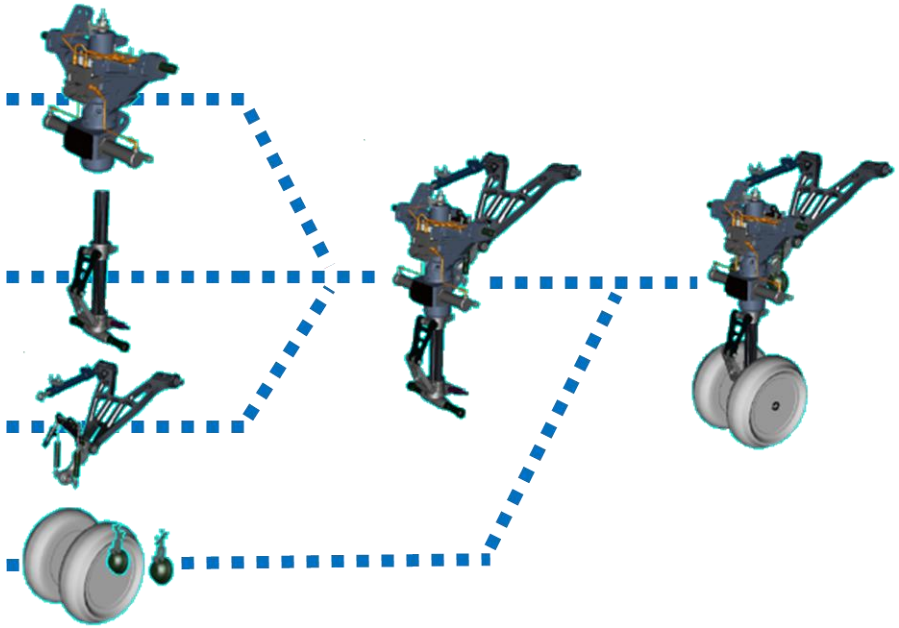


- Feasibility study
- Automatic path planner and operations order
- 3D kinematic simulation
- Operation sequence
- Dynamic collision detection

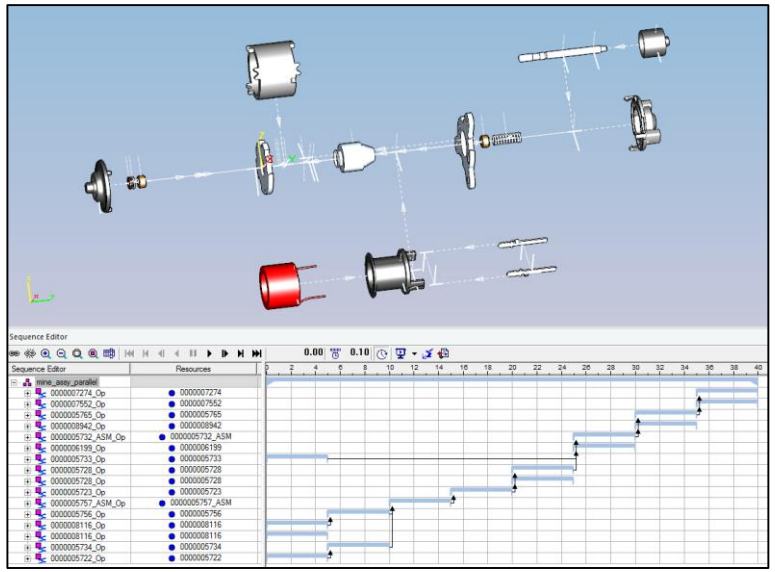


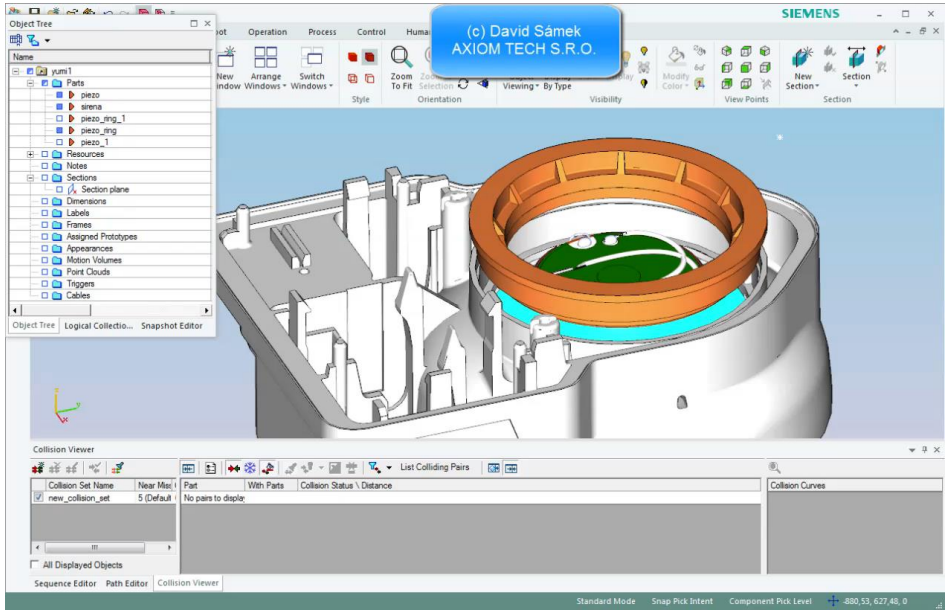


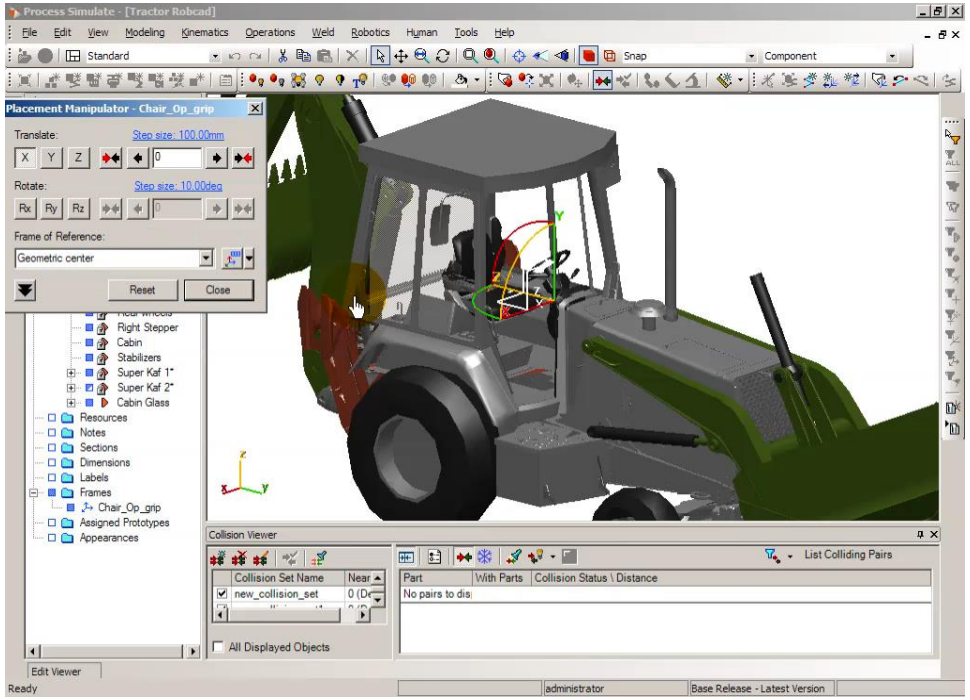




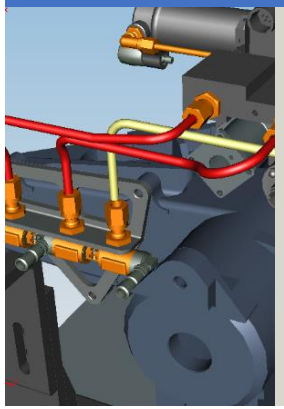
Assembly Planning







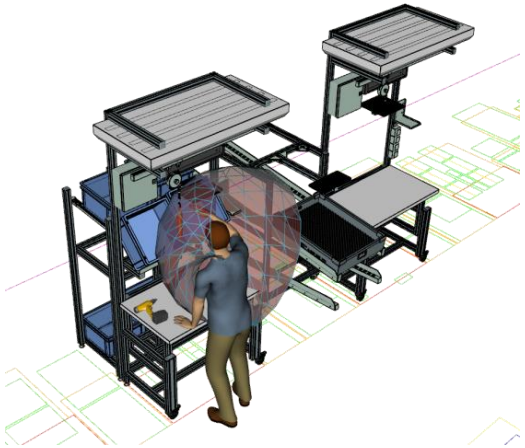
Assembly / Disassembly

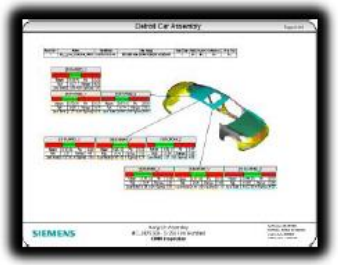


- Gantt chart
- Automatic Path Planner
- Collision detection

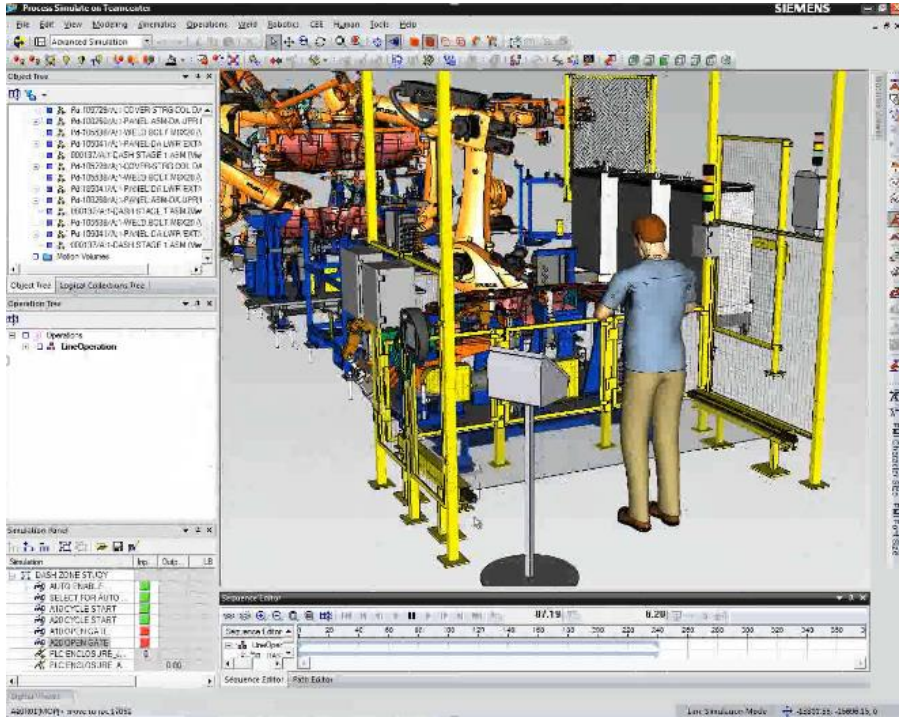
Tecnomatix Human

Solutions to cover manufacturing challenges





Tecnomatix Robotics



Line layout

- Design and optimization

3D environment

- intuitive work

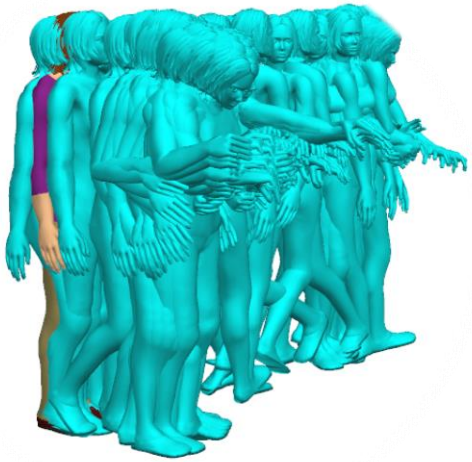
Off-line robots programming

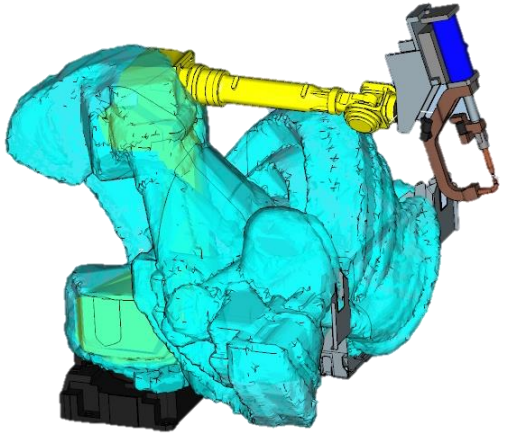
- resulting code could be directly loaded and run in the robot

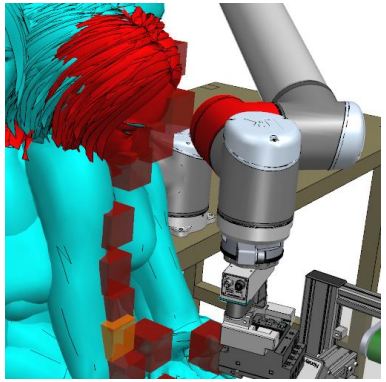
Simulation

- optimization of robot program / line design, including conveyors, safety equipment, tooling, fixtures, PLC control, sensors

Tecnomatix Robotics: Human - Robot Collaboration







Dynamic Collision Report

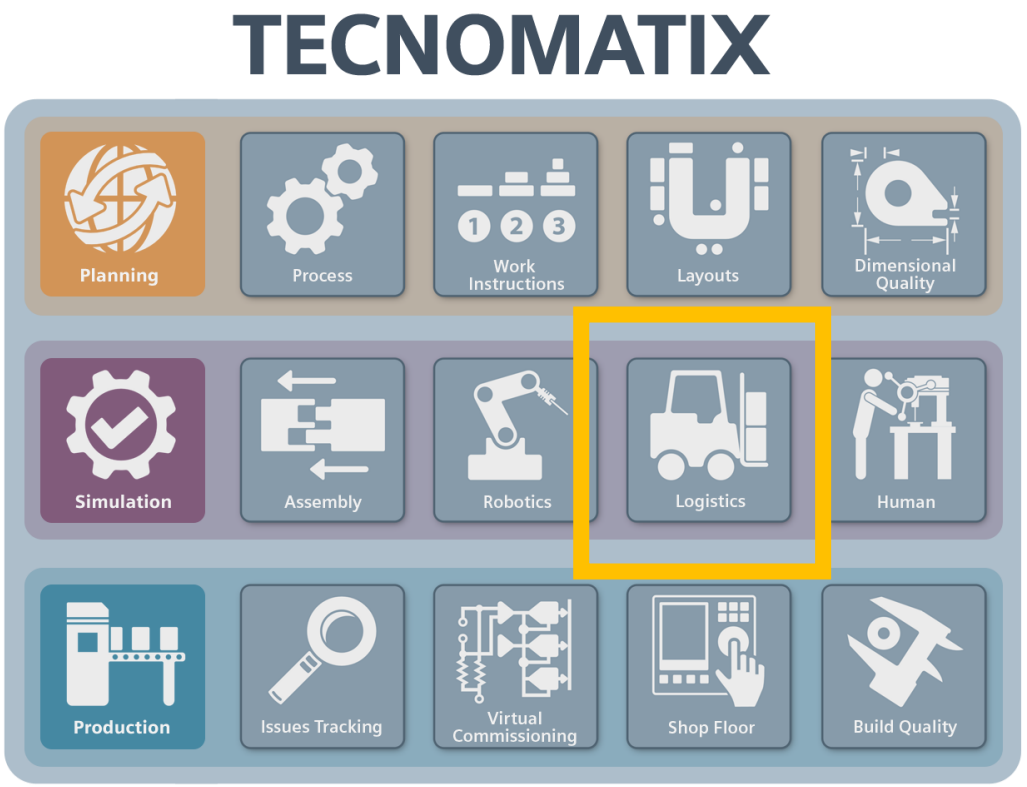
Main

Time	Object A	Object B	Violation Status	Violation Value
2.4	Device .	Weld gun	Near Miss	14.95
2.6	000241/	Weld gun	Near Miss	6.04
2.6	Device .	Weld gun	Collision	149.06
2.8	000243/	Weld gun	Near Miss	9.34

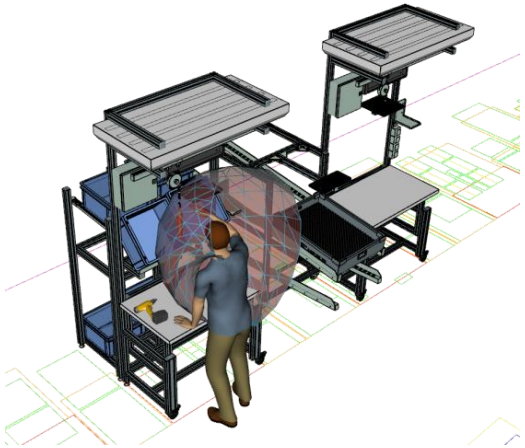
Minimal Distance Report

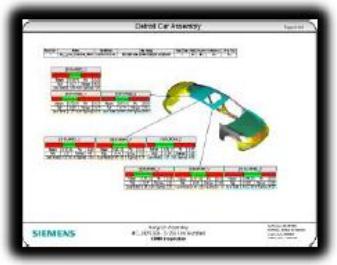
Time	Collision Set	Object A	Object B	Minimal Distance
0.00	new_collision_set	Jill	Workbench3	173.80
0.10	new_collision_set	Jill	Workbench3	179.21
0.20	new_collision_set	Jill	Workbench3	187.55
0.30	new_collision_set	Jill	Workbench3	196.12
0.40	new_collision_set	Jill	Workbench3	204.90
0.50	new_collision_set	Jill	Workbench3	213.53
0.60	new_collision_set	Jill	Workbench3	217.30
0.70	new_collision_set	Jill	Workbench3	212.22
0.80	new_collision_set	Jill	Workbench3	207.54
0.90	new_collision_set	Jill	Workbench3	203.48
1.00	new_collision_set	Jill	Workbench3	199.76
1.10	new_collision_set	Jill	Workbench3	198.60
1.20	new_collision_set	Jill	Workbench3	193.13
1.30	new_collision_set	Jill	Workbench3	184.56
1.40	new_collision_set	Jill	Workbench3	174.27
1.50	new_collision_set	Jill	Workbench3	166.99

Tecnomatix Plant Simulation



Solutions to cover manufacturing challenges





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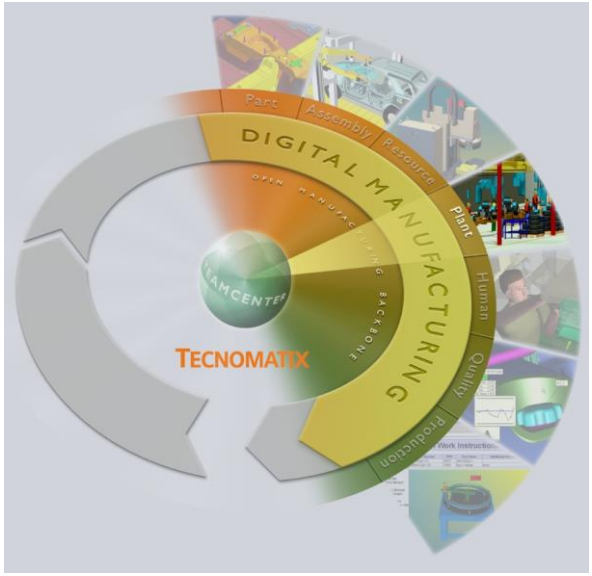
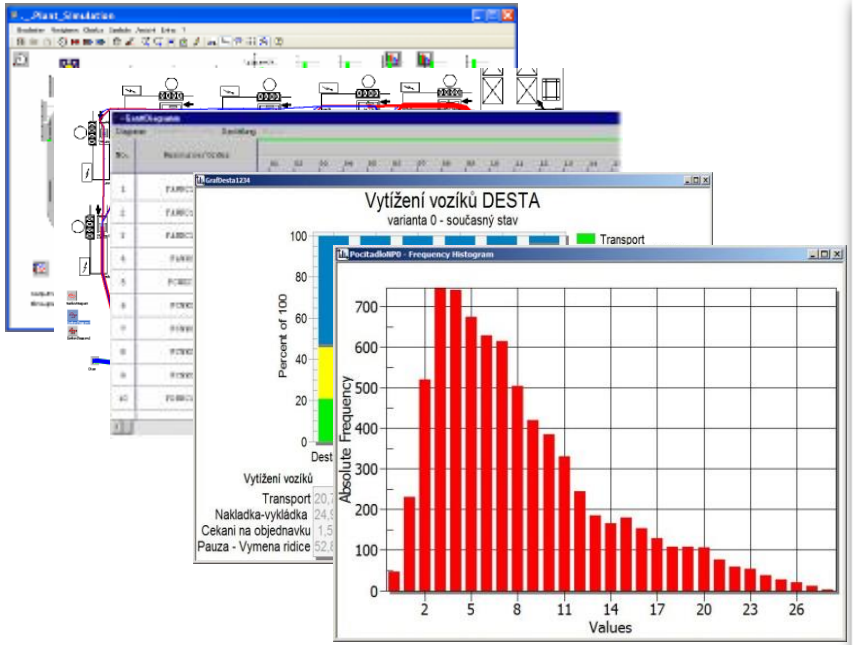
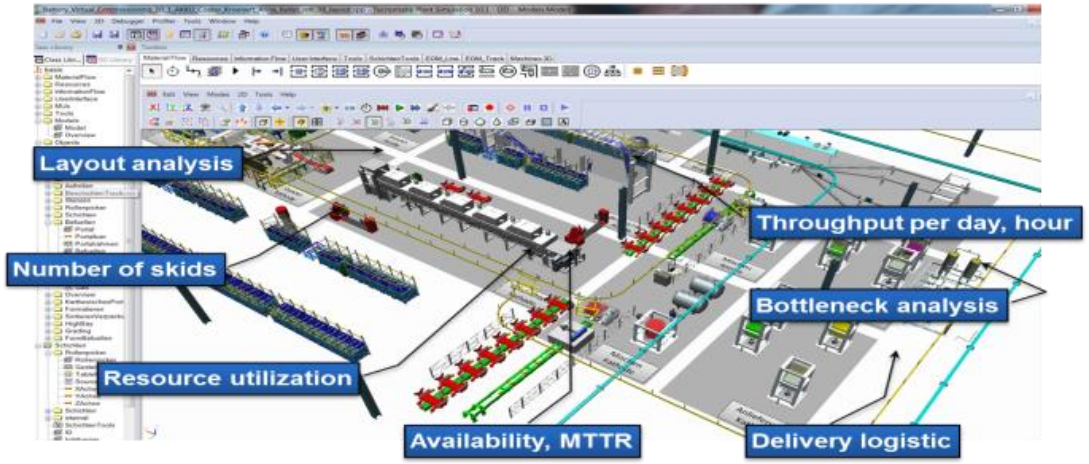
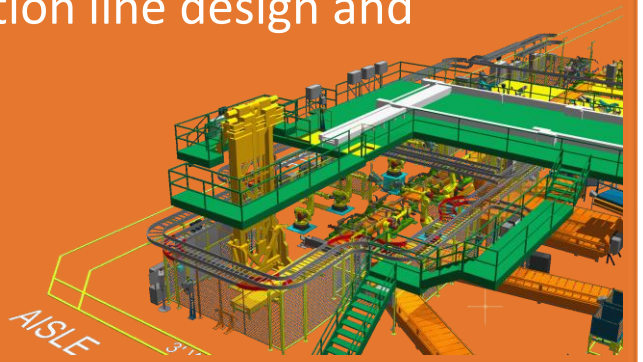






