



## TENNECO Integrates SAP and MES with Paperless Work Instructions from Sequence

*Integrating a manufacturing facility's manufacturing execution system (MES) with ERP software has been a common processing plant practice for years. Today, however, one company is reaping rewards after integrating the two platforms with paperless work instruction software in a discrete application.*

Tenneco, Inc. introduced the integrated platforms at its Seward, Neb., plant to help a global construction and mining equipment manufacturer reduce its engine emissions and cut component costs.



A leading international designer, manufacturer and distributor of clean air and ride performance products and systems, Tenneco provided feedback on the design of the clean-emission module used in a variety of the manufacturer's heavy equipment. The company's products are found in worldwide automotive, commercial truck and off-highway markets and aftermarket.

Every step of the discrete assembly process at the Seward plant is held up to scrutiny through a digital documentation process using Sequence software. The software is tightly integrated with the plant's SAP and Rockwell Automation's Production Centre SCADA platforms.

"The work instructions include all steps conducted during the build of these computer controlled exhaust systems," says Sequence Software President Barry Lucas. "At the time a step is loaded, Production Centre calls for an instruction from Sequence based on the part, routing, operation, step and revision level."

The steps take place at a facility that includes six customer groups with multiple stationary production cells per group. It takes approximately 450 components to make each clean air emissions module on the line dedicated to the manufacturer. The module advances from one cell to the next on carts.

"At each workstation, the integrated system ensures the proper technician is certified to work at that station," says Tricia Miller, plant manager at Tenneco's facility in Lincoln, Neb., who was an engineer at the Seward facility when Sequence was introduced. "There's badge-level control. The system automatically informs operators if they are in the wrong location or if the operation is out of proper order. That guarantees that the team member is in the right area and that they are qualified to perform the procedure."



“The real benefit is the visual nature of the system,” she continues. “At any time, we can see exactly the work that needs to be done in real-time, including changes. Errors are reduced because all machine programs are automatically pre-selected by the system for the team members. Also, cycle time data is available to help us make improvements as needed.”

Every clean air module unit is considered a single order with its own history and paperless documentation. Photos of every view of the module are taken before each component goes into a shipping container. Approximately 200 pictures of each model are displayed in Sequence, representing each step of the process.

“This is a true discrete integration with an MES system,” Lucas adds. “Production Centre acts as the master system on the shop floor having functionality that allows Tenneco to completely define the manufacturing process flow.”

Throughout the assembly, Sequence passes back an internal URL that links to the WebSequence page containing the requested instructions. These instructions are displayed in a frame in the Production Centre interface. There is a corresponding Sequence instruction for every step in the process flow in Production Centre.

“These instructions allow Tenneco to precisely instruct shop floor workers with the appropriate contextual work instruction,” Lucas says. The instructions are based on the current scenario. At the same time the software takes advantage of Production Centre’s MES functionality for gathering information from tooling, including torque wrenches, PLCs and other tools, that are then managed and archived in a historian feature.”

## **The Results**

Today, the clean air module is being used in numerous models of the equipment manufacturers backhoes, wheel loaders and bulldozers. After the clean air module was put into production, the equipment manufacturer reported that its collaboration with Tenneco has significantly reduced costs on its equipment.

Additionally, Miller says the number of assembly errors have been significantly reduced as well.

“We trace everything in the bill of material,” Miller says. “That includes every washer, bolt and fastener. Without the electronic work instructions, we would have to manually track every component. The system is very capable and does exactly what we need it to do.”

## **Sequence Enterprise**

Designed for the manufacturing enterprise needing work instructions that are collaboratively authored, fully integrated with ERP/PLM/MES and deployed in a real time, interactive paperless environment.

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