Drive & Control **profile**

Assembly Work Made Simple

Everything in the right place: boards with work information explain the assembly steps, all the parts required are within easy reach, and the tools are ready at hand. In addition, the ball rollers recessed in the table top make it easier to turn the workpiece pallet.

Paris, June 2003. The Eiffel Tower shines by night with a new brilliance, enhancing its allure. Something hardly any tourist knows: this landmark of the Seine metropolis sparkling with 20,000 flashing lights is currently the best-known reference for Pfannenberg GmbH. Trend-setting innovations in two business segments are characteristic of the Hamburg company. Whereas the flashing lights are its specialty in the visual and acoustic warning and emergency alarm sector, Pfannenberg's invention of the filter fan some 40 years ago laid the foundations for switch cabinet air conditioning.

The increasing demand seen in past years for cooling units, heat exchangers, heaters and filter fans for switch cabinet air conditioning meant the company had to take stock of its assembly processes. The result is: time losses due to incompletely structured processes, insufficient ergonomics at the workplaces and inadequate facilities for deploying extra personnel to meet peak demand. Frank Sauer, Pfannenberg's process engineer, sums matters up, "We had to

Challenge

Develop new worktable system to handle assembly of large air cooling units

Bosch Rexroth Solution

- EcoFlow linking system

Benefits

- Unusual work tables can handle cooling units 2 meters high weighing 75 kg
- Recessed ball rollers in worktables make it easy to rotate heavy units
- Adjustable table eliminates need for crane to raise/lower units
- Workstation eliminates need to kneel or climb ladders to install components
- Workplaces better illuminated, have more working room and more convenient tables and storage features

It is now easy for the employees to set up cooling units of up to 75 kg weight by simply rolling them off the EcoFlow linking system onto the lowered adjustable table.

produce more, yet had no extra reserves to do so. The system before was too complicated in structure, not accurate enough and, in terms of ergonomics, was no longer up-to-date with present-day requirements."

A turn for the better, thanks to ball rollers

Pfannenberg GmbH registered an increase in productivity just a few months after its new manual assembly line went into operation. The ergonomically designed and linked workplaces made of standard modular components from Rexroth's manual workplace systems feature a high level of flexibility.

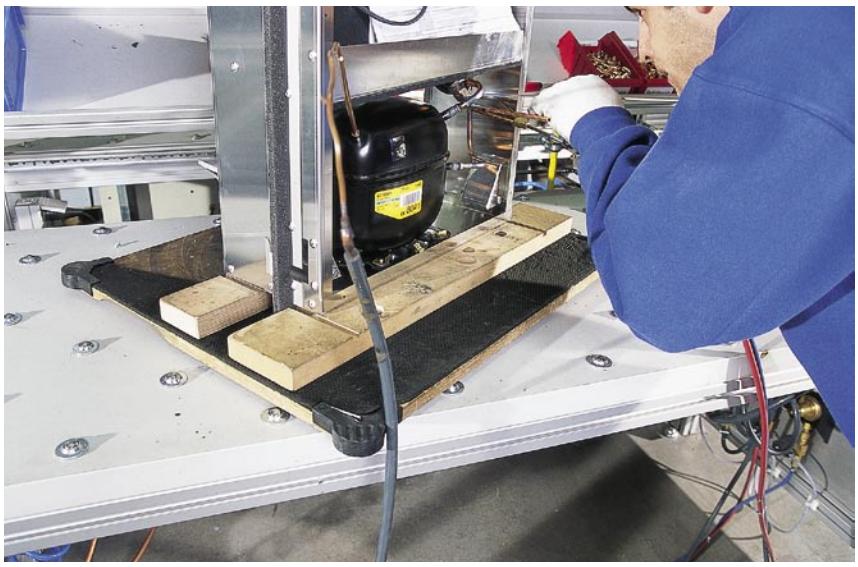
Higher productivity with ergonomic workplaces and the EcoFlow linking system from Rexroth. Cooling units of up to 6.5 feet height and 165 pounds weight, such as those Pfannenberg assembles on the line, are not exactly handy. That is why a high degree of creativity was required in the project planning phase for the line. Unusual work tables made from standard components in Rexroth's manual workplace systems range were developed in close cooperation between Pfannenberg personnel and Handke Industrietechnik Handels-GmbH.

The table size is selected to accommodate the workpiece pallets so that they can be turned on the table and parts mounted on either side of the cooling units. Recessed ball rollers in the table top make it easy to turn the heavy units. Frank Sauer explains, "This seemingly simple solution takes an enormous strain off assembly personnel, because up to now they had to lift each workpiece to turn it."

Integrated, vertically adjustable table replaces crane

The relief provided by using two vertically adjustable tables integrated in the line is also obvious. Whereas the cooling units formerly had to be set up with the help of a crane, the employees now lower the adjustable table, let the cooling unit slide conveniently over the EcoFlow rollers and place it at an angle on the workpiece pallet. An additional adjustable table with rollers and centering options is used as a packing workplace.