- Improve productivity of existing facilities
- Reduce investment in planning new facilities
- Cut inventory and throughput time
- Optimize system dimensions, including buffer sizes
- Reduce investment risks through early proof of concept
- Maximize use of manufacturing resources
- Improve production line design and schedule



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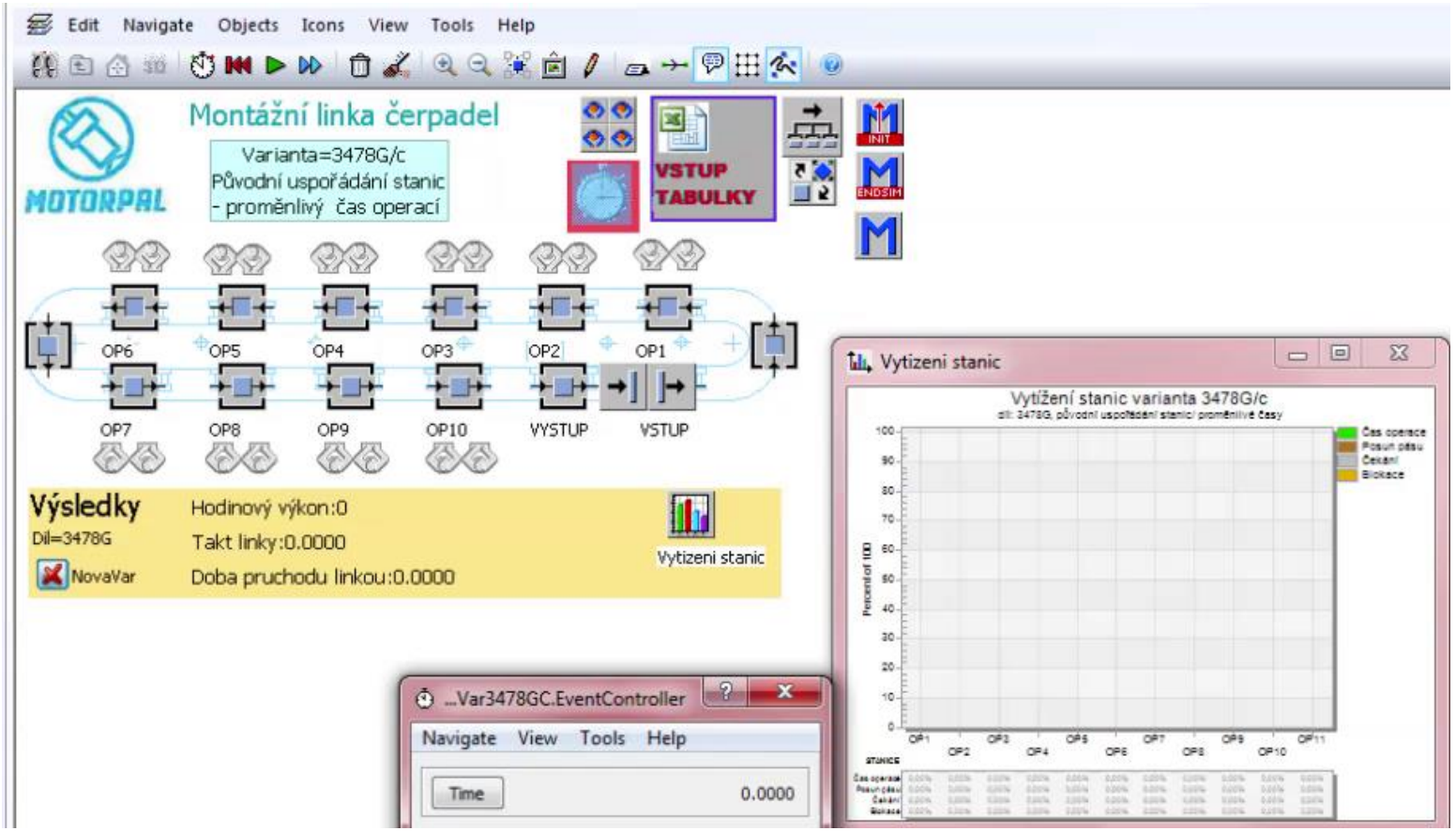
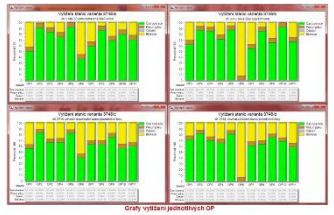


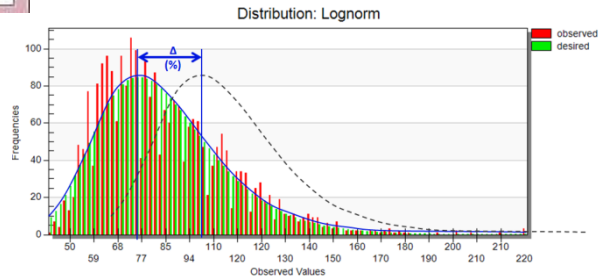
Benefits:

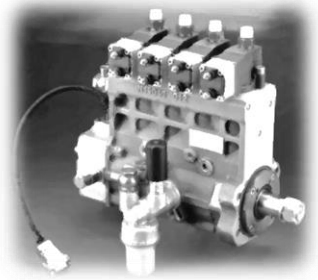
- Validation of designed measures in assembly process
- Identification of the bottle-necks.
- Statistic evaluation of the operation times and workloads
- Suggestion of final measures with clear ROI

Směrodatné odchylky	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8	OP9	OP10	ø
Statistiky 3478G - směrod. odch.	26,44	29,95	24,58	24,26	20,73	23,55	22,71	26,74	27,65	19,82	24,64
Statistiky 3492 - směrod. odch.	27,99	37,74	27,07	26,47	23,07	26,34	27,01	26,32	29,16	23,67	27,48
Statistiky 3522 - směrod. odch.	28,40	26,68	27,11	27,37	17,40	23,76	20,70	26,14	32,44	34,40	26,44
Statistiky 3707 - směrod. odch.	22,44	64,08	54,06	59,24	61,38	43,74	27,98	27,51	28,99	17,63	40,70
Statistiky 3748 - směrod. odch.	21,66	34,24	23,43	30,89	19,35	25,54	30,57	27,93	24,74	30,14	26,85

Legenda:
- nejvyšší SO
- druhá nejvyšší SO
- nadprůměrná SO
- podprůměrná SO







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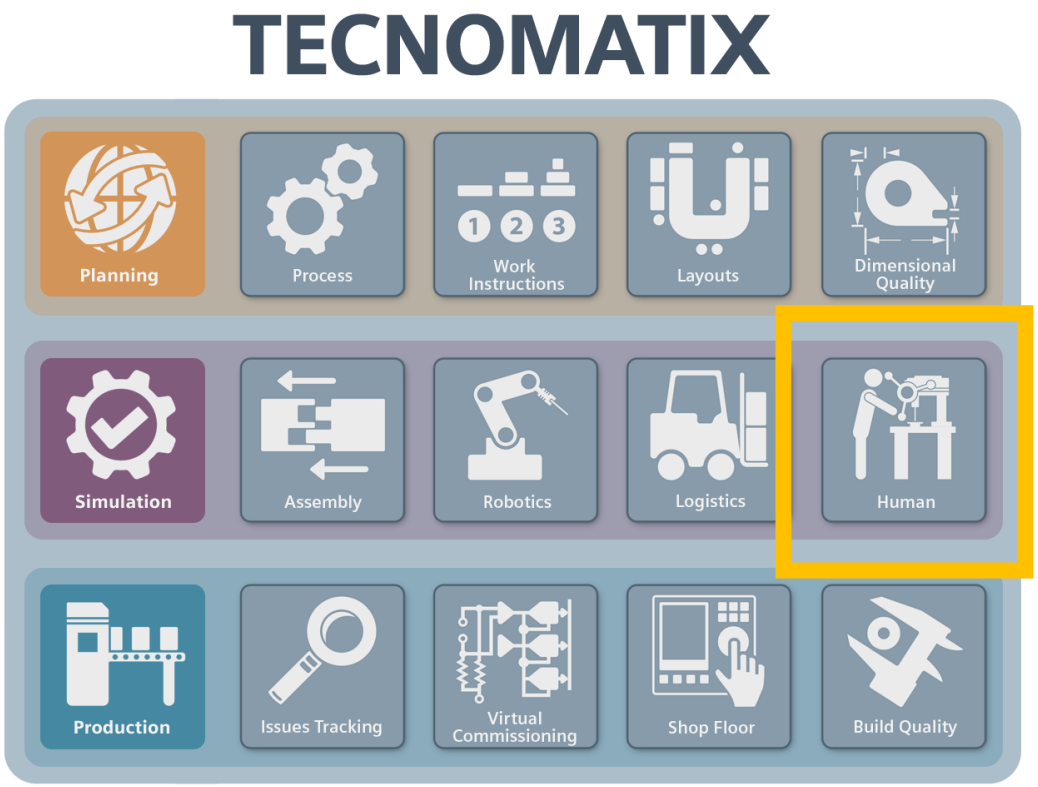
Tecnomatix Human



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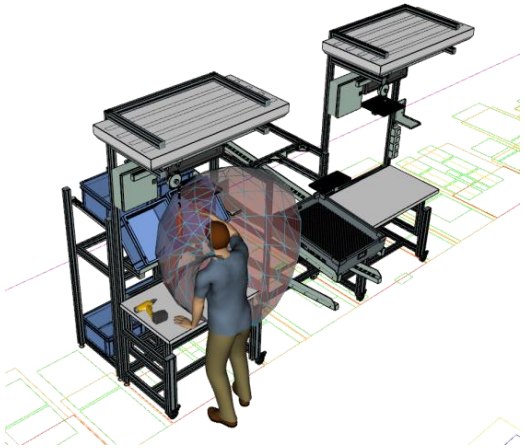
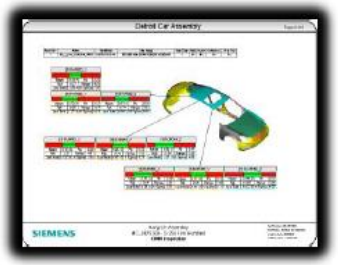
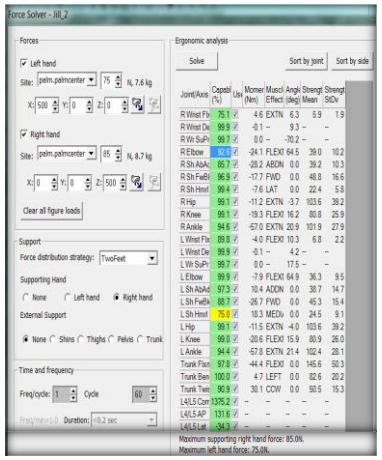


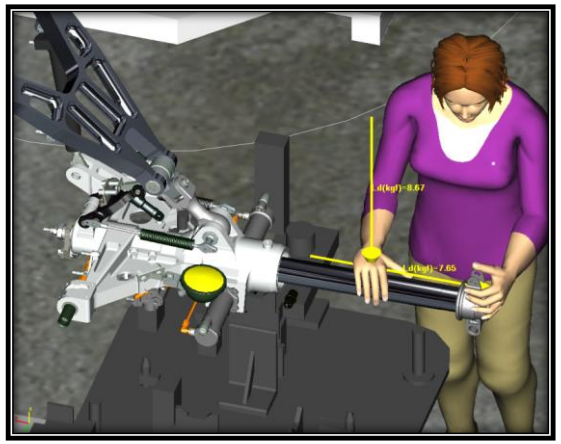


Digital Human Modelling

- Reduce cost of change with early detection (digital twin)
- Reduce cost & eliminate human factor issues upfront
- Increase productivity of new or existing production facilities
- Optimize ROI for capital equipment investments
- Increase efficiency of manual operations
- Validate workspace configurations and protect worker safety
- Utilize Anthropomorphic models that represent the workforce

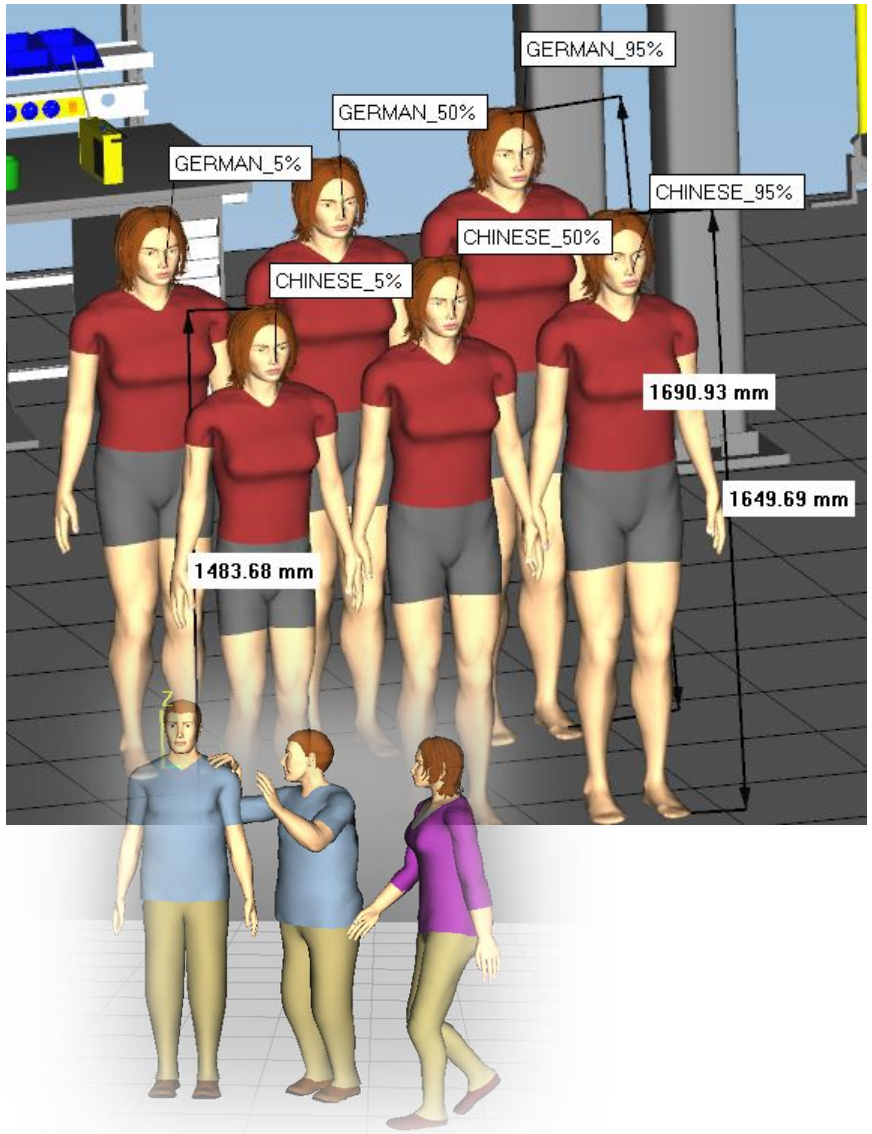
Tecnomatix Human

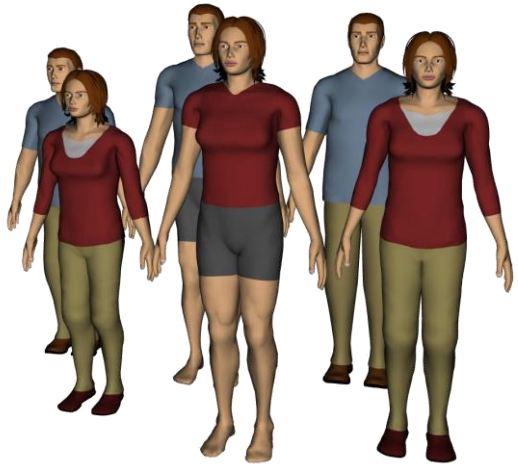


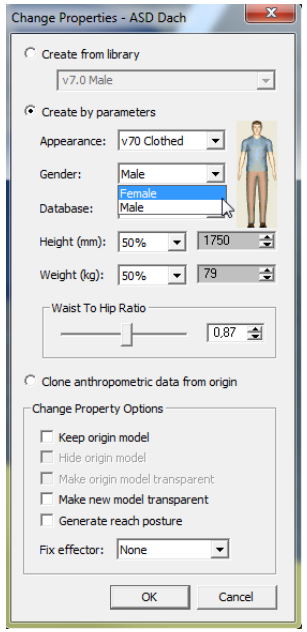


- Human Centered Design Process (1st person perspective)
- Relevant physical human factors assessments throughout the product lifecycle in most industries
- Broad ergonomic tools for comprehensive ergonomic assessment
- Accurate figure models for fit, reach, vision
- Powerful posture prediction for automated and repeatable prediction of task postures
- Easy to use Task Simulation Builder for process simulation
- Virtual Reality support for accelerated exploration of new product, workstation and process designs.

