

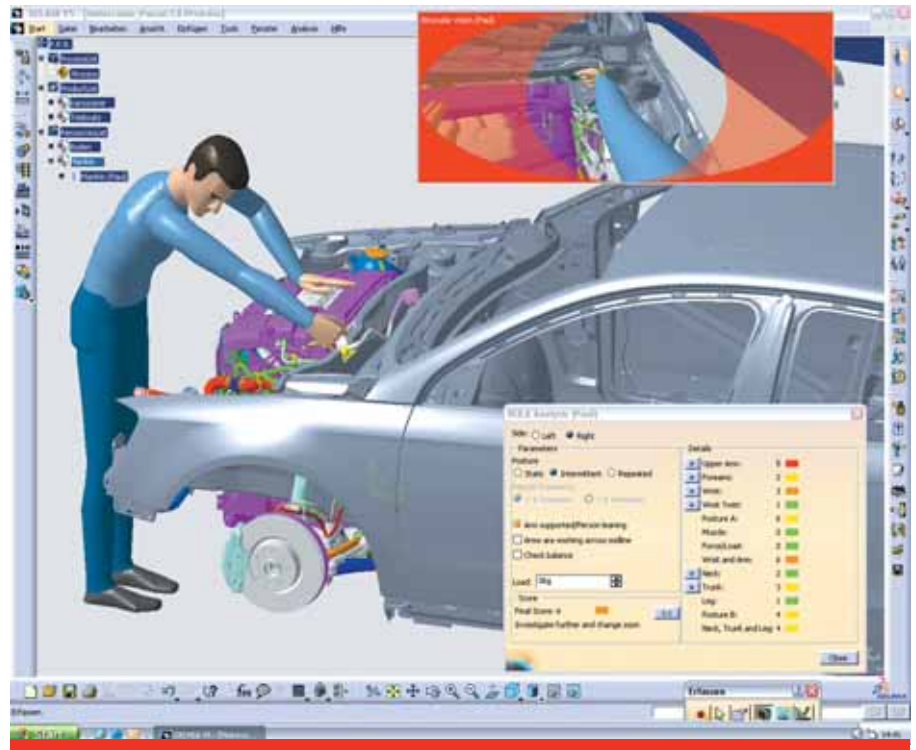


## Simulation Instead of Trial and Error

*An ergonomically designed workstation makes work positions more comfortable for employees - this pays dividends for the company. Volkswagen recognized this effect and the ergonomics engineer working in Volkswagen's planning division uses DELMIA software from Dassault Systèmes to assist them in executing assigned projects.*

The following scenario illustrates what can happen if a company disregards a workstation's ergonomic aspects: a particular bolt connection was found to be hard to reach and consequently, it was difficult for the assembly worker to tighten the bolt. As the assembly line continues to move along relentlessly at an unchanging speed, the worker was having a hard time keeping up with the pace, making the uncomfortable position more painful after a while. The result of this could be the entire production line coming to a screeching halt - an outcome no company could afford. In some situations, it might not even be possible to meet delivery times.

As an internationally known car manufacturer based in Wolfsburg, Volkswagen has recognized the productivity increasing effects of an optimized workstation and has appointed an engineer to improve the interface between man and machine. Since the beginning of the year, Maileen Zander has been serving as a consultant for Volkswagen's various vehicle projects in all matters pertaining to workstation ergonomics. "The many inquiries coming in from all vehicle classes show that workstation ergonomics is a hot topic with a lot of room left for development," says Zander.



An additionally superimposed field of view enables a detailed view of the component that should be reached

### At the Juncture Between Development, Production, and Medicine

"On the one hand, we have more and more employees complaining about physical problems, and on the other, divisions see the potential of manufacturing better quality products in a faster, more cost-effective manner using optimized work procedures," says Zander. This issue also applies to physically disabled employees. Their respective workstations need to be customized to a given employee's physical capabilities, or they need to be configured in such a manner that they will also accommodate disabled employees.

### Simulate First, Then Change

As soon as Zander receives a department's request to optimize a workstation, she analyzes the existing work environment using pre-defined criteria. Given that employees' task procedures are often complex, she uses DELMIA V5 Human software, which enables her to create human CAD models called manikins.

"DELMIA V5 Human gives me the capability to first simulate work environments on the computer and to check their suitability before we implement them in real life." The alternative would be to first change the work environment and then check whether the results actually reflect the desired improvements.



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### DELmia – Complex but Logical

"DELmia V5 Human is a complex, highly sophisticated system; however, the program is set up in a very logical manner. I was able to master it fairly quickly and then turn it into a very productive tool," explains Zander. After she became familiar with the software, the required CAD data, had to be stored in DELmia. Now, Zander is able to depict an entire workstation environment, as well as add and move human models. She can assign the manikins various parameters, such as sex and population groups. In addition, she can also modify different anthropometric variables, like height and weight.

### System Automatically Displays Possible Postures

Of the 65 moveable body parts, 49 can be highlighted with individual colors. Certain body parts and areas like the spine, chest area, lumbar region, or pelvis can be blocked or activated in the simulation. Objects can be added to the manikin, such as a hardhat that automatically moves with every motion. The field of vision also adjusts dynamically to the manikin's movements. "Since the system simulates many standard positions and one can also expand the body posture library, so one is spared from having to manually model

every new position," says Zander. If actual conditions require a deviation from the standard positions, they can be modified accordingly. The only limitation is what is anatomically possible, i.e. DELmia V5 Human cannot simulate motions on the manikins that are impossible in real life. "For example, you can only rotate an arm backward to a certain point," explains Zander.

The manikin cannot only move autonomously, it can also walk on reference surfaces. In addition, DELmia V5 Human contains functions for climbing stairs and ladders, whereby the body automatically moves in synch with the limbs used. The human models can grasp objects within their reach as well. What's more, it is possible to determine the projected effort required for a certain activity when an individual is in a particular body position. "DELmia V5 Human can show me, for example, what the maximum weight of an object can be for a person to be able to carry it from A to B without injury," explains Zander.

### Scientific Analysis Methods

Not only can body postures and movements be depicted, but ergonomic factors can be analyzed, too. The system incorporates the RULA (Rapid Upper Limb Assessment) analysis method, developed by The

University of Cambridge, which indicates what strain an assumed position can place on the body. The analysis uses a point rating process and RYG (red/yellow/green traffic light) visualization. Other scientifically recognized analysis methods like those developed by Snook and Ciriello, as well as the National Institute for Occupational Safety and Health are also integrated within the software.

"DELmia V5 Human is an absolutely essential tool for my work," says Zander, emphasizing the software's important role. "Without the true-to-life simulation, we would be unable to verify our findings in the early planning phase."

### Results are Positive

Zander is convinced that Volkswagen will continue to give the topic of workstation ergonomics a high priority in the future. "Since I started here, we have received many requests from various divisions. It shows that our internal customers have recognized the software's potential." The results Zander has achieved so far are most positive and have made the leap from computer simulation to bona fide implementation, such as where the pre-assembly of the doors for the Golf's successor model were ergonomically optimized.



When manufacturing the latest Polo, the option of applying an installation seat was considered digitally – here when installing the sun visors

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