



2005

# SOLVING NEWS



## A new chassis every 15 minutes

Shorter and faster assembly lines at Volvo are developed and installed by Solving ... See page 3

Solving is one of the world's leading manufacturers of flexible and cost-effective equipment for handling heavy loads. Our handling systems are based either on air bearings or wheels. Having specialised for almost 30 years in customised solutions, we have now added Automated Guided Vehicles, AGVs, to our range.

This publication includes some of our recent installations to provide inspiration. If you need a flexible solution to your material handling requirement, please contact the Solving office nearest you; the details are on the back page.



## 65 tonnes on air bearings ..... See page 3

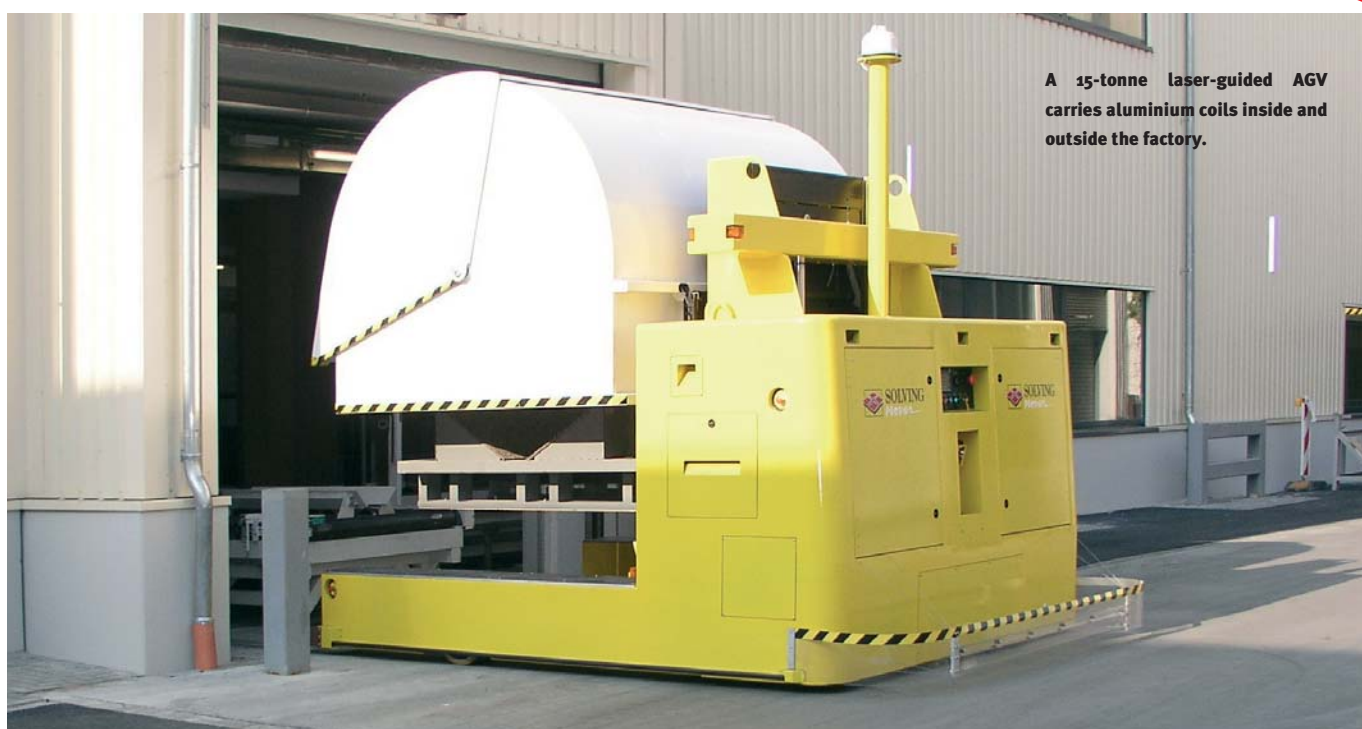
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A 15-tonne laser-guided AGV carries aluminium coils inside and outside the factory.

## 15-tonne automated handling between buildings

### German customer chooses Solving's technology for handling heavy aluminium coils.

Hydro Aluminium Deutschland GmbH manufactures rolled aluminium sheets for the printing and other industries. The reconstruction of the production facilities led to a requirement for automated transportation of their aluminium reels, which are placed on special pallets from production to the packaging area. Because aluminium reels are handled continuously through three shifts, automated transportation was a natural choice.

### Automated movement system

The transport route, running between two separate buildings, is also used for intersecting traffic, such as lorries and forklift trucks. Because the throughfare couldn't be closed to these vehicles, an automated movement system was therefore the most suitable choice. The required capacity of maximum six reels per hour, each reel weighing maximum 15 tonnes, is also appropriate for a Solving AGV system.

Hydro Aluminium chose a fork-shaped Solving AGV Mover equipped with laser navigation and a rapid chargeable NiCd-battery suitable for continuous shift work. Laser navigation was considered appropriate to the current operating conditions; the

Mover is driven indoors in two buildings and a short distance outdoors between the buildings. The frame of the Mover is designed to suit the requirements of outdoor use considering the weather conditions in Germany. The safety devices are a combination of conventional technology, including safety buffers, and modern laser based technology.

The AGV Mover receives its transport orders via radio communication from a PC/Windows-based Solving AGV-control system communicating with the fixed conveyors at the pick up and delivery stations, and also with the automatic doors along the transport route. A graphic PC display and remote supervision allow for fault finding.

### Both outdoors and indoors

This solution is unusual, because the AGV drives in the open and moves unpacked products from production to the packaging area. Fitted with automatic load protection, the AGV Mover and load are protected from outdoor conditions such as rain, snow, dust and dirt. The protection consists of a cover that is activated automatically by the Mover's control system, to be open when an aluminium coil is loaded and unloaded, and closed when driving outdoors. ▲



The Solving AGV Mover assisted Hydro Aluminium in finding a practical solution to their requirement for regular material flow between buildings.

Creating Movement



# Solving breaks away from tradition



From being a manufacturer dedicated to air film-based handling equipment, Solving has now embraced more automated – and often wheel based – equipment, to create Solving AGV Movers. Although air film technology remains our major business, wheeled handling systems represent an important step forward in our development.

An extended product range requires additional human and production resources. Human resources have been and will continue to be strengthened as

and when necessary, whilst the production facilities are now being significantly enlarged. The foundations of the production and office expansion scheme in Jakobstad, Finland, have been laid, and the new facilities are scheduled to be ready this autumn. The new assembly facility will provide better conditions to simultaneously handle the final assembly of several projects, thus resulting in shorter production times. In the end this will benefit our customers with improved service and delivery.

We are pleased to present some of our

most recent installations in this year's Solving News – both air bearing solutions and automated wheel-based systems. Please feel free to contact us for any material handling information or advice; we will be happy to create handling solutions to suit your requirements.