Tecnomatix Human: Figure Anthropometry

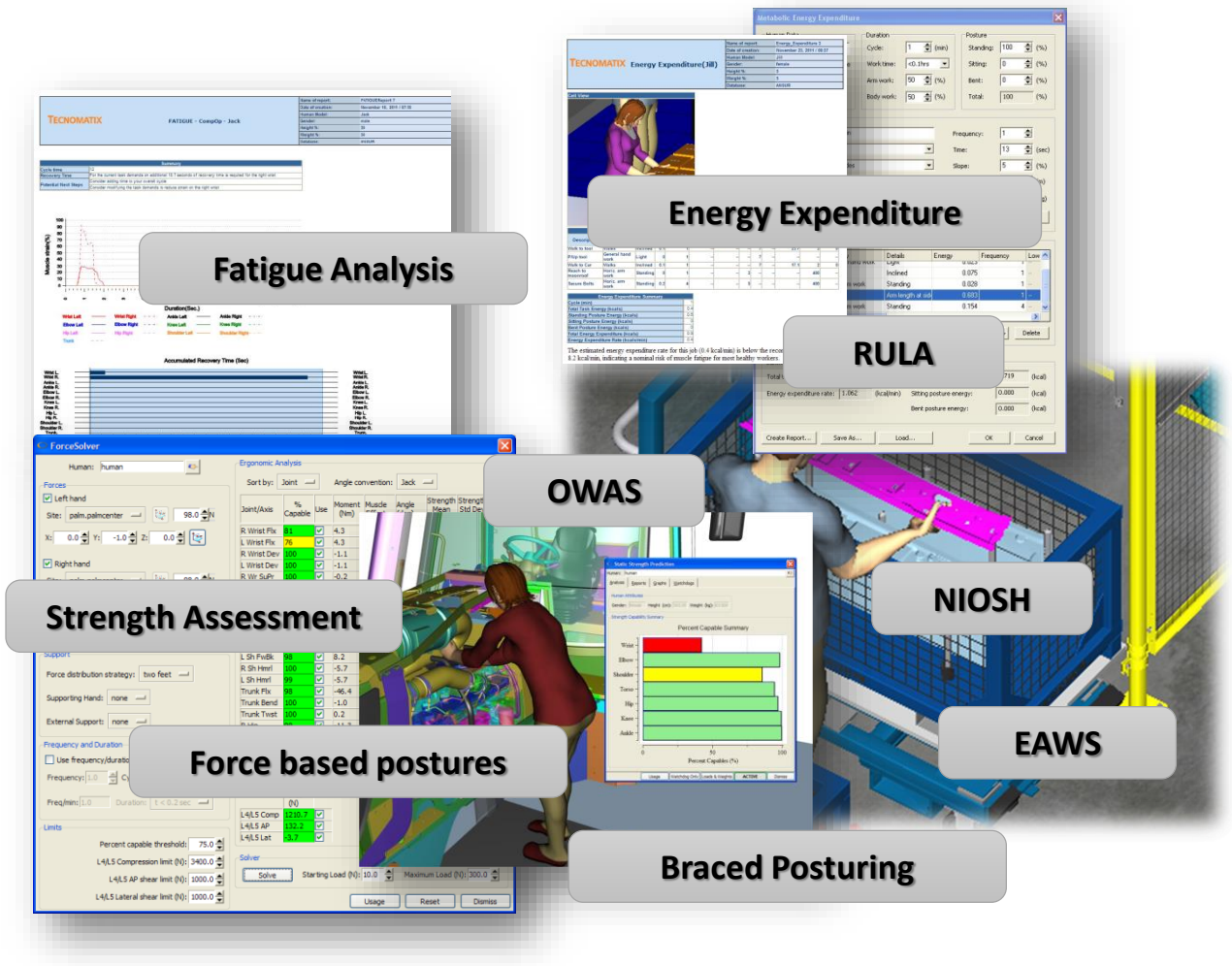






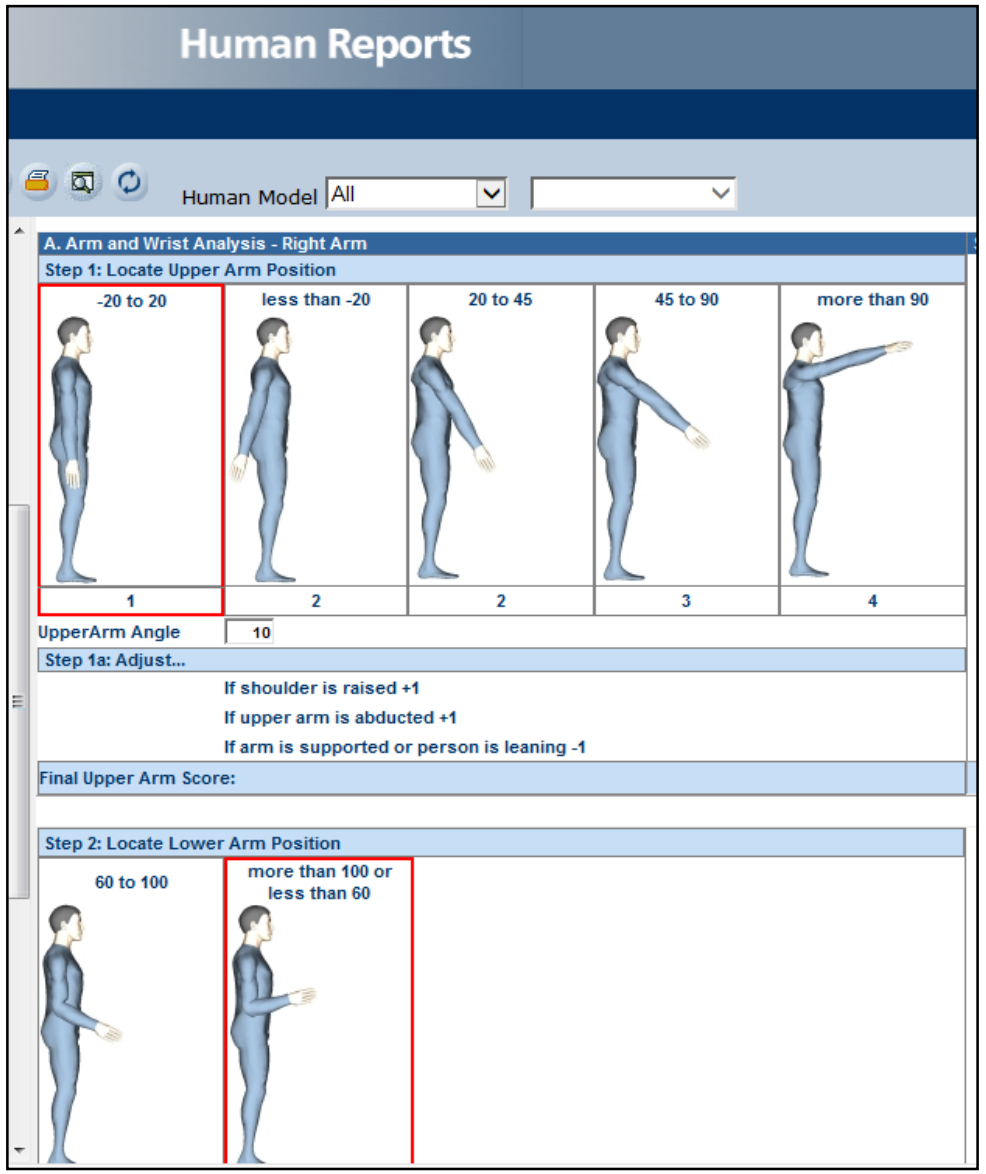
- Anthropomorphic models that represent the workforce
- Accurate Human figures to represent workers from around the World
- Fully articulated spine and hands
- Independently articulated eyes
- Deformable skin on the human manikin surface provides realistic simulation
- Detailed hand models based on scans

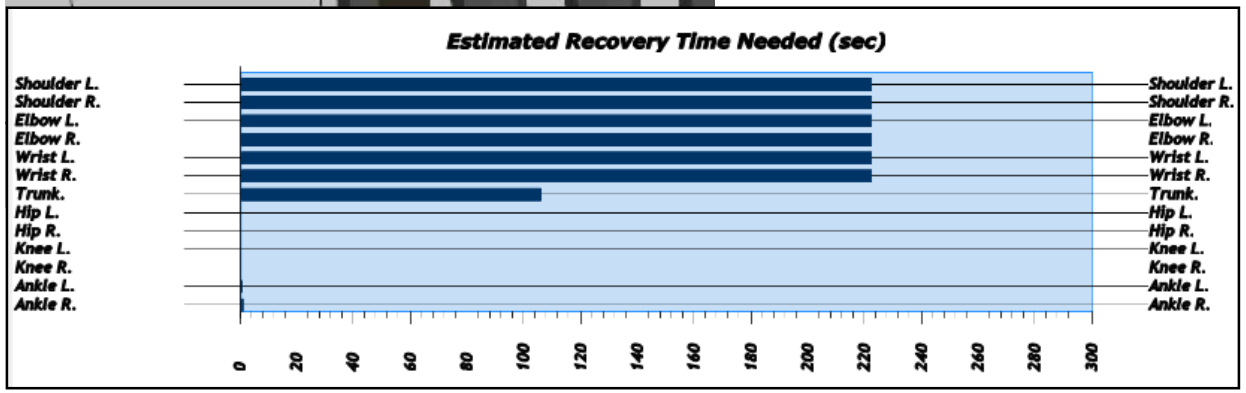
Tecnomatix Human: Human Performance Tools



- Comprehensive human performance capability assessment
- Strength, low back injury risk, posture analysis and fatigue assessment
- Quantitative numbers for engineering decisions
- Industrial standards integrated
- Reports with figures and tables

Tecnomatix Human: Human Performance Tools

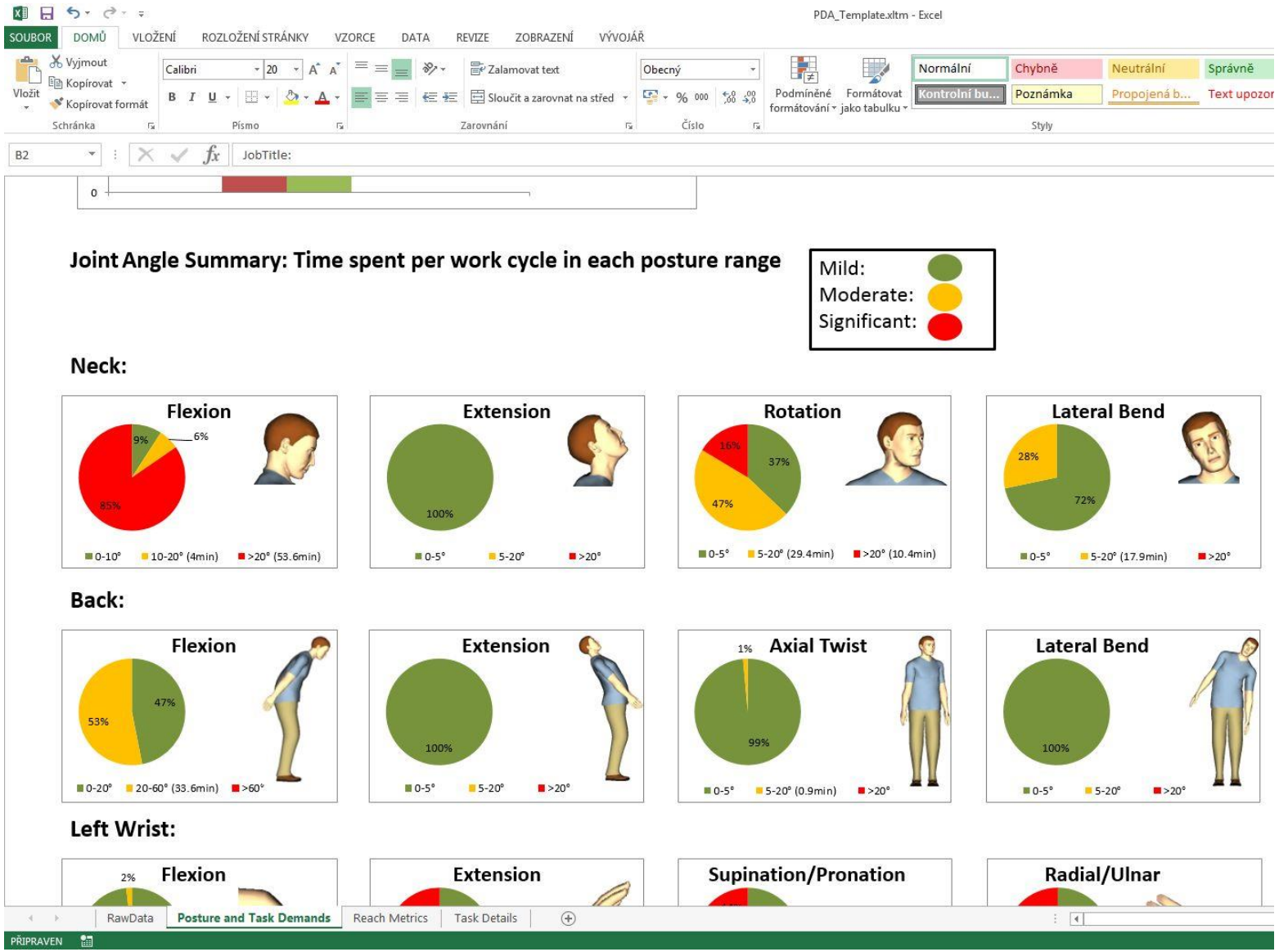




- Reports with figures and tables
- Report Viewer
- Reports are printable files, that can be sent by email

Tecnomatix Human: Human Performance Tools

Tecnomatix Human: Human Performance Tools



- Ergonomics Metrics Report
- XLS file
- Time evaluation of work postures during a shift

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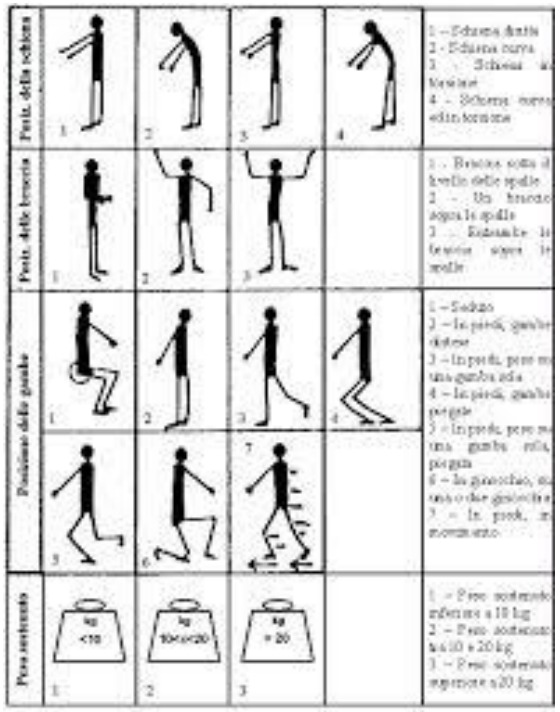
Tecnomatix Human: Human Performance Tools

OWAS

-Ovako Working posture Analyzing System



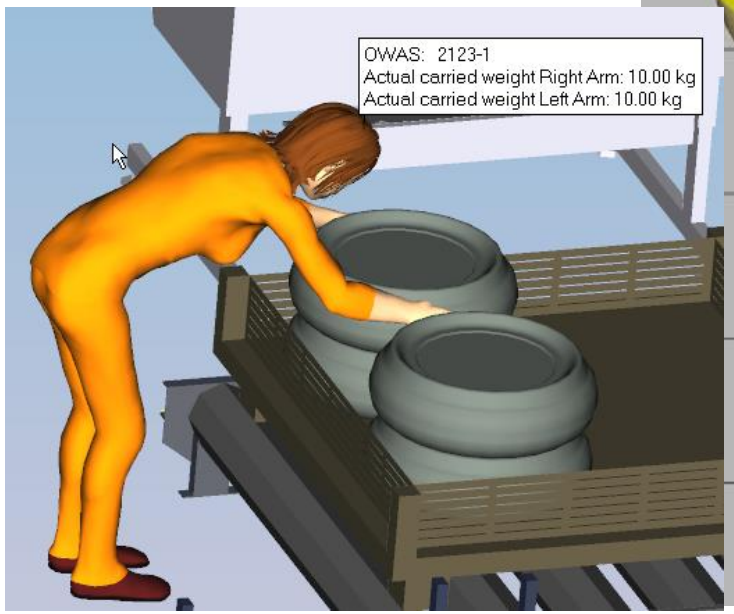
PIERNAS																							
CARGA/FUERZA	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS	MENOS DE 10 KGS	ENTRE 11 Y 20 KGS	MAS DE 20 KGS
ESPALDA	BRAZOS																						
1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1
	3	1	1	1	1	1	1	1	1	1	2	3	2	2	2	3	1	1	1	1	1	2
2	1	2	2	3	2	2	3	2	2	2	3	3	3	3	3	3	2	2	2	2	3	3
	2	2	2	3	2	2	3	2	2	3	3	3	4	3	4	4	3	3	4	2	3	4
	3	3	3	4	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4	2	3	4
3	1	1	1	1	1	1	1	1	1	2	3	3	4	4	4	1	1	1	1	1	1	1
	2	2	2	3	1	1	1	1	1	1	2	4	4	4	4	4	3	3	3	1	1	1
	3	2	2	3	1	1	1	2	2	3	3	4	4	4	4	4	4	4	4	1	1	1
4	1	2	3	3	2	2	3	2	2	2	3	4	4	4	4	4	4	4	4	2	3	4
	2	3	3	4	2	3	4	3	3	3	4	4	4	4	4	4	4	4	4	2	3	4
	3	4	4	4	2	3	4	3	3	3	4	4	4	4	4	4	4	4	4	2	3	4

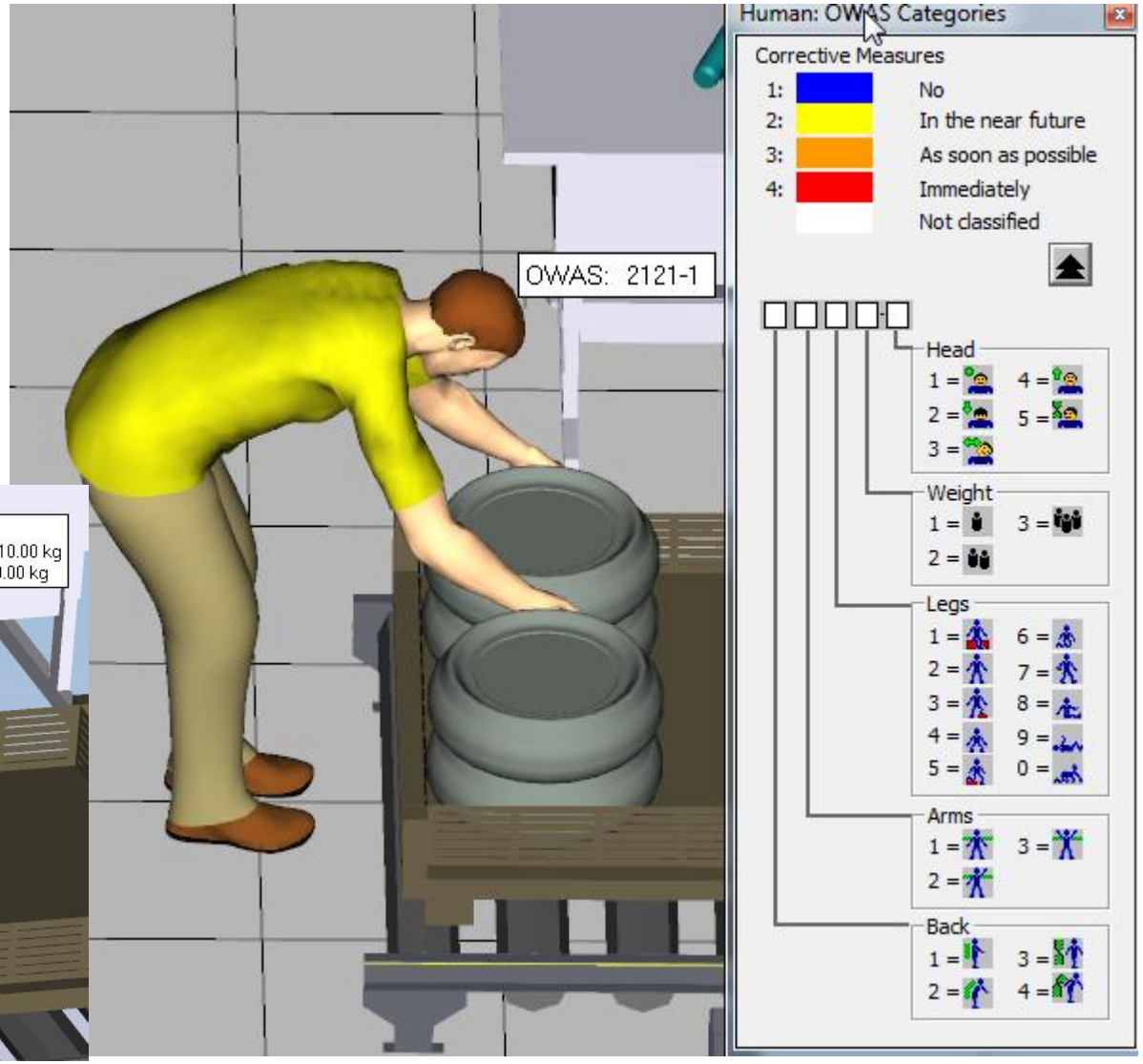
FUENTE: ESPECIALISTA YAJAIRA CÁRDENAS A. 2011.
ELABORACIÓN PROPIA PARA UN MEJOR ENTENDIMIENTO.

Tecnomatix Human: Human Performance Tools

OWAS

-Ovako Working posture Analyzing System





Tecnomatix Human: Human Performance Tools

NIOSH (National Institute for Occupational Safety and Health)

-manual lifting operations

1. THE REVISED LIFTING EQUATION

This section provides the technical information for using the revised lifting equation to evaluate a variety of two-handed manual restrictions/limitations, revised lifting equation

1.1 Definition of Terms

1.1.1 Recommended Weig

The RWL is the principal equation. The RWL is def as the weight of the load t perform over a substantial without an increased risk ***healthy workers***, we mean conditions that would incr

The RWL is defined by th

RWL = LC X HM

A detailed description of t are provided in Section 1.3

1.1.2. Lifting Index (LI)

The LI is a term that provi physical stress associated The estimate of the level relationship of the weight weight limit

The LI is defined by the following equat

$$LI = \frac{\text{Load Weight}}{\text{Recommended Weigh}}$$

1.1.2. Terminology and Data Definitions

The following list of brief definitions is revised NIOSH lifting equation. For det terms, refer to the individual sections wh Methods for measuring these variables ar in Sections 1 and 2.

Lifting Task	Defined as the act of mar of definable size and mas vertically moving the obj assistance.
Load Weight (L)	Weight of the object to b kilograms, including the
Horizontal Location (H)	Distance of the hands aw between the ankles, in in (measure at the origin an Figure 1.
Vertical Location (V)	Distance of the hands abo or centimeters (measure a destination of lift). See F
Vertical Travel Distance (D)	Absolute value of the diff vertical heights at the destination and origin of the lift, in inches or centimeters.
Asymmetry Angle (A)	Angular measure of how far the ***object*** is displaced from the front (mid-sagittal plane) of the worker's body at the beginning or ending of the lift, in

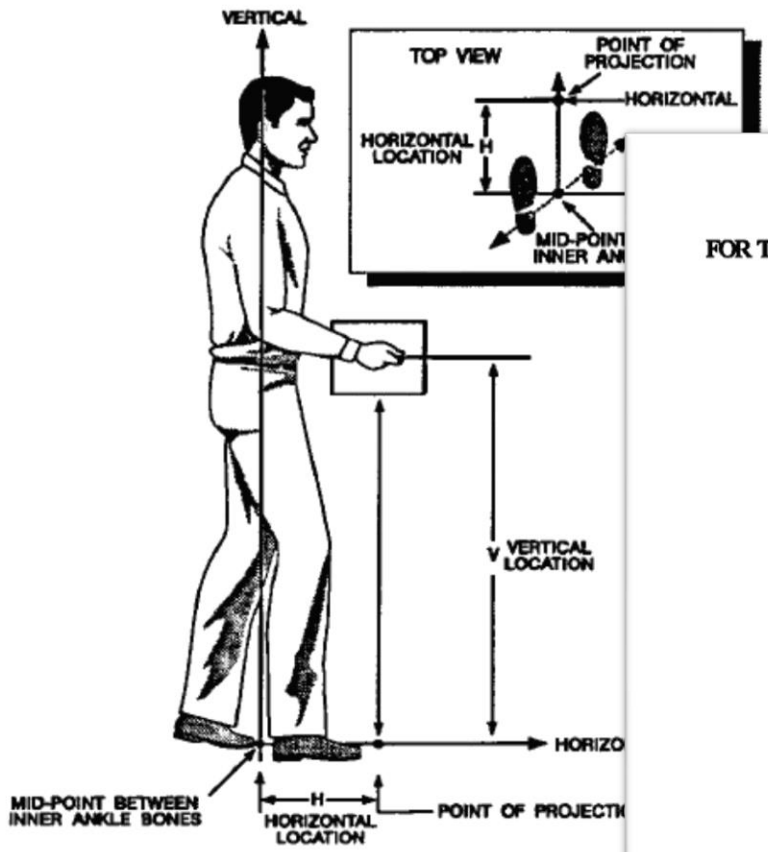


Figure 1 Graphic Representation of Hand L

APPLICATIONS MANUAL
FOR THE REVISED NIOSH LIFTING EQUATION

Thomas R. Waters, Ph.D.
Vern Putz-Anderson, Ph.D.
Arun Garg, Ph.D.

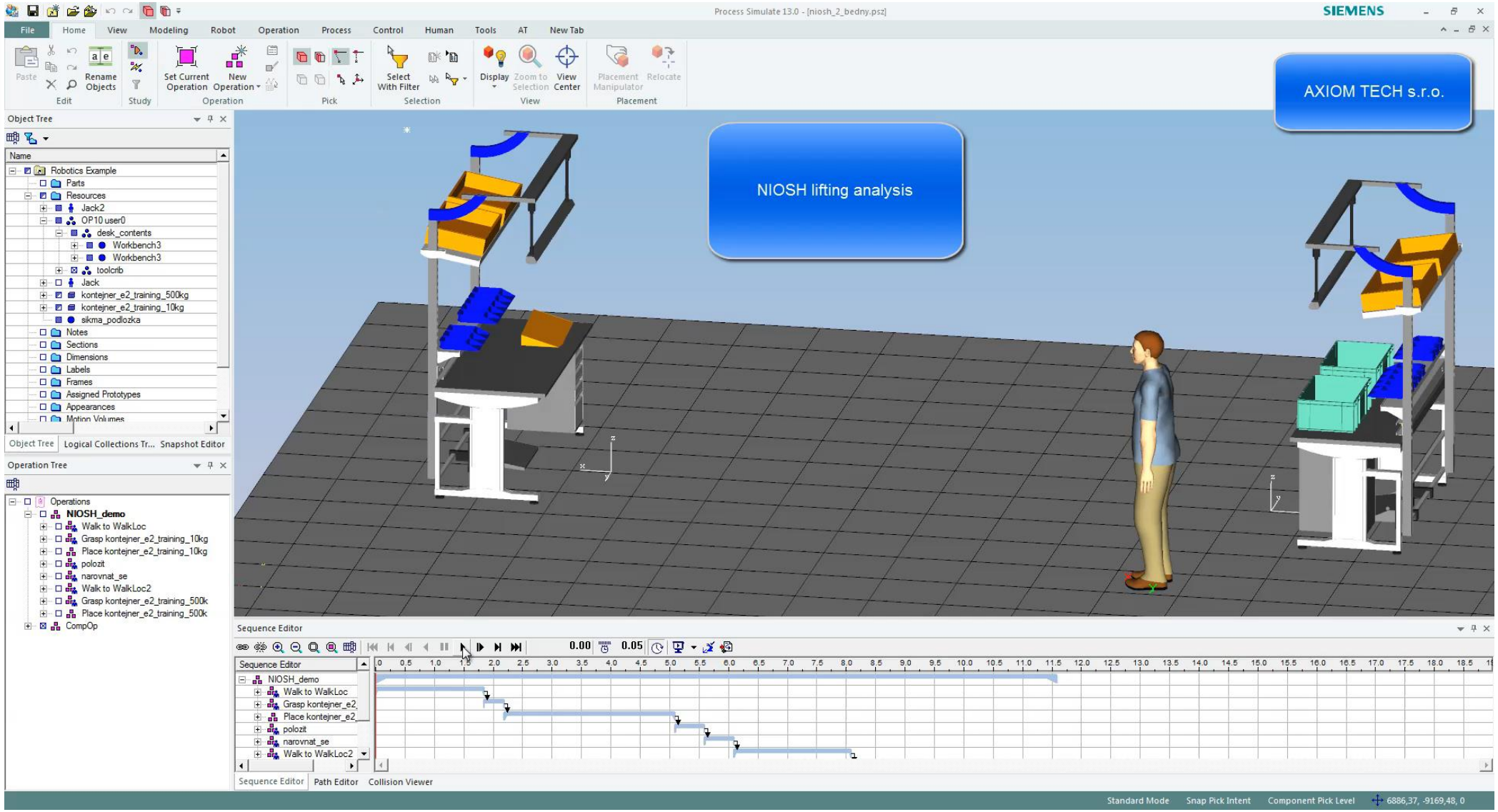
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
Division of Biomedical and Behavioral Science
Cincinnati, Ohio 45226

January 1994

Tecnomatix Human: Human Performance Tools

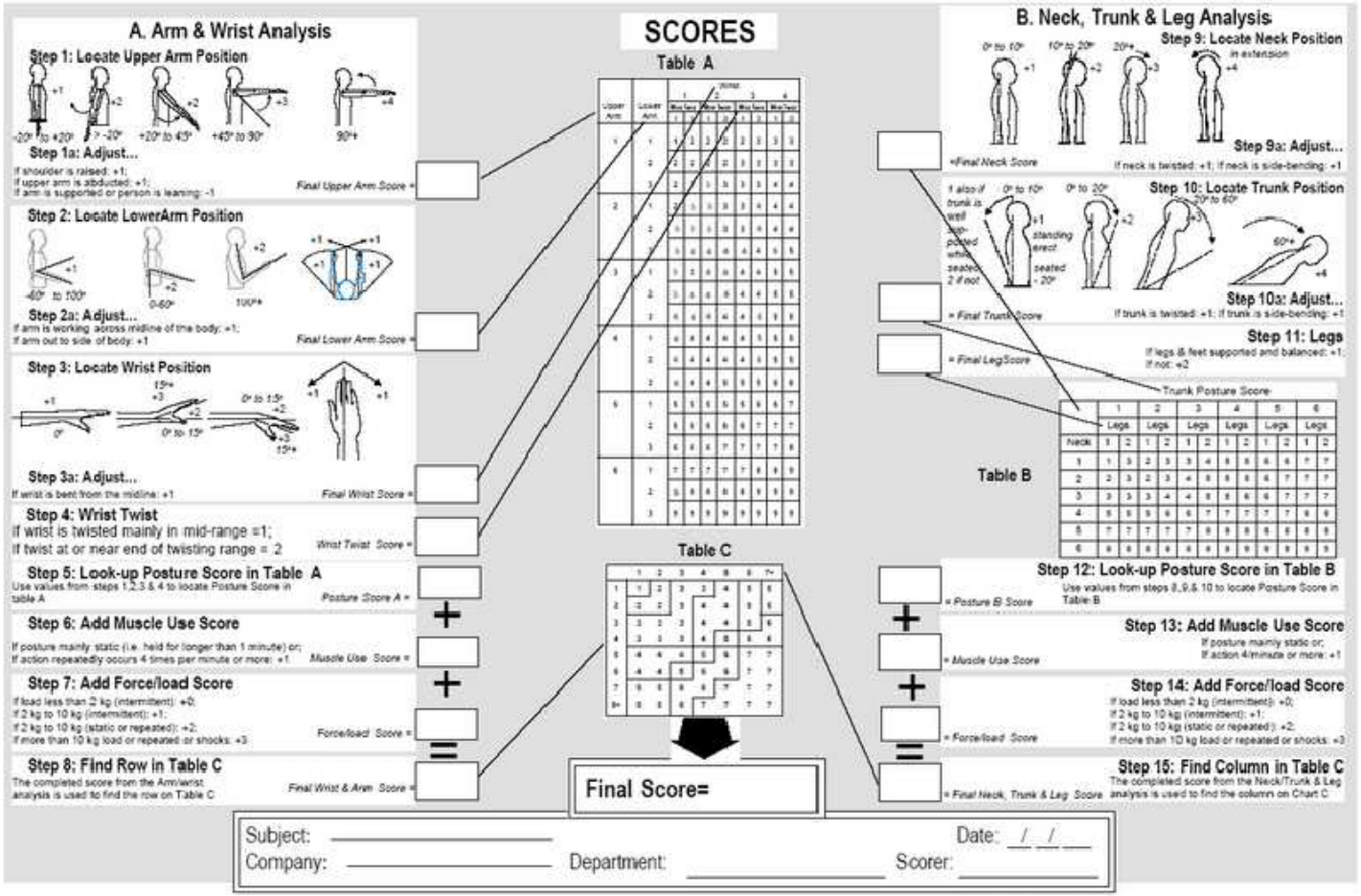
NIOSH (National Institute for Occupational Safety and Health)

-manual lifting operations



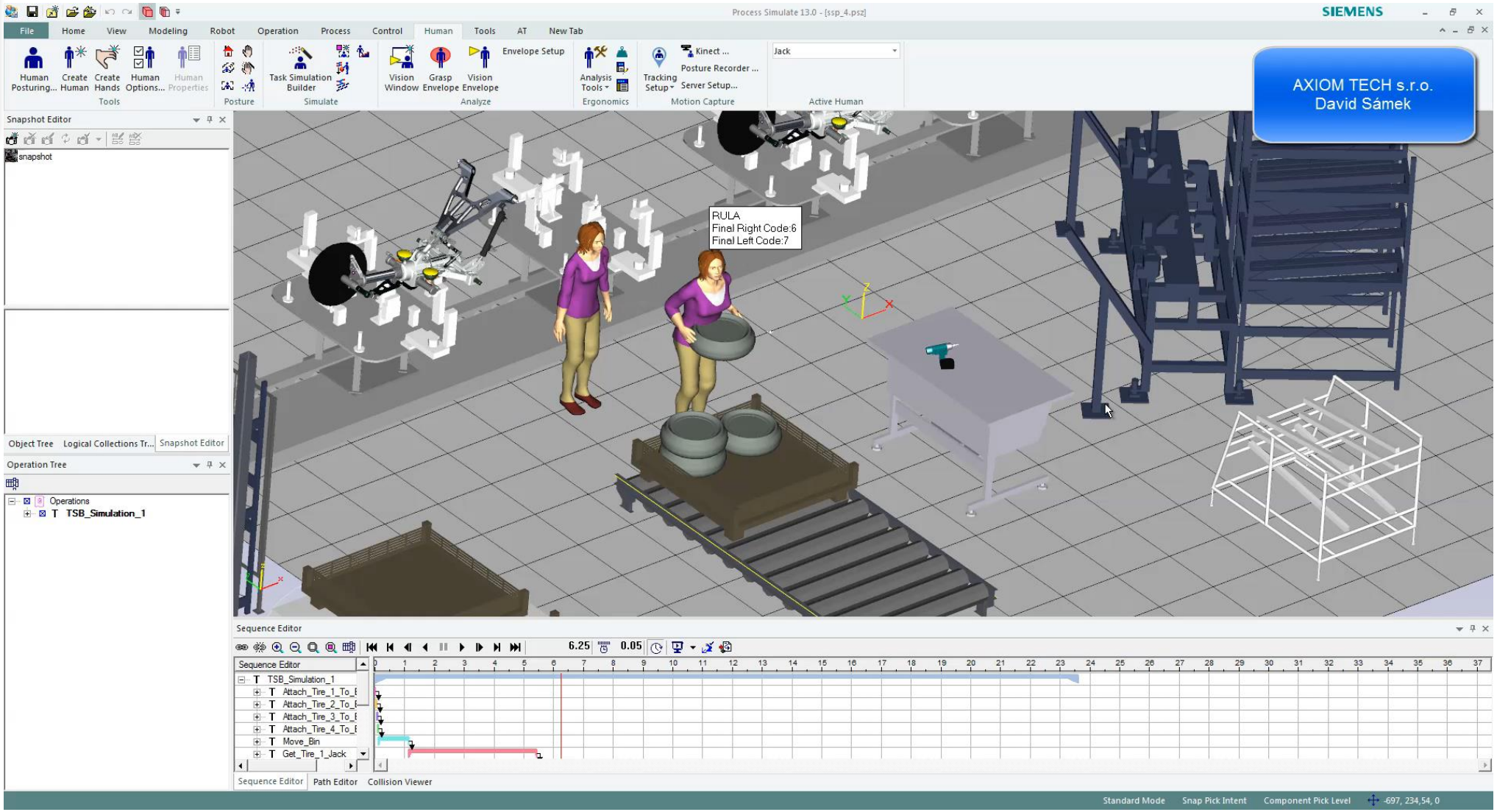
Tecnomatix Human: Human Performance Tools

RULA - Rapid Upper Limb Assessment



Tecnomatix Human: Human Performance Tools

RULA - Rapid Upper Limb Assessment

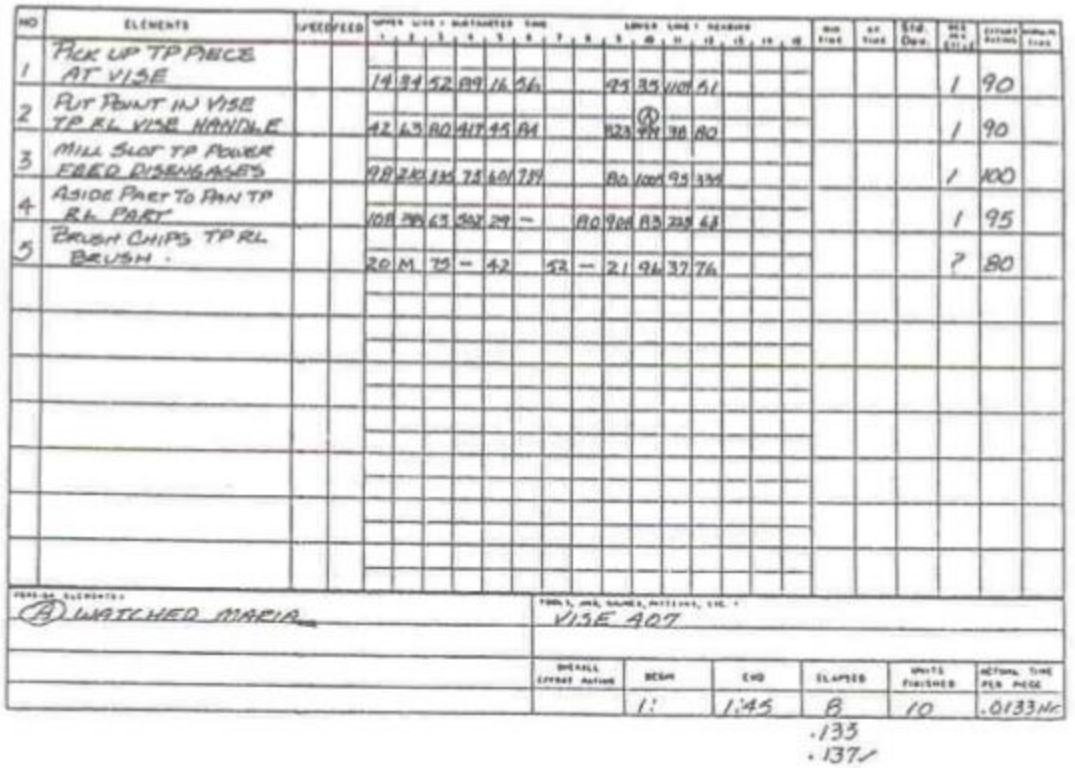


Methods Time Measurement (MTM)

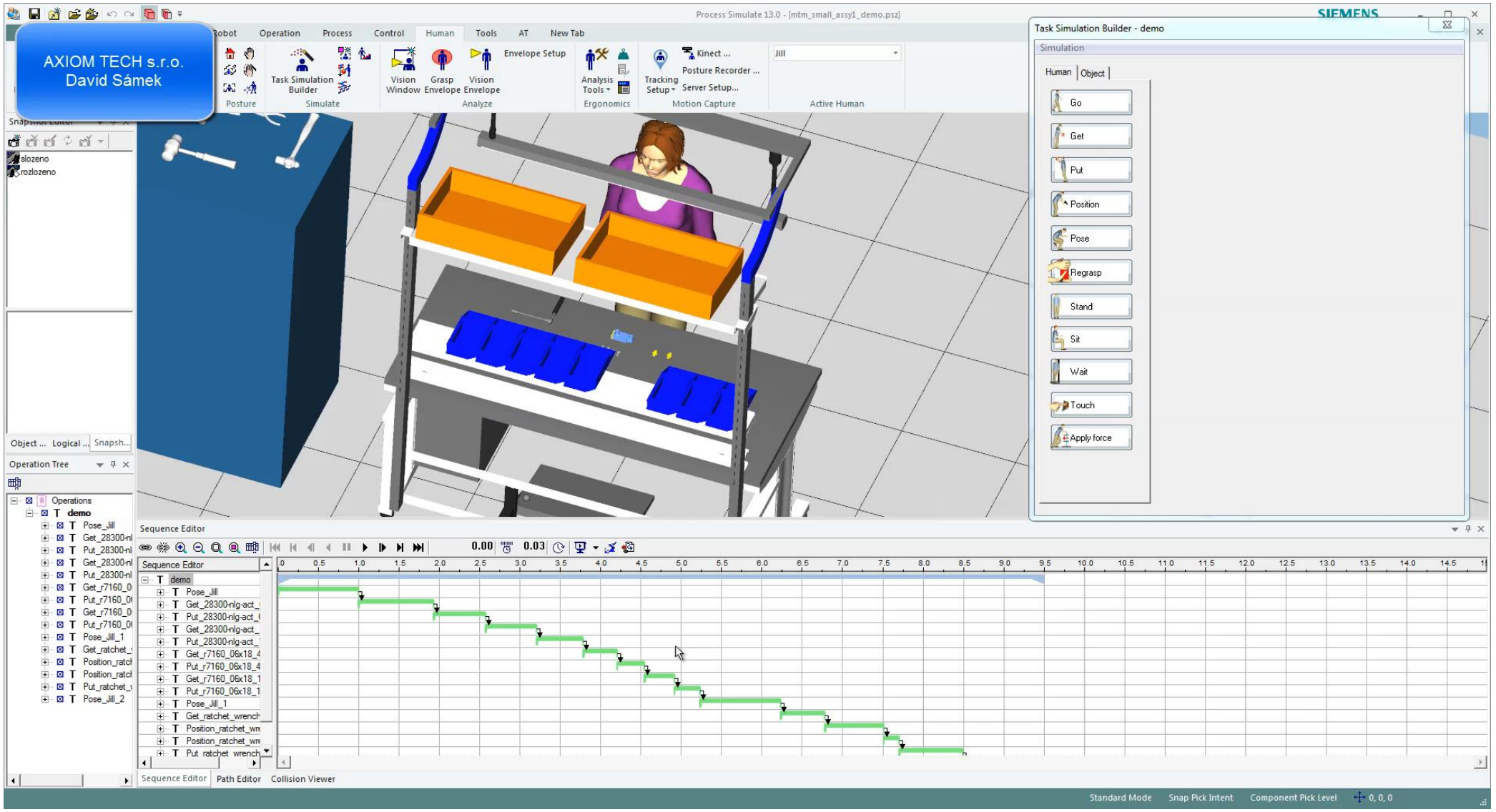
Distance Moved (inches)	TIME (TMU) A	B	C	Hand in Motion B	WEIGHT ALLOWANCE Weight (pounds) up to:	Dynamic Factor	Static Constant TMU	Case and Description
¾ or less	2.0	2.0	2.0	1.7				
1	2.5	2.9	3.4	2.3	2.5	1.00		
2	3.6	4.6	5.2	2.9				
3	4.9	5.7	6.7	3.6	7.5	1.06		
4	6.1	6.9	8.0	4.3				
5	7.3	8.0	9.2	5.0	12.5	1.11		
6	8.1	8.9	10.3	5.7				
7	8.9	9.7	11.1	6.5	17.5	1.17		
8	9.7	10.6	11.8	7.2				
9	10.5	11.5	12.7	7.9	22.5	1.22		
10	11.3	12.2	13.5	8.6				
12	12.9	13.4	15.2	10.0	27.5	1.28		
14	14.4	14.6	16.9	11.4				
16	16.0	15.8	18.7	12.8	32.5	1.33		
18	17.6	17.0	20.4	14.2				
20	19.2	18.2	22.1	15.6	37.5	1.39		
22	20.8	19.4	23.8	17.0				
24	22.4	20.6	25.5	18.4	42.5	1.44		
26	24.0	21.8	27.3	19.8				
28	25.5	23.1	29.0	21.2	47.5	1.50		
30	27.1	24.3	30.7	22.7				
Additional	0.8	0.6	0.85		TMU per inch o			

Unit Number	70% Unit Time	70% Total Time	75% Unit Time	75% Total Time	80% Unit Time	80% Total Time
1	1.000	1.000	1.000	1.000	1.000	1.000
2	.700	1.700	.750	1.750	.800	1.800
3	.568	2.268	.634	2.384	.702	2.502
4	.490	2.758	.562	2.946	.640	3.142
5	.437	3.195	.513	3.459	.596	3.738
6	.398	3.593	.475	3.934	.562	4.299
7	.367	3.960	.446	4.380	.534	4.834
8	.343	4.303	.422	4.802	.512	5.346
9	.323	4.626	.402	5.204	.493	5.839
10	.306	4.932	.385	5.589	.477	6.315
11	.291	5.223	.370	5.958	.462	6.777
12	.278	5.501	.357	6.315	.449	7.227
13	.267	5.769	.345	6.660	.438	7.665
14	.257	6.026	.334	6.994	.428	8.092
15	.248	6.274	.325	7.319	.418	8.511
16	.240	6.514	.316	7.635	.410	8.920
17	.233	6.747	.309	7.944	.402	9.322
18	.226	6.973	.301	8.245	.394	9.716
19	.220	7.192	.295	8.540	.388	10.104
20	.214	7.407	.288	8.828	.381	10.485
21	.209	7.615	.283	9.111	.375	10.860
22	.204	7.819	.277	9.388	.370	11.230
23	.199	8.018	.272	9.660	.364	11.594
24	.195	8.213	.267	9.928	.359	11.954
25	.191	8.404	.263	10.191	.355	12.309
26	.187	8.591	.259	10.449	.350	12.659
27	.183	8.774	.255	10.704	.346	13.005
28	.180	8.954	.251	10.955	.342	13.347
29	.177	9.131	.247	11.202	.338	13.685
30	.174	9.305	.244	11.446	.335	14.020

							.495	12.402	.634	14.608
							.490	12.892	.630	15.237
							.484	13.376	.625	15.862
							.479	13.856	.621	16.483
							.475	14.331	.617	17.100
							.470	14.801	.613	17.713
							.466	15.267	.609	18.323
							.462	15.728	.606	18.929
							.458	16.186	.603	19.531
							.454	16.640	.599	20.131
							.450	17.091	.596	20.727



Methods Time Measurement (MTM)



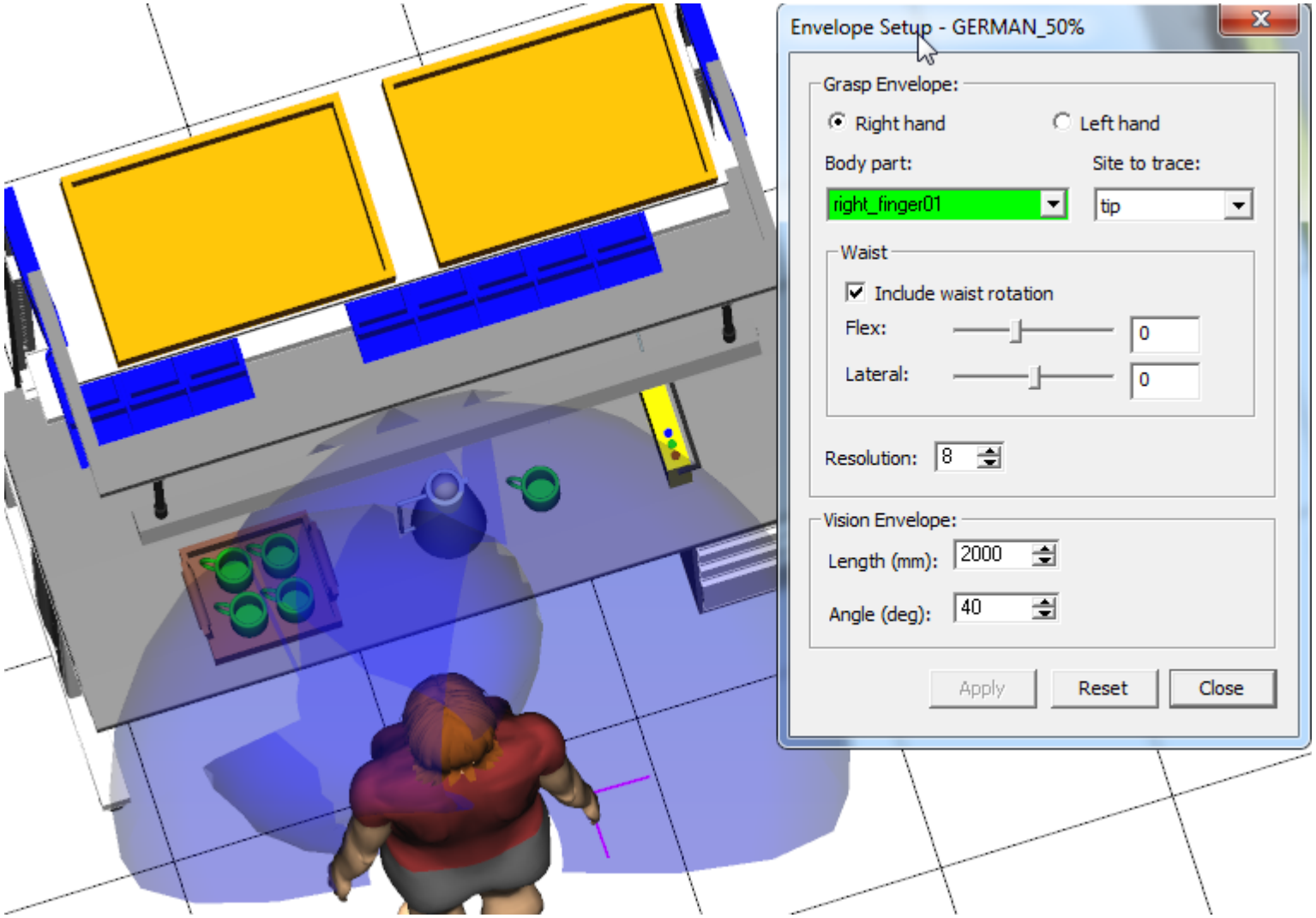
Tecnomatix Human: Timing Report, MTM codes

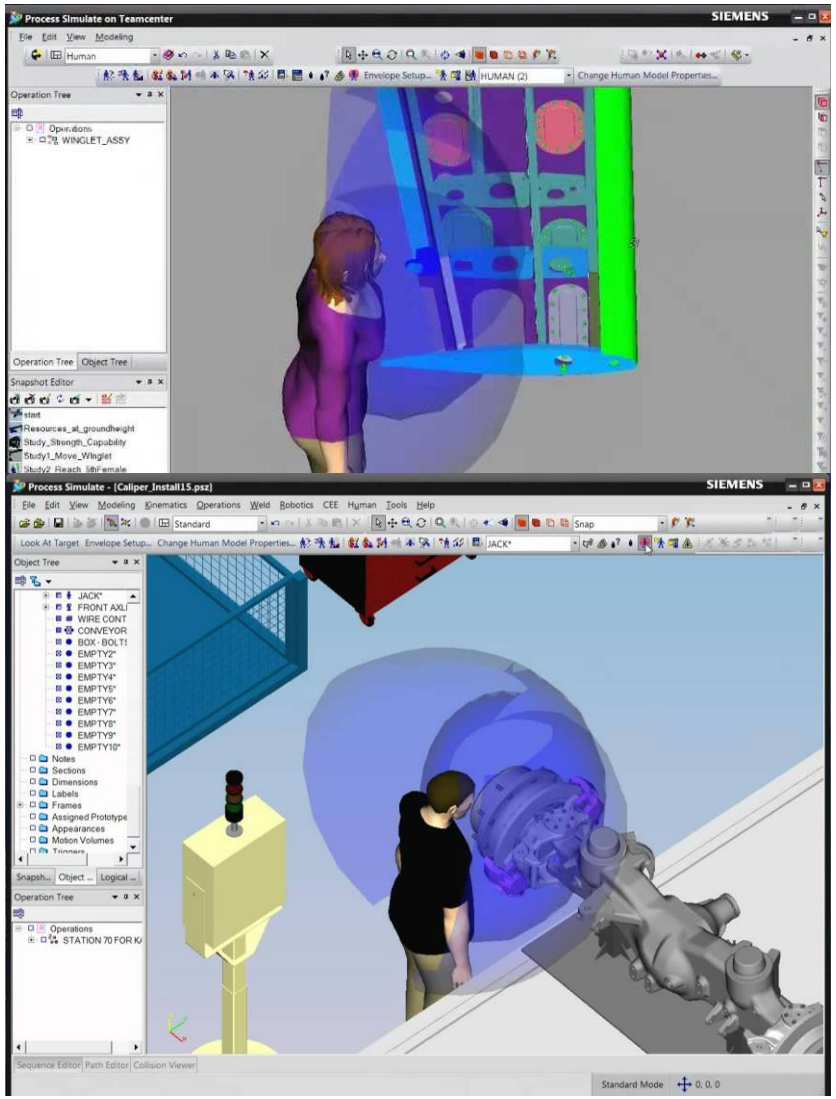
Jill			
Task	Action	Duration (s)	Code
Get_28300_nlg_act_623_Jill		0.9	
	Reach	0.86	R18.213A(l)
	Grasp	0.072	G1A(l)
Put_28300_nlg_act_623_Jill		0.6	
	Reach	0.569	R10.175A(b)
	Release	0.072	RL1(l)
Get_28300_nlg_act_1157_Jill		0.6	
	Reach	0.569	R9.645A(l)
	Grasp	0.072	G1A(l)
Put_28300_nlg_act_1157_Jill		0.6	
	Reach	0.504	R8.602A(b)
	Release	0.072	RL1(l)
Pose_Jill		1	
	Pose	1	Pose
Get_r7160_06x18_4_Jill		0.4	
	Reach	0.346	R4.097A(l)
	Grasp	0.072	G1A(l)
Put_r7160_06x18_4_Jill		0.3	
	Reach	0.266	R2.378A(b)
	Release	0.072	RL1(l)
Get_r7160_06x18_1_Jill		0.4	
	Reach	0.299	R3.502A(l)
	Grasp	0.072	G1A(l)
Put_r7160_06x18_1_Jill		0.3	
	Reach	0.252	R2.331A(b)
	Release	0.072	RL1(l)
Pose_Jill_1		1	
	Pose	1	Pose
Get_ratchet_wrench1_Jill		0.5	
	Reach	0.472	R7.493A(r)
	Grasp		
Position_ratchet_wrench1_Jill			
	Reach		
Position_ratchet_wrench1_Jill_1			
	Reach		
Put_ratchet_wrench1_Jill			
	Reach		
	Release		
Pose_Jill_2			
	Pose		

- Simulated time of human tasks
- Suboperations duration
- Gantt chart

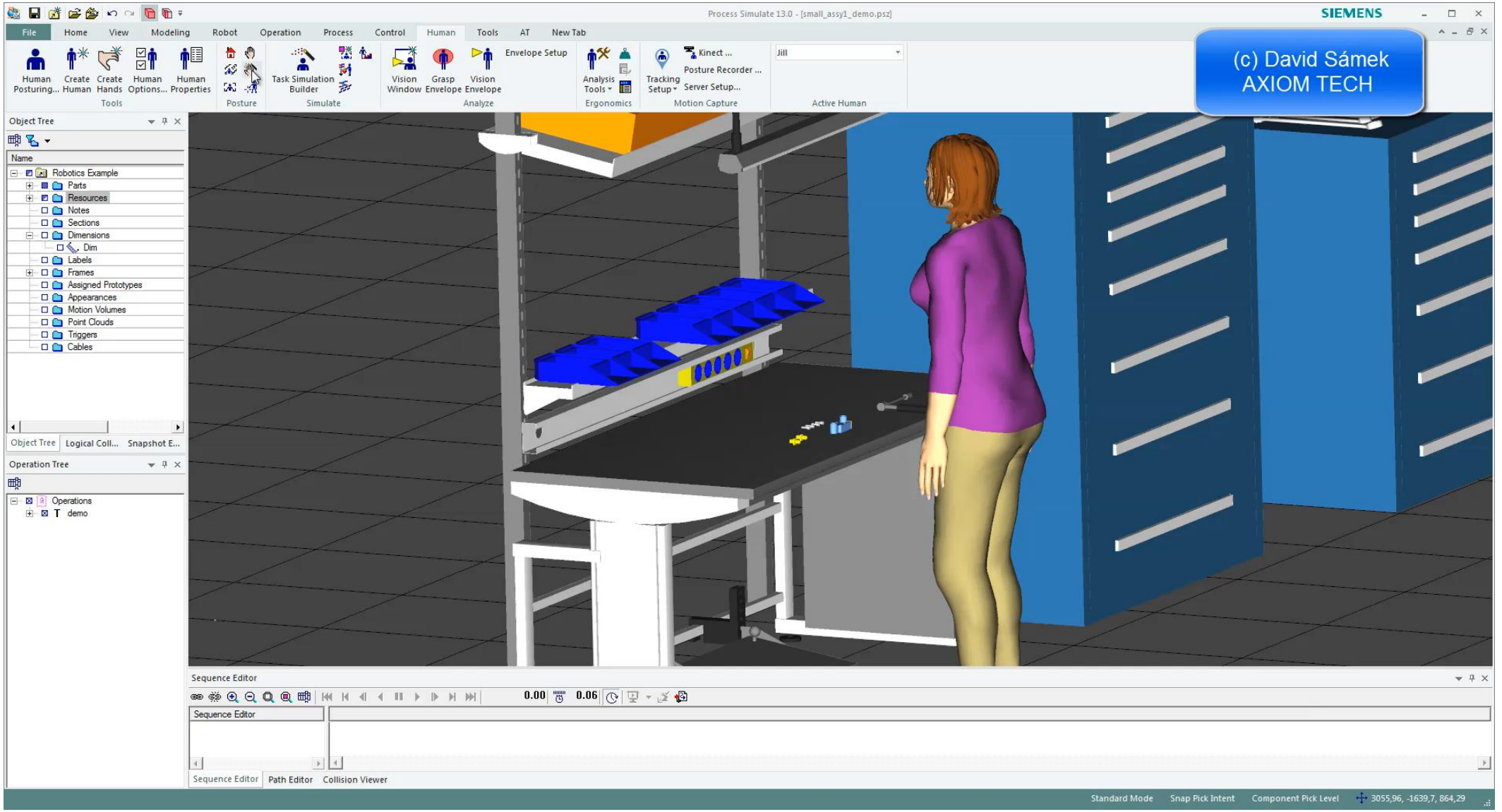
Tecnomatix Human: Feasibility Tools

Human reach

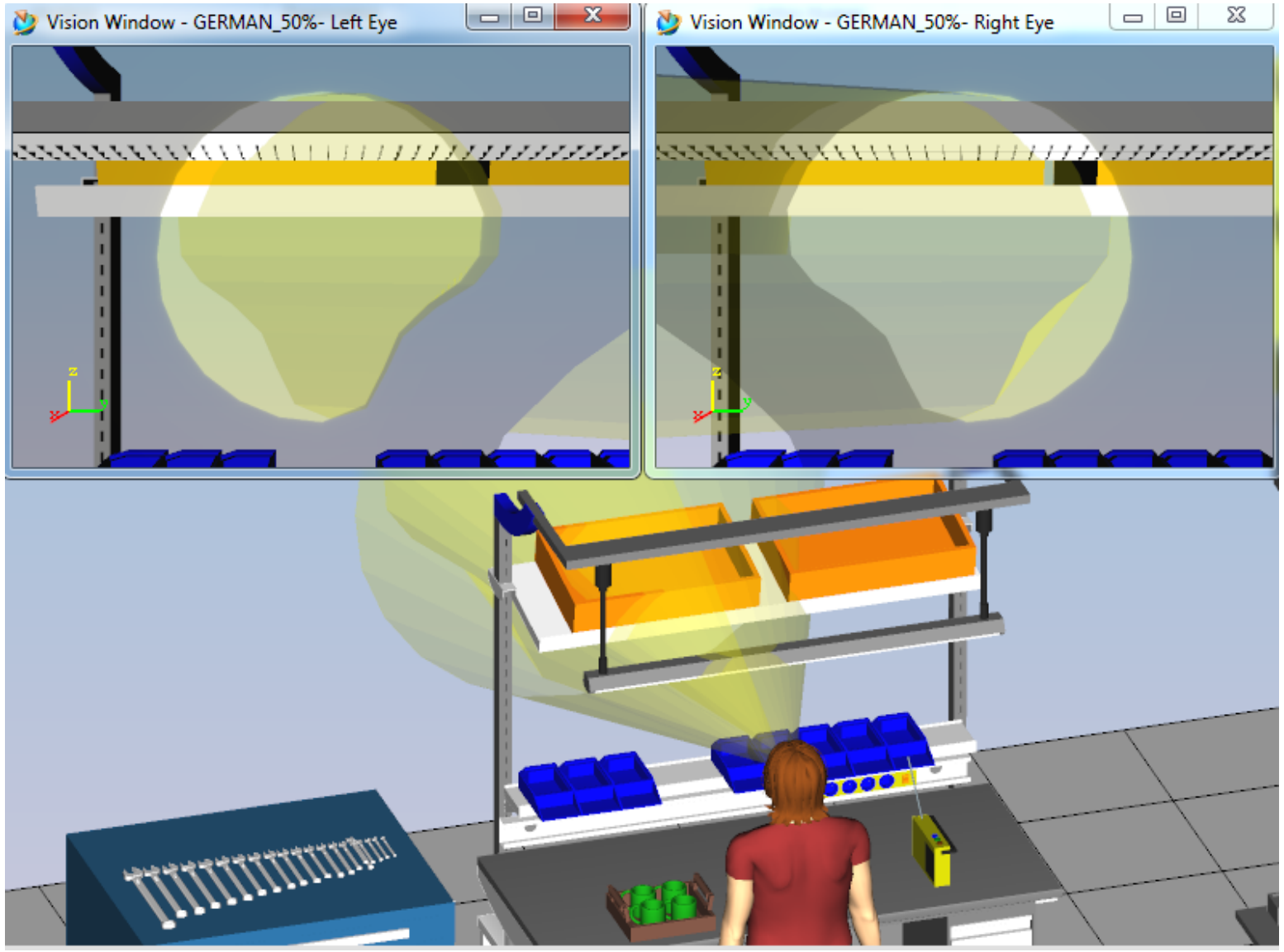

Envelope Setup - GERMAN_50%
Grasp Envelope:
Right hand
Left hand
Body part:
Site to trace:
right_finger01
tip
Waist
Include waist rotation
Flex:
0
Lateral:
0
Resolution:
8
Vision Envelope:
Length (mm):
2000
Angle (deg):
40
Apply
Reset
Close


Process Simulate on Teamcenter
SIEMENS
Process Simulate - [Caliper_Install15.psz]
SIEMENS

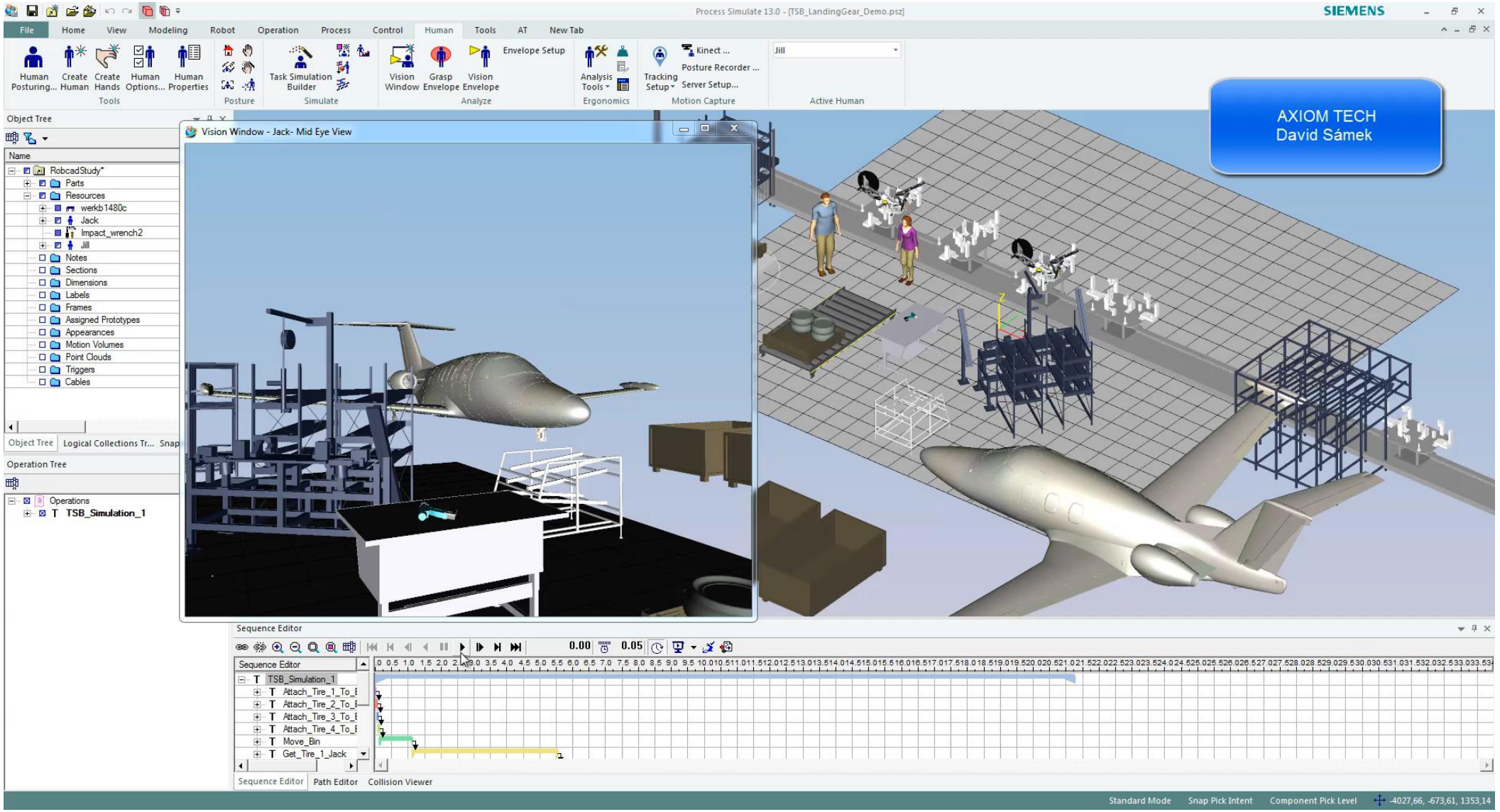
Human reach


Process Simulate 13.0 - [small_assy1_demo.psz]
SIEMENS
File
Home
View
Modeling
Robot
Operation
Process
Control
Human
Tools
AT
New Tab
Human Posturing...
Create Human
Create Hands
Human Options...
Human Properties
Tools
Posture
Task Simulation Builder
Simulate
Vision Window
Grasp Envelope
Vision Envelope
Envelope Setup
Analyze
Analysis Tools
Ergonomics
Tracking Setup
Kinect ...
Posture Recorder ...
Server Setup...
Motion Capture
Jill
Active Human
(c) David Sámek
AXIOM TECH
Object Tree
Name
Robotics Example
Parts
Resources
Notes
Sections
Dimensions
Dim
Labels
Frames
Assigned Prototypes
Appearances
Motion Volumes
Point Clouds
Triggers
Cables
Object Tree
Logical Coll...
Snapshot E...
Operation Tree
Operations
demo
Sequence Editor
0.00
0.06
Sequence Editor
Sequence Editor
Path Editor
Collision Viewer
Standard Mode
Snap Pick Intent
Component Pick Level
3055,96, -1639,7, 864,29