Problems of quite a different type were previously created especially by the height of the cooling units. Components that had to be mounted in the lower area of the cooling units literally forced the employees to their knees; the assembly of components in the upper area sometimes required a ladder. "Such awkward working positions are now a thing of the past. Thanks to the idea of providing this workplace with a platform on one side of the linking system, assembly operations can now be conveniently carried out either sitting or standing. Employees who also prefer standing to sitting when



Ball rollers recessed in the table top make it easier to turn the workpiece pallets at the workplace.

working on the lower part of the cooling unit can turn the unit round and stand on the opposite side," is how Frank Sauer describes the new ergonomic work features.

Materials and tools are always on hand

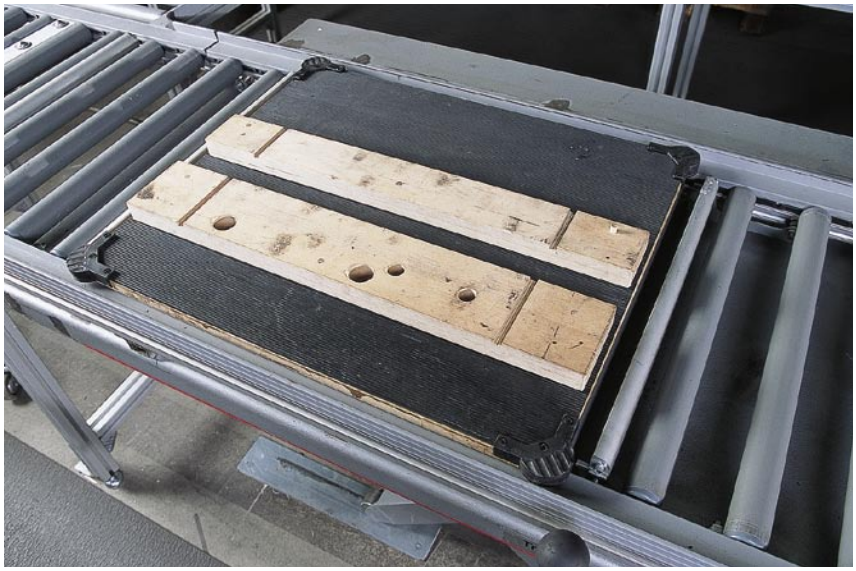
In addition to these creative details, the new assembly line presents a series of other convenient benefits for the employees and company alike. The ergonomic design of the workplaces reduces work fatigue and cuts down on the sources of errors, such as a lack of concentration. The workplaces have lighting systems, shelves and containers for parts, as well as information boards that provide more particulars on the respective working steps.

(Left) The combination of linking elements with rollers and work tables with recessed ball rollers enables different system layouts. Thanks to this design, it was easy for Pfannenberg to retrofit an additional workplace with test station. (Right) The platform is a simple, but ingenious solution for this workplace. Instead of always standing during work, sometimes even on a ladder for particularly high cooling units, the employees can now work here sitting and standing.

A versatile aluminum profile with a sophisticated geometry forms the basis for this. Rollers, transverse supports, leg sets and other components for workplace design can be inserted in the grooves of the profile. The rollers are clipped into a 300 millimeter long roller carrier at 50 millimeter intervals. A plastic guide profile also just clips in place to keep the rollers in position. At the same time, this profile ensures the workpiece pallets are securely guided on the section. As with the grooves in the EcoFlow profile, the T-groove on the workplace provides numerous mounting possibilities almost everywhere and allows for quick modifications.

The T-groove means supply lines can be installed quickly and neatly, providing every workplace with power and compressed air for the appropriate tools.

The Rexroth EcoFlow linking system also allows the use of customized workpiece pallets. Pfannenberg continues to use chip board pallets with specially made cooling unit supports. Plastic corners acting as spacers form part of the EcoFlow range and prevent employees from getting their fingers caught between two



Pfannenberg continues to use simple chip board carriers as workpiece pallets in the Rexroth EcoFlow linking system. Plastic corners act as spacers and prevent employees from getting their fingers caught between two workpiece pallets.

workpiece pallets. They also help the workpiece pallet to smoothly negotiate curves.

Reduction in non-productive time, flexible system layout

"There are a great many advantages compared with our former assembly line," reports Frank Sauer and enumerates the individual points. "The workplaces are better illuminated. We have created more working room for the employees and today we have brought the work sequences under far better control." The process engineer names as an example the fact that in the previous line tasks were not assigned to a dedicated workplace. This meant that tools were used at different places, could not be fixed as a result, and therefore were not always at the employees' direct disposal. "All this led to non-productive time, which could soon be significantly reduced using the EcoFlow."

The flexibility, particularly in linking the manual workplaces with EcoFlow, is demonstrated not only by the creative system layout using standard components, but also by the options for easy extension. Every cooling unit undergoes a 100 percent inspection before leaving the factory. Increasing production figures induced Pfannenberg to set up a second workplace with a test station shortly after the project planning phase. "Attaching an additional workplace just like that," as Frank Sauer puts it, would have been impossible due to the nonflexible structure of the former system. "Extending this line, however, involved no difficulties at all. The uniform concept with coordinated and optimally matched components made it possible to install an outfeed section and integrate another test station into the line in a matter of no time."

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