

INSTEAD OF HEAVY LIFTING AND HAULING

MOBILE LIFT WITH SENSOR TECHNOLOGY FOR PRECISE POSITIONING

Clever ideas require reliable sensor technology, e.g. for automating a mobile lift for handling and transporting tire blanks.

This solution was developed by TransOrt GmbH, whose MobilLift systems have been providing low-load internal transport since 1998 (see box). With around 14 employees, the company based in Schmallingenberg (Sauerland) designs and manufactures mobile lifting equipment for loads up to 200kg.

SPECIAL SOLUTION FOR TIRE MANUFACTURER

The lifting tools are always customized to the specific requirements and thus the corresponding parts logistics or products of the customers. "Around 400 such lifting devices leave our production facilities every year. If a product from our standard range does not fit, we develop special versions according to customer specifications," explains Michael Neumann, master electrician at TransOrt. Such a special solution was developed at the request of a leading tire manufacturer who was looking for an ergonomic mobile solution for raising and lowering as well as transporting tire blanks.

OPTICAL SENSORS FOR SEMI-AUTOMATIC OPERATION

TransOrt then developed a MobilLift system that essentially consists of a battery-powered transport cart with a lifting axis and two internal grippers. Michael Neumann: "We wanted a solution for semi-automatic operation, so we needed appropriate sensor solutions for both the positioning of the lifting axis and the internal grippers." One of the challenges in this project was to find an optical diffuse reflection sensor that could detect the very dark tire surfaces despite their rather poor reflective behavior. "In addition, the devices had to provide the switching distances we needed and also be compact, as we didn't have much space available for mounting, especially in the inner grippers. We finally found the sensors with the specific characteristics that we wanted at ipf electronic," says Neumann.

EXACT POSITIONING OF THE LIFTING AXIS

At first glance, the functionality of TransOrt's solution appears to be immediately obvious, which is definitely an advantage in terms of intuitive handling of the mobile lift via two separate operating elements for the lifting axis and gripper. However, it is only on closer inspection in practical use that the sophisticated details of the system become clear.

To pick up a tire blank, e.g. from a warehouse, the MobilLift must first be positioned in a way that the lifting axis is directly above the material to be transported. At the push of a button, the lifting axis lowers until the two inner grippers (one movable and one fixed to the lifting axis) have reached the correct height for clamping the tire blank. The position of the lifting axis is monitored by an **OR150175** retro-reflected sensors mounted on the side and a reflector mounted on the moving gripper as a counter element. If the upper edge of the tire breaks the light barrier, the lifting axis stops. Now the MobilLift must be moved forward a little by the operator until the tire support of the rigid gripper is under the inner edge of the blank. The movable inner gripper can then be activated via a separate operating element.

RELIABLE POSITIVE CLAMPING

Both clamping elements on the lifting axis integrate the **OT330570** optical sensors, whose switching distances have been taught to the slightly protruding tire supports of the grippers. The diffuse reflection sensors look down on these supports and stops the clamping process independently of the tire inner diameter only when both tire sidewalls have been reliably detected. "This state does not have to be taught separately, as the controller processes this by going below the previously taught sensing ranges," Neumann emphasizes. Therefore, the control system only releases the moving inner gripper when the sensor in the rigid gripper reliably detects the first tire flank. Only now the movable gripper processes until the second tire flank is detected. "In this case, the tire is not tensioned by pressure, but merely positively," Neumann said.

IDEAL HEIGHT FOR GENTLE DEPOSIT

The lifting axis can then be raised and the tensioned tire transported to the storage location, e.g. a tire stack on a machine, positioned accordingly and the lifting axis lowered at the push of a button. "As soon as the transported tire touches down on the other tire blank, it pushes up slightly in the load pickup, interrupting the retro-reflective sensors again and stopping the lifting axis at the ideal depositing height to avoid damaging the tire blanks. Finally, the inner grippers are released and the lifting axis is released upwards. Another optical diffuse reflection sensors ensures that the grippers do not close completely on the inside," explains Neumann.

ERGONOMIC, INTUITIVE AND ALWAYS SAFE

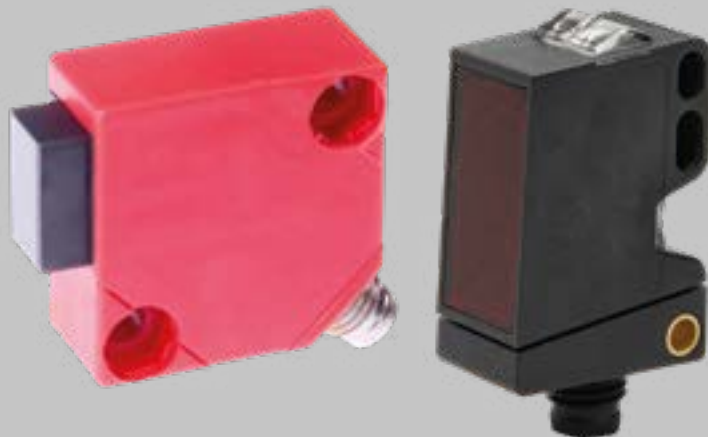
Two mobile lifts from TransOrt are now in use at the leading tire manufacturer. In addition to the best possible ergonomics, their development focused on intuitive operation with a high level of safety. Therefore, also the partially automated solution. "The diffuse reflection sensors on the operating elements for the lifting axis and also gripper have to be pressed permanently during the individual operations. If the diffuse reflection sensor is released, the process stops immediately," says Michael Neumann, who praises the successful cooperation with ipf electronic: "When implementing our devices, we work in principle with partners from our region. That also proved its worth in this project, because the sensor specialist from Sauerland had exactly the right solutions for our requirements, so we were also able to overcome some challenges."

i Excellent developments for more ergonomics

Safely lift, tilt, pour, rotate, lower, grip, drive and swing heavy loads in a manner that is easy on the back. The professional MobilLift systems from TransOrt ensure low-load internal transport, increase safety in companies and also accelerate internal logistics processes. The company has received several awards from the "Aktion Gesunder Rücken e.V."

i Powerful solutions for position inquiry

TransOrt's solution integrates a total of four sensors from ipf electronic: three **OT330570** optical diffuse reflection sensors with background suppression (right) and one **OR150175** retro-reflective sensor (left). The compact **OT330570** with IP67 protection operates with red light (scanning range 30 to 300mm) and detects materials almost independently of their degree of reflection, i.e. also the dark and thus poorly reflecting surface of a green tire. The **OR150175** retro-reflective sensors in IP65 is particularly compact (30x30x15mm) and has a maximum switching distance of 2000mm. In the application as described, it is used for position inquiry of the lifting axis.





Semi-automated transport solution for green tires. The load pickup of the mobile lift consists of a lifting axis and a front fixed as well as a movable inner gripper. (All images: TransOrt GmbH)



OR150175 retro reflective sensors for position inquiry of the lifting axis. Before clamping, the lifting axis is lowered until the upper edge of the green tire interrupts the light barrier. Then the inner grippers have also reached the correct height.



The switching distances of the two **OT330570** optical diffuse reflection sensors in the grippers have been adapted to the slightly protruding tire supports. The reflector for the light barrier is also located in the movable gripper.



The gripper clamping process stops automatically, regardless of the tire's inner diameter, when both tire sidewalls have been reliably detected.



The third optical sensor in the rigid inner gripper ensures that the grippers do not close completely when moving inwards.



Michael Neumann, master electrical engineer, praises the cooperation with ipf electronic: "With the sensor solutions, we also overcame some of the challenges of the project."