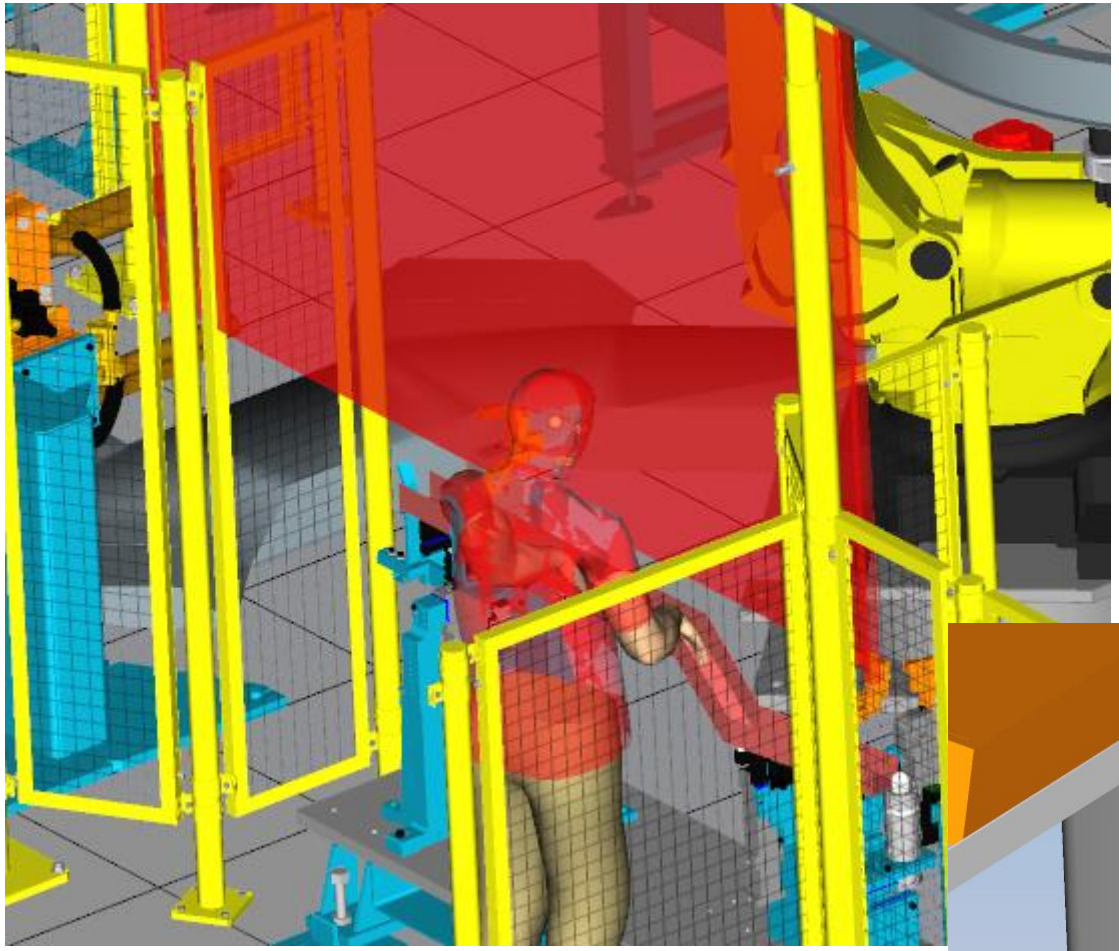
Vision view


Vision Window - GERMAN_50%- Left Eye
Vision Window - GERMAN_50%- Right Eye

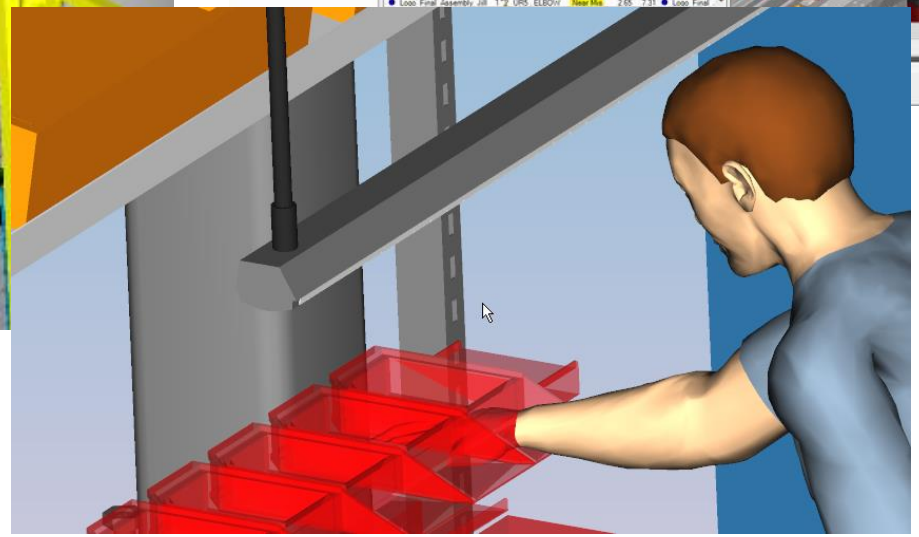
Vision view


Process Simulate 13.0 - [TSB_LandingGear_Demo.psz]
SIEMENS
Vision Window - Jack- Mid Eye View
AXIOM TECH
David Sámek
Object Tree
Operation Tree
Sequence Editor
Standard Mode
Snap Pick Intent
Component Pick Level

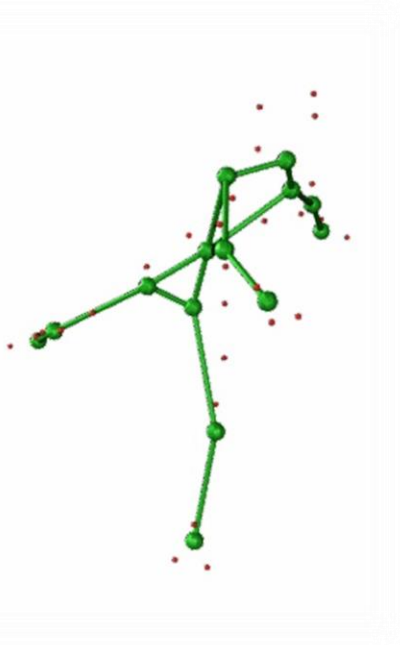
Collisions




SIEMENS
Process Simulate 13.0.2 - [SAFETY_ANALYSIS.psz]
Dynamic Collision Report
Operation Tree
Object Tree
Snapshot Editor
Standard Mode
Snap Pick Intent
Entity Pick Level



Tecnomatix Human: Motion Capture & VR

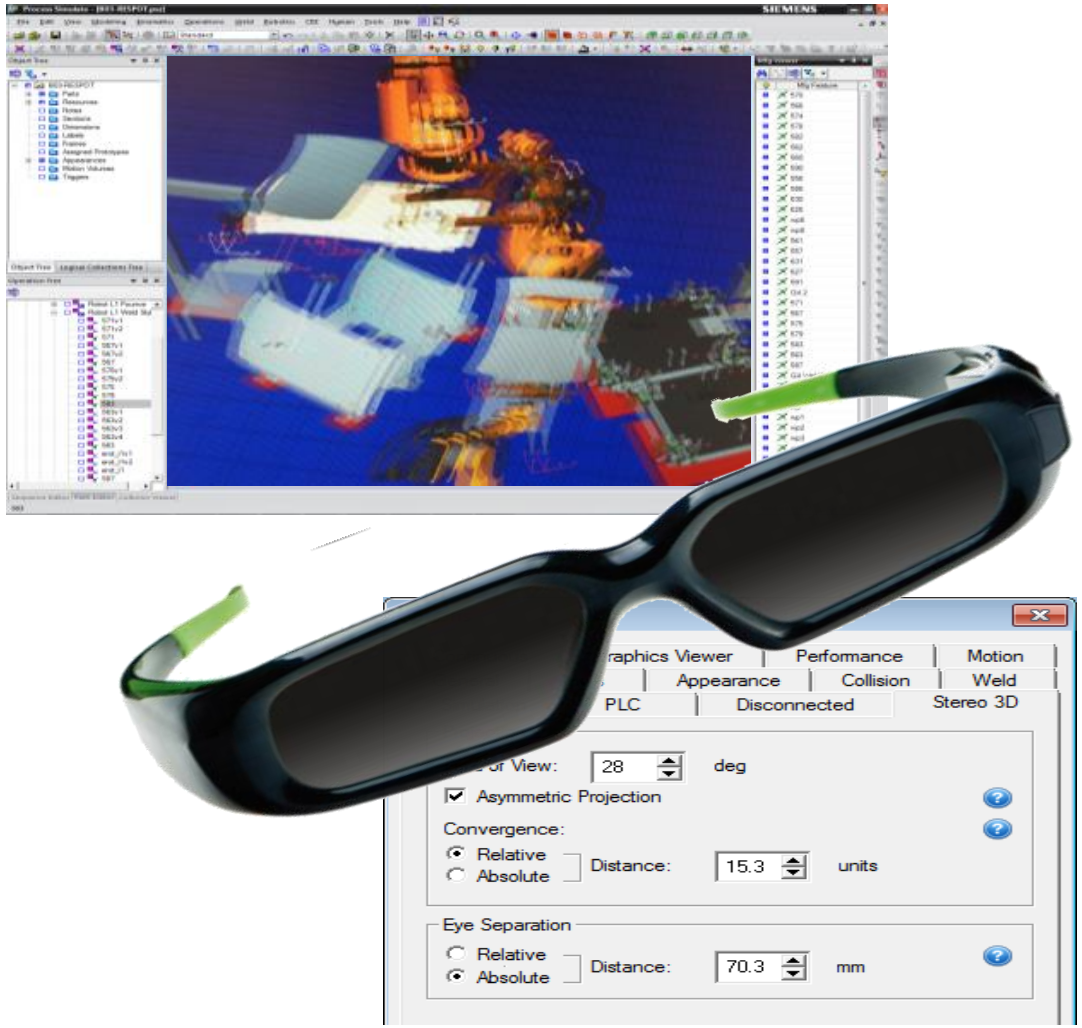


Tecnomatix Human: Motion Capture

- Wide range of supported hardware
- Optical and gyroskopic systems
- Whole body, partial body, disembodied hands (data gloves)
- Open protocol for third party applications

Tecnomatix Human: Motion Capture

Tecnomatix Human: Virtual Reality



- Head Mounted Displays (HMDs)
- 3D Stereoscopic mode of the Graphics Viewer and Human Visibility Viewer
- Enable realistic 3D view for intuitive understanding of the layout and process
- Active Stereo (Shutter Glasses) support, HTC Vive
- Third party API support

Tecnomatix Human: Virtual Reality

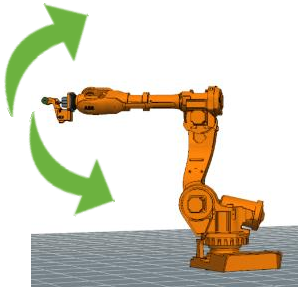
- HTC Vive

Teleport

Measure

Flashlight

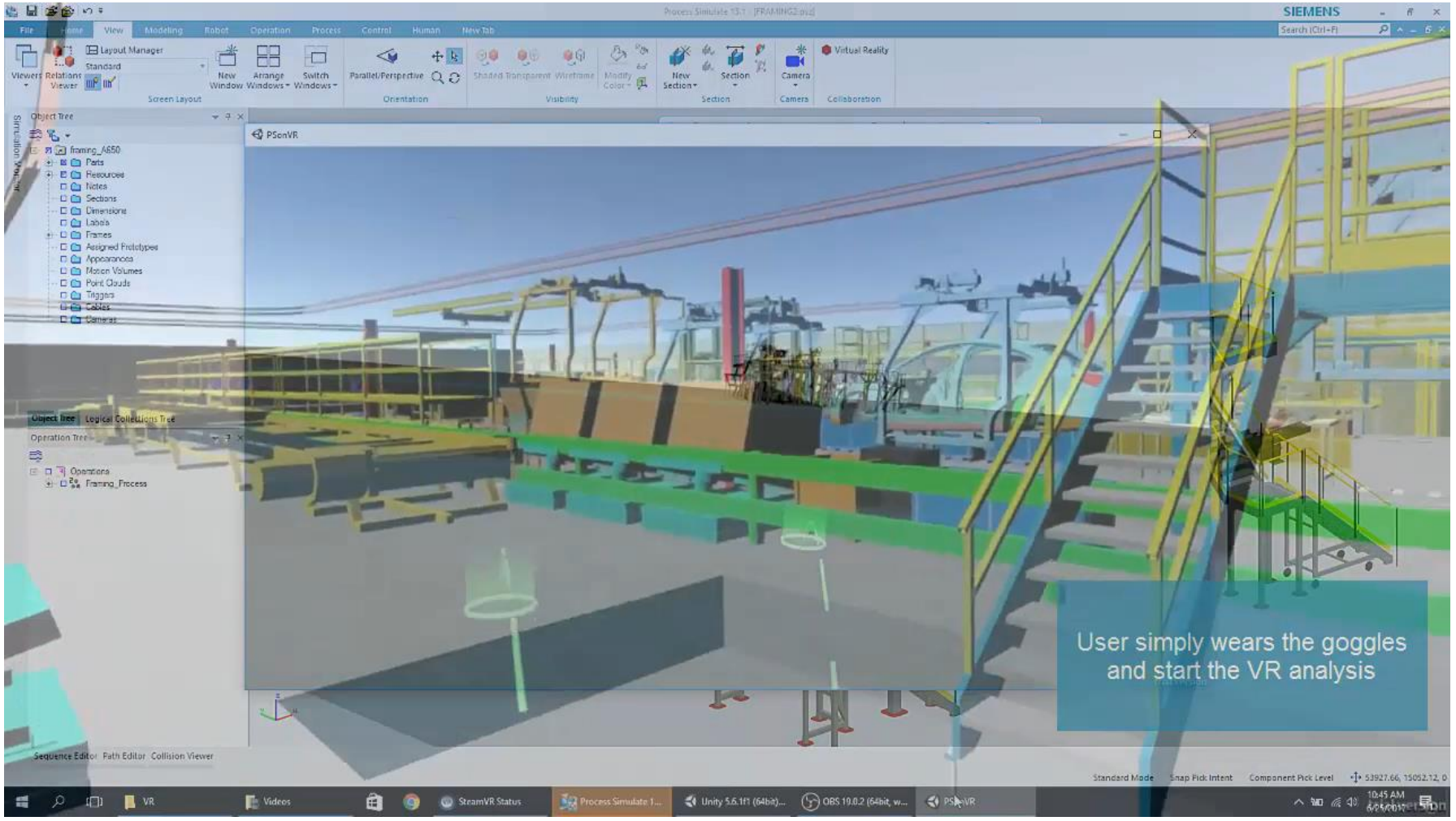
Play Simulation



Laser Pointer

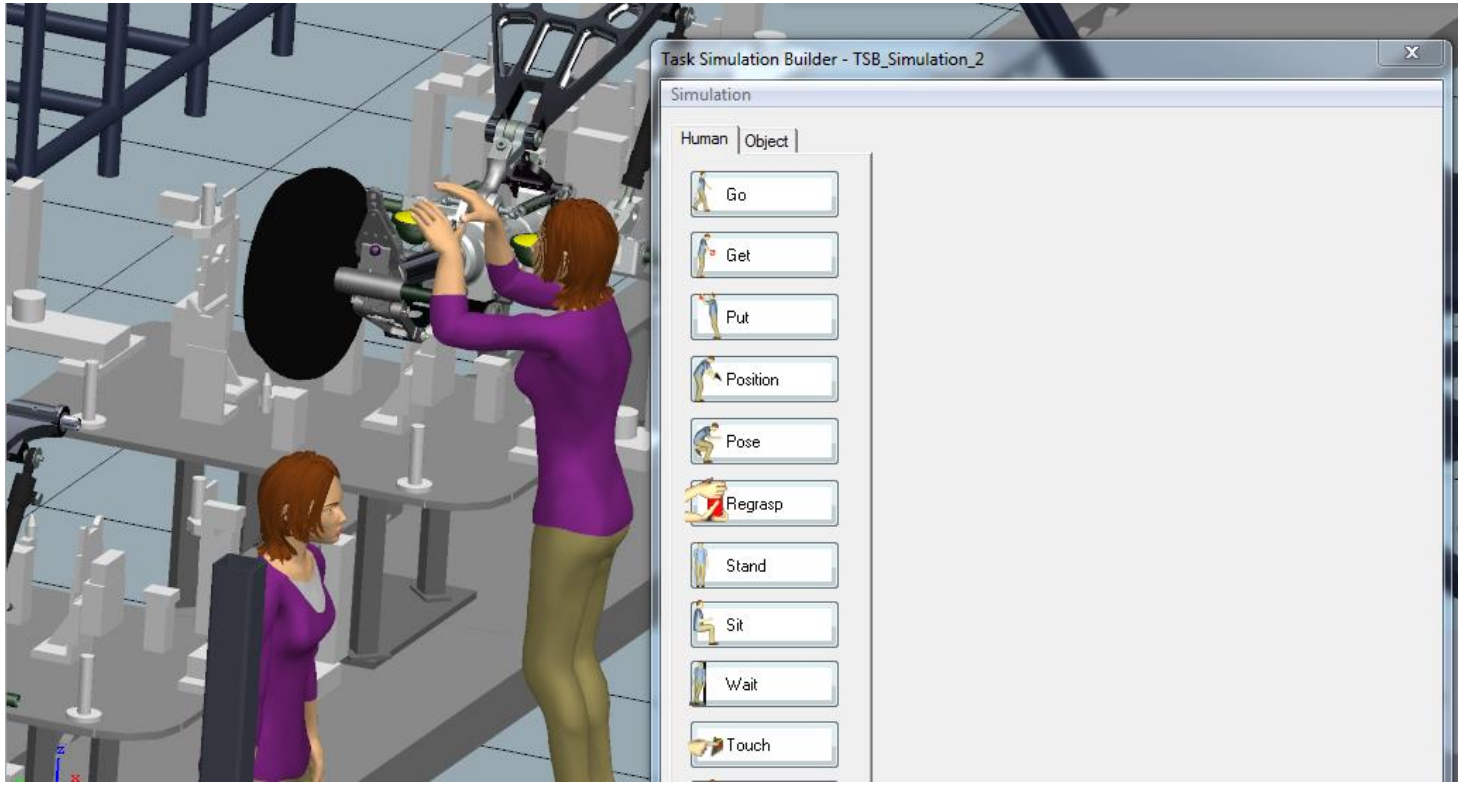
Tecnomatix Human: Virtual Reality

- HTC Vive

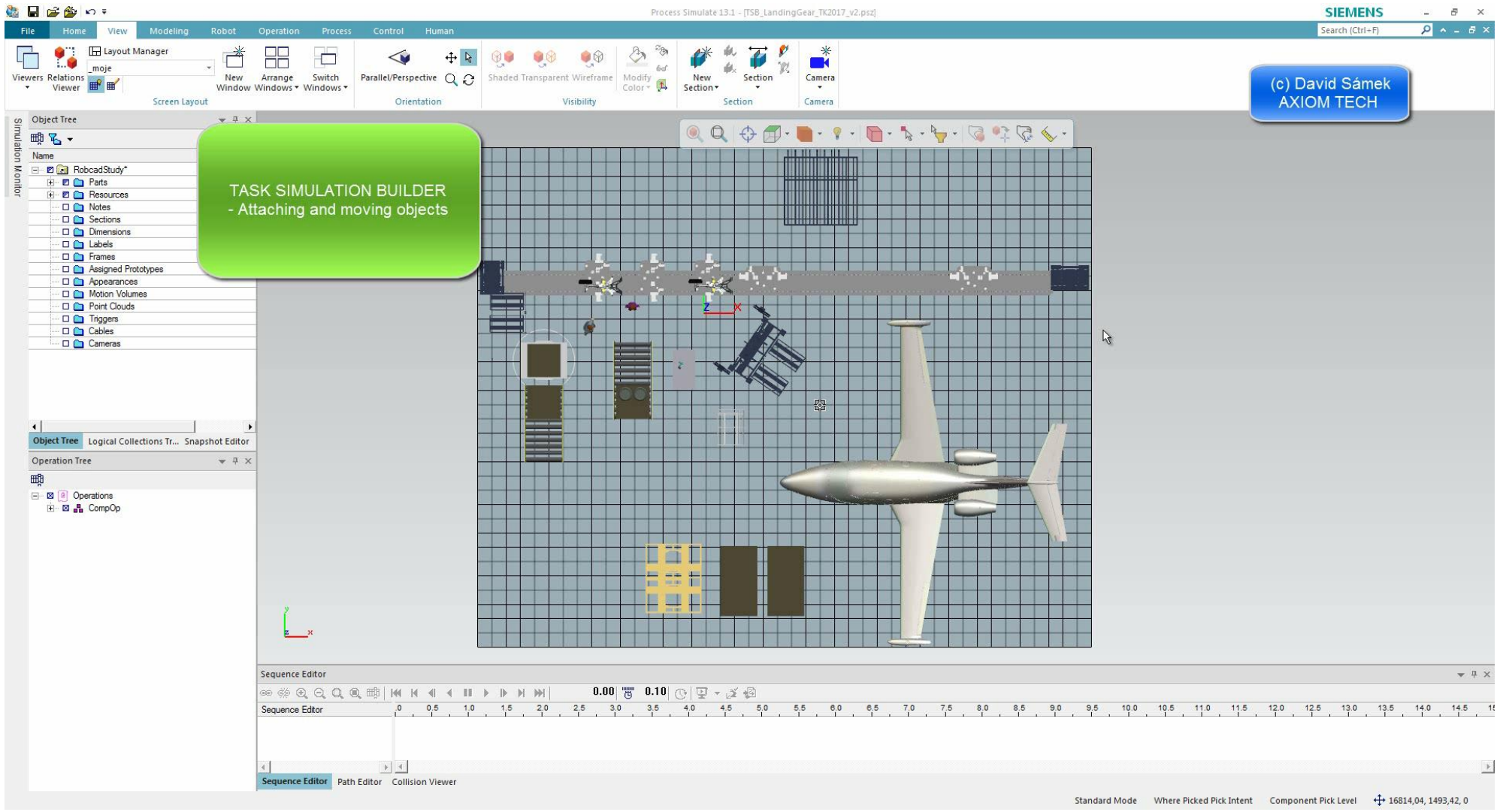


Task Simulation Builder

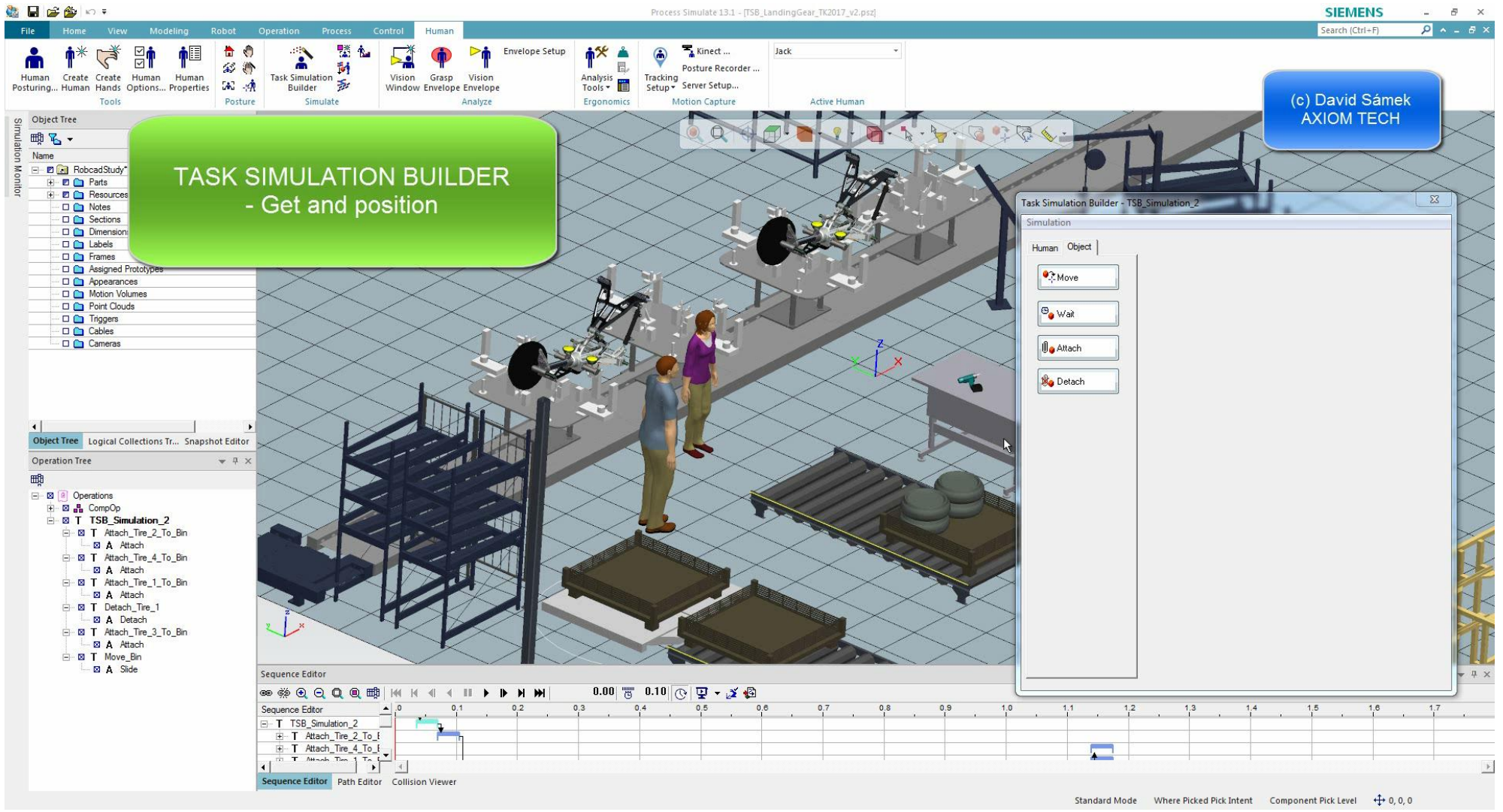
- **Easy way how to simulate human tasks**



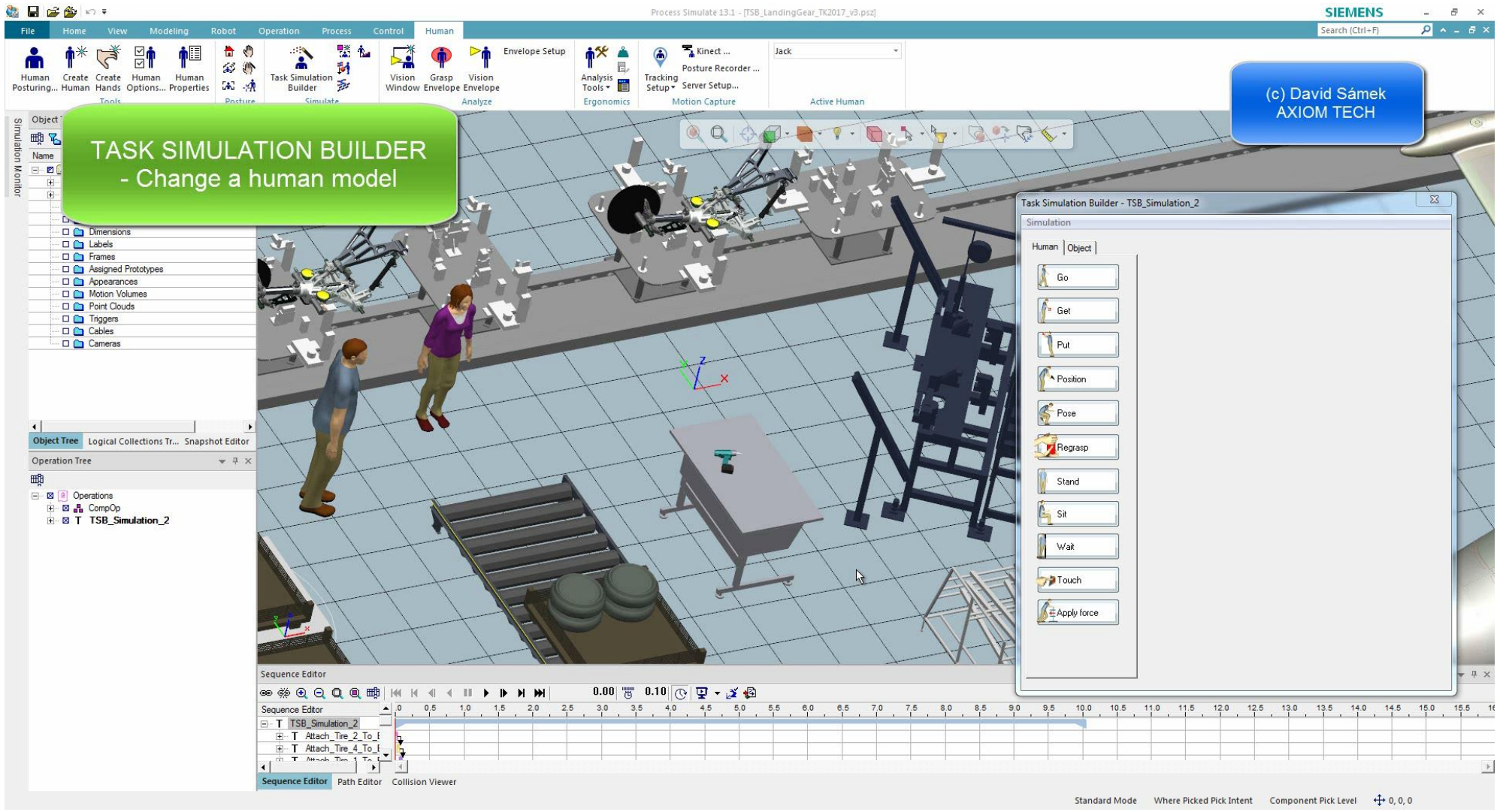
Task Simulation Builder



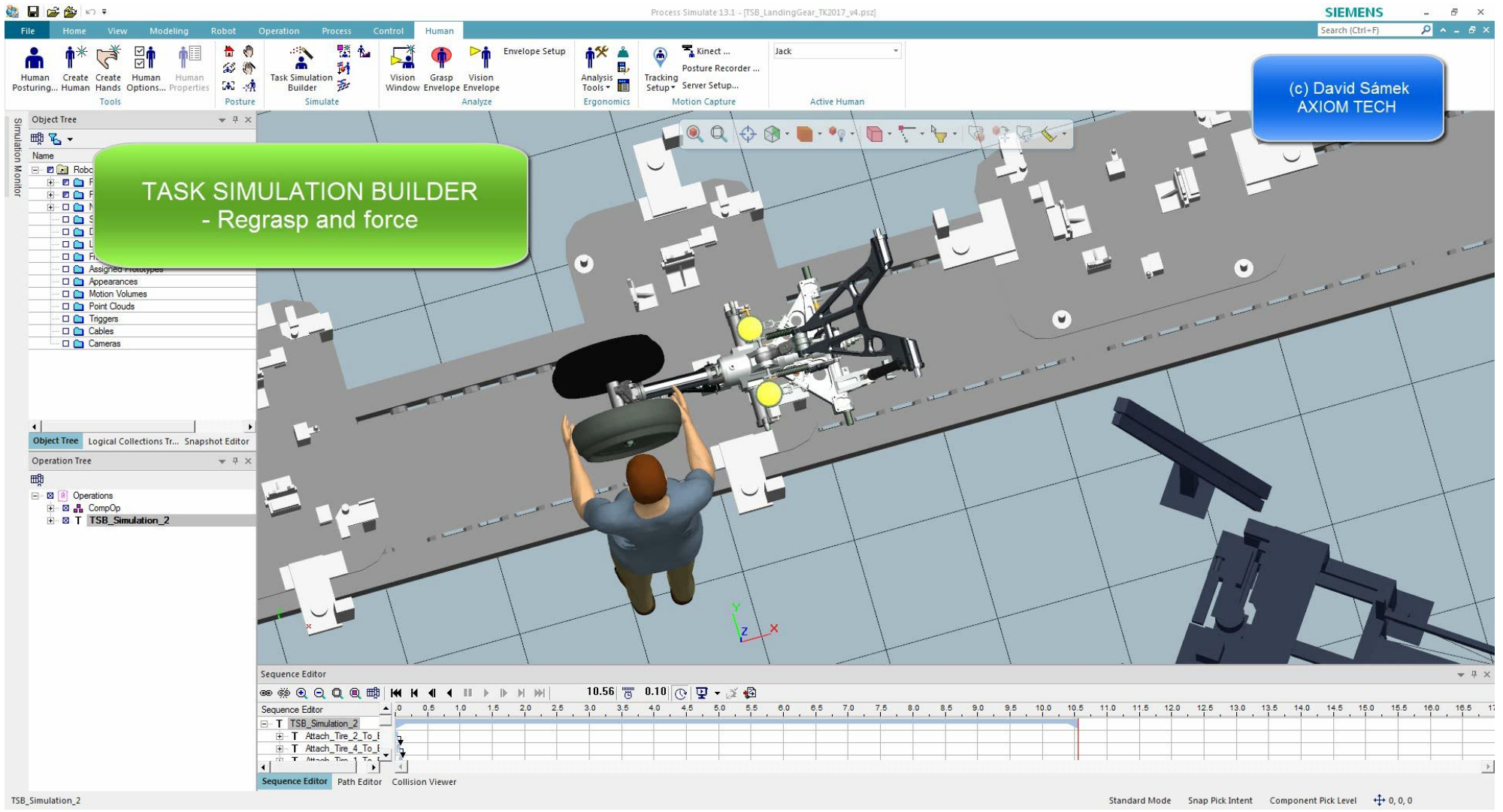
Task Simulation Builder



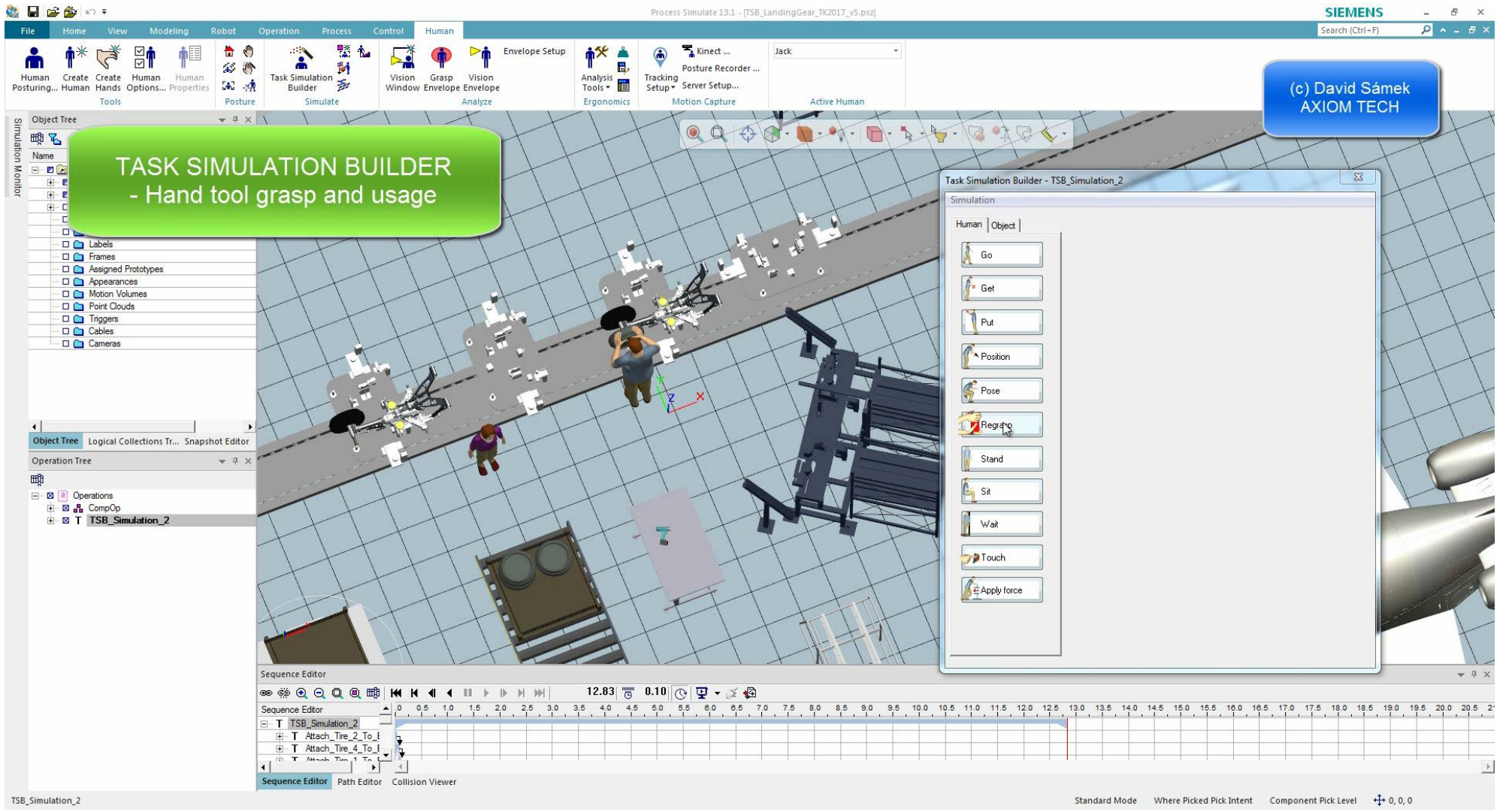
Task Simulation Builder



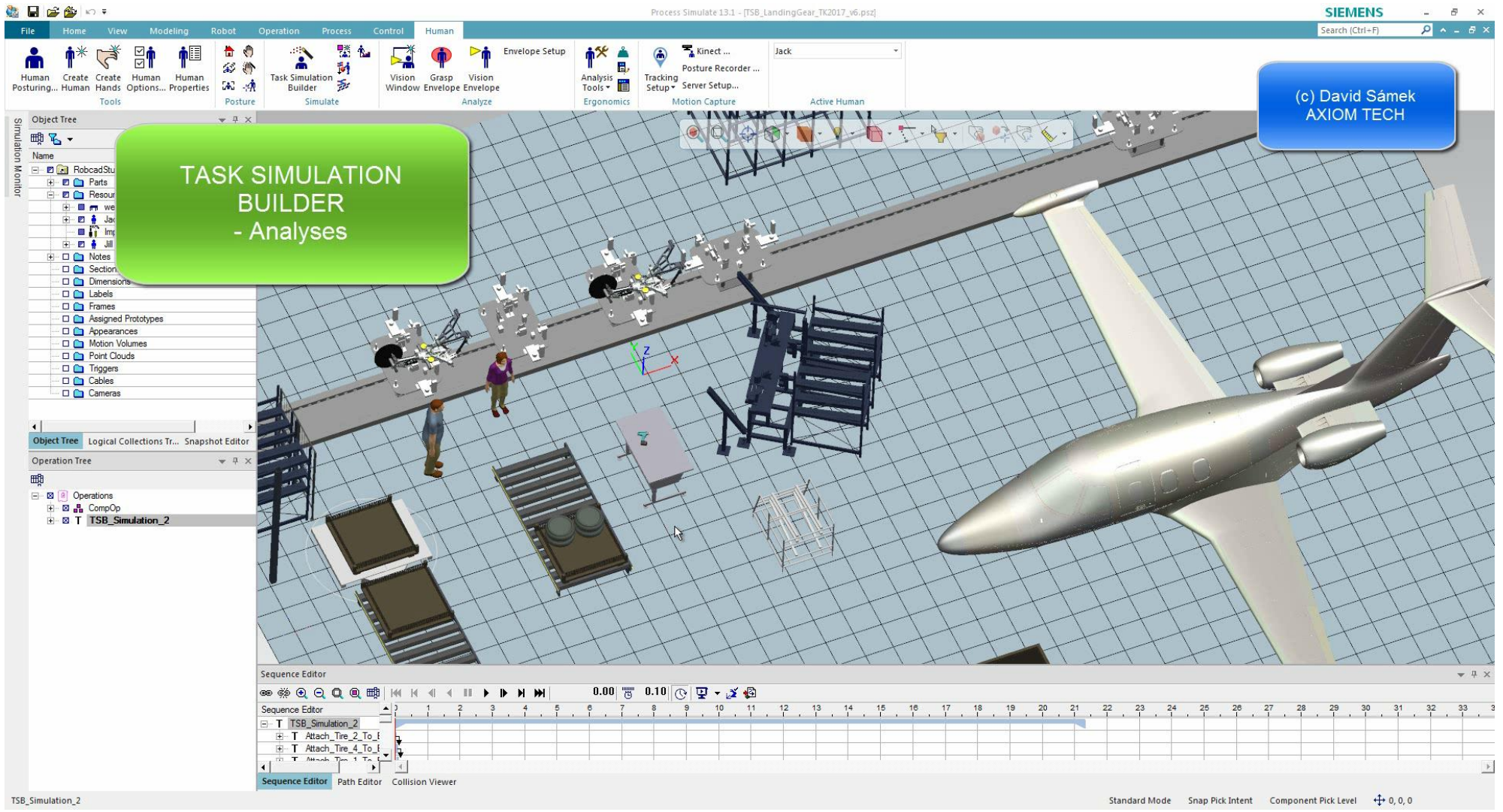
Task Simulation Builder



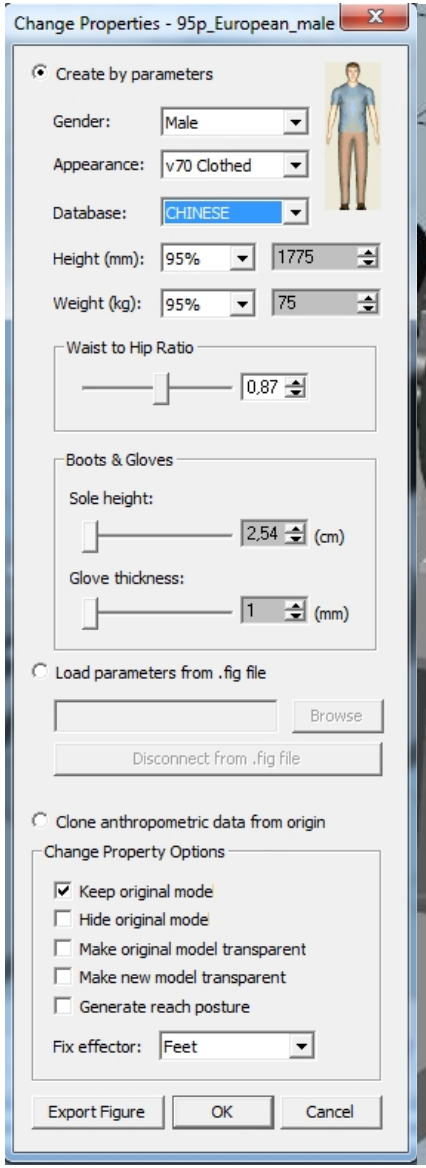
Task Simulation Builder



Task Simulation Builder



Task Simulation Builder



95 percentil ANSUR

50 percentil GERMAN

5 percentil CHINESE

AXIOM TECH

Human - Robot Collaboration

Human - Robot Collaboration

Cobots Safety Challenges

Safety Measurements Devices

Certification Procedures

Protection Equipment

Acceptance and Training

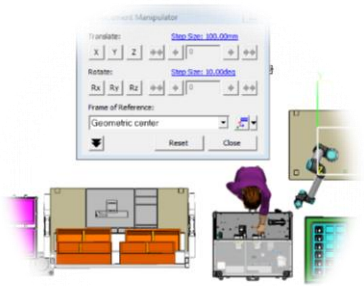
System Layout

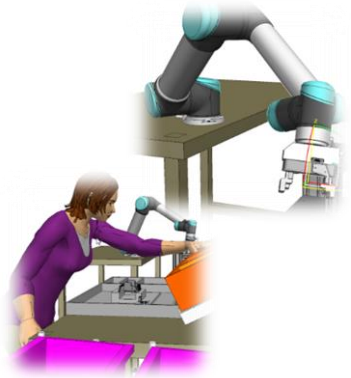
Line Shutdown

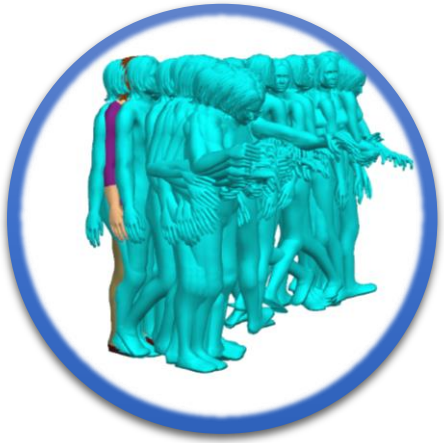
Throughput

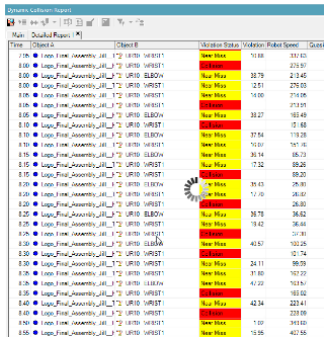
Workflow

Design Station → Plan Process → Generate Working Envelopes → Run Analysis → Analyze Results

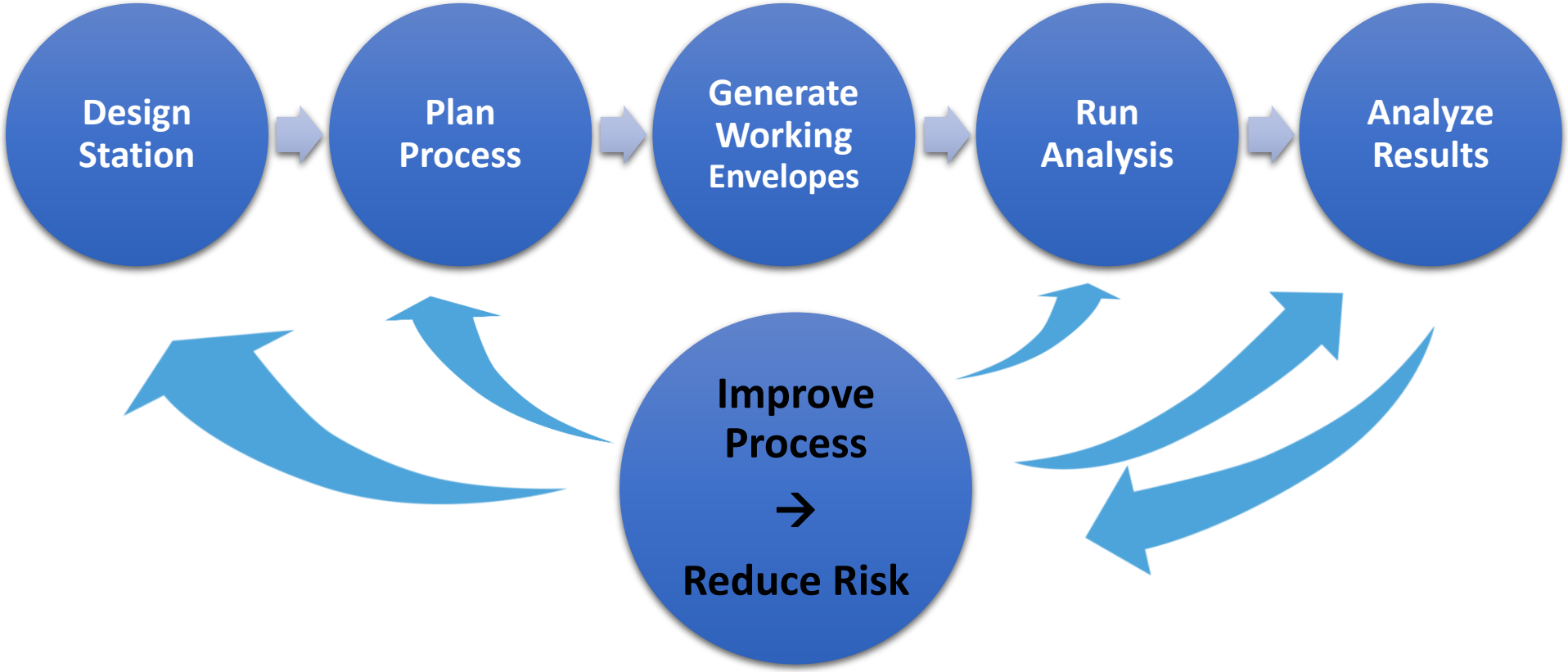






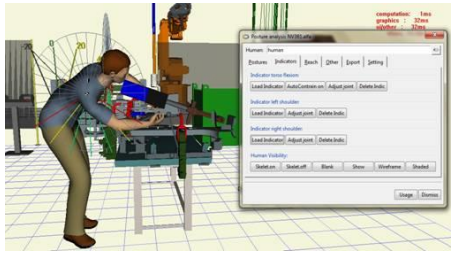


Workflow


Design Station
Plan Process
Generate Working Envelopes
Run Analysis
Analyze Results
Improve Process
→
Reduce Risk

Jack vs Process Simulate Human

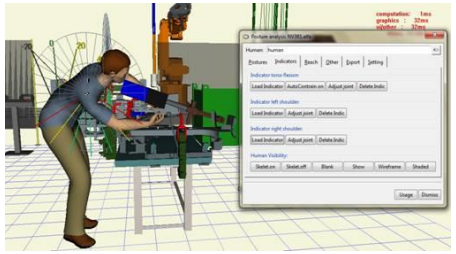
Jack



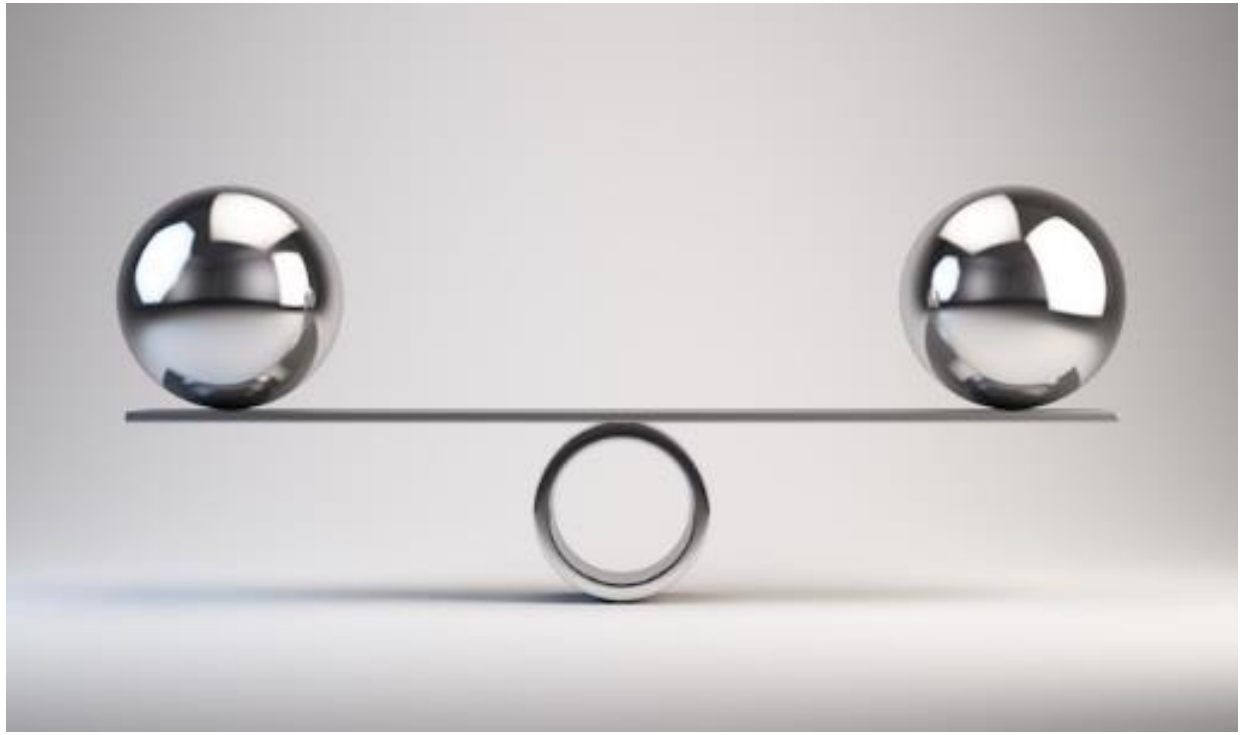
PS Human

Jack vs Process Simulate Human

Jack



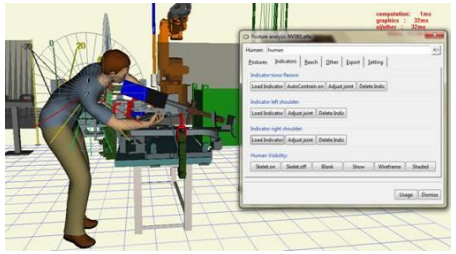
PS Human

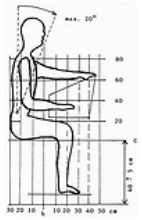


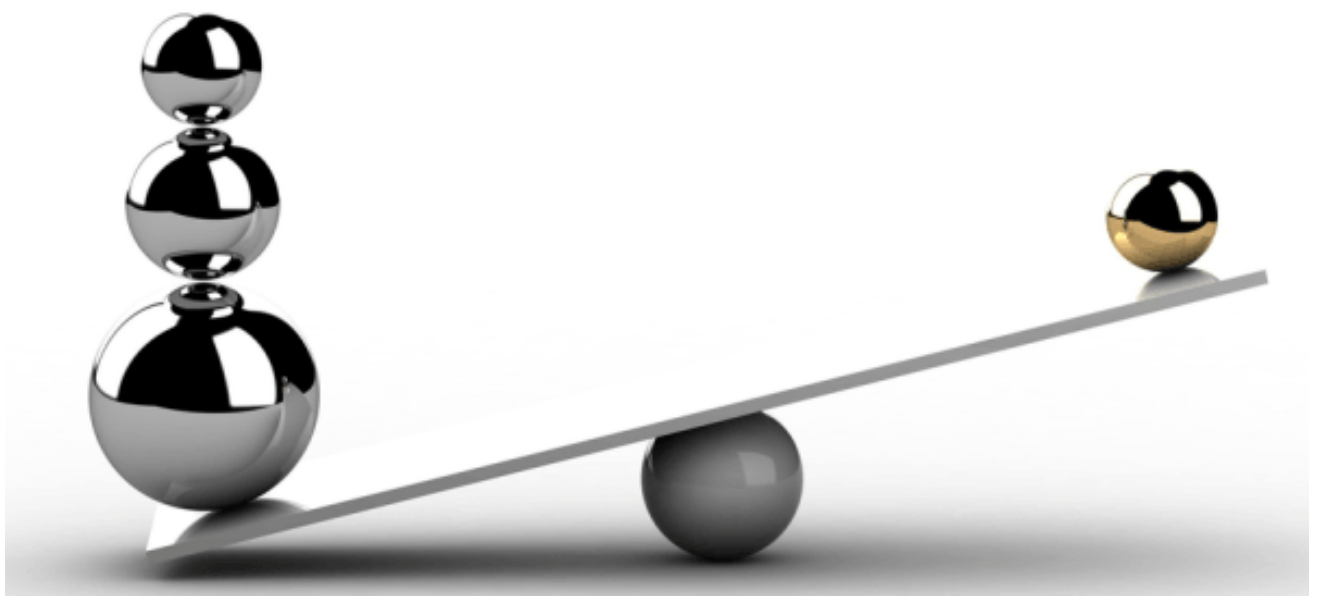
Much the same

Jack vs Process Simulate Human

Jack





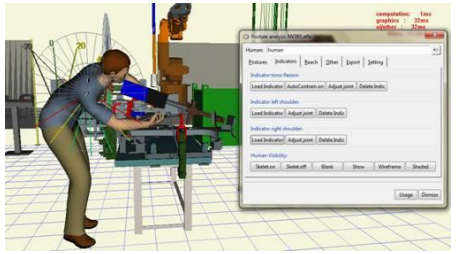


PS Human

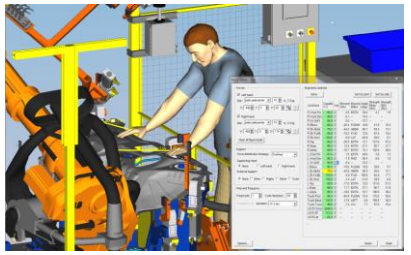
Scripting, Detailed human scaling, Occupant Packaging Toolkit, Add-Ons

Jack vs Process Simulate Human

Jack

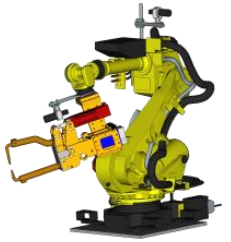


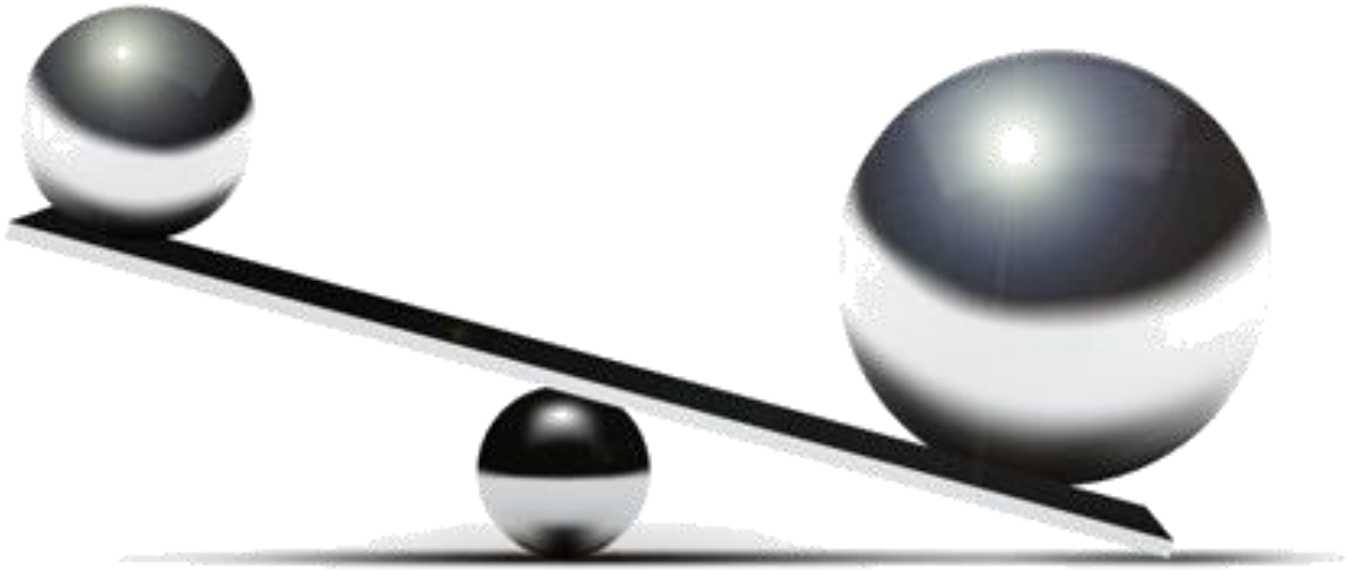
PS Human



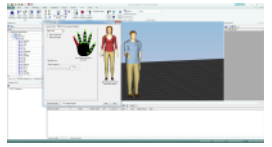
TEAMCENTER

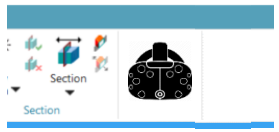
eMS





PLM support, Robotics, VC, HRC, Assembly simulation, 3D modelling, enhanced reporting, VR, point cloud, Motion Capture for TSB, …





AXIOM TECH

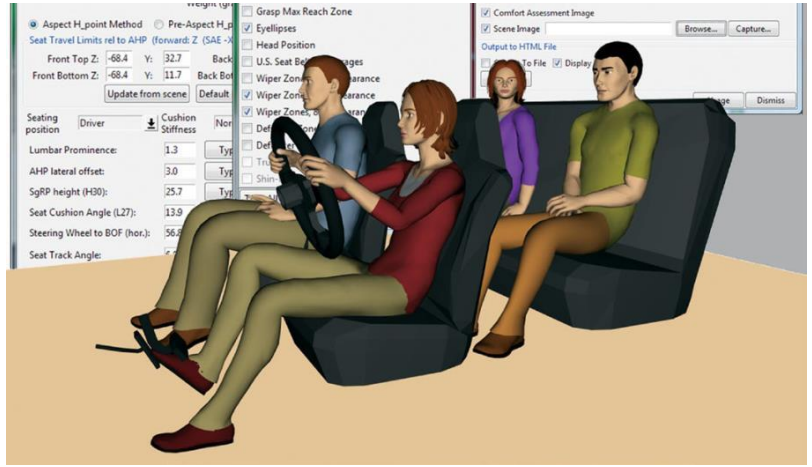
Summary

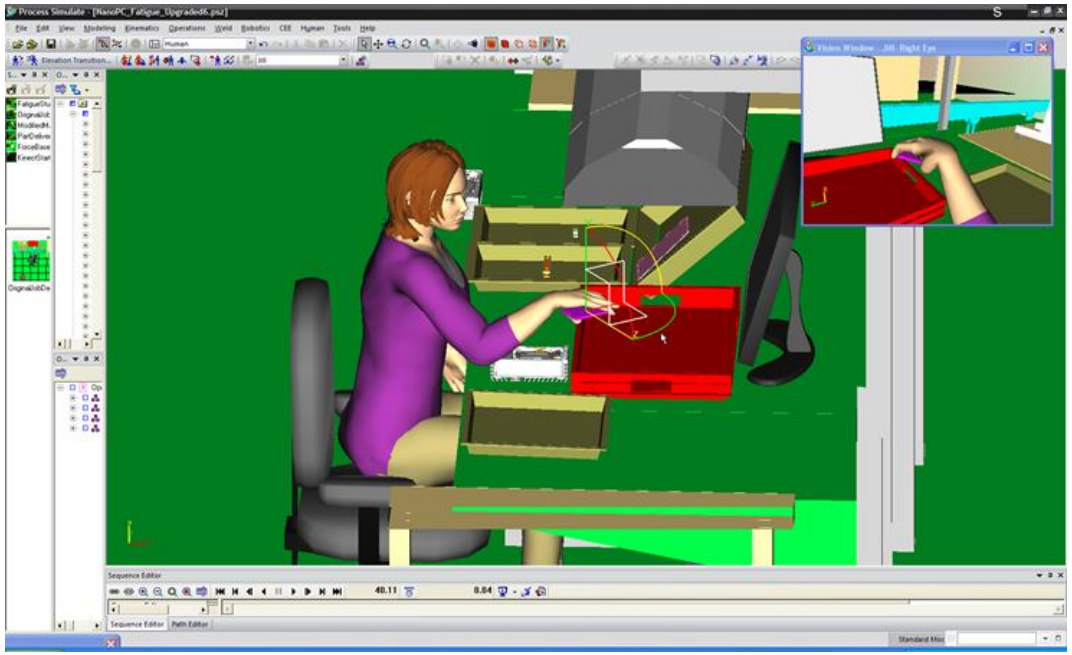
1	2	3	4	5
				
Increase Customer Satisfaction	Compress time to Launch	Reduction of medical and absenteeism costs	Ensure Serviceability	Visualization of human tasks

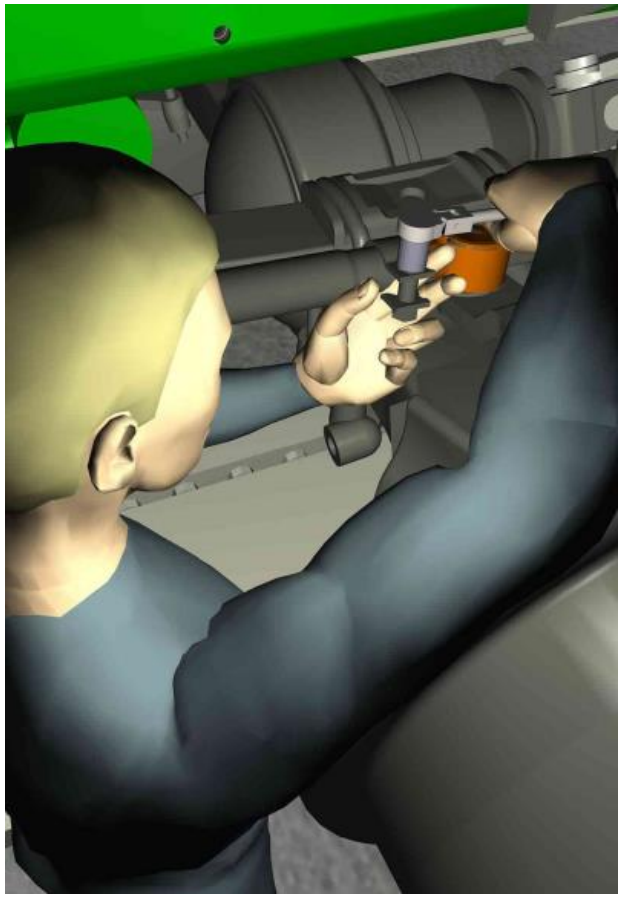
Summary

Target users:

- Mechanical designers
- Ergonomics experts
- Process engineers
- Human safety specialists







Conclusion

Thank you for your attention

Contacts:

David Sámek
AXIOM TECH s.r.o.
Kamenná 2525, 760 01 Zlín
tel.: 577 006 310
gsm: +420 725 946 573
david.samek@axiomtech.cz

www.axiomtech.cz or www.axiomtech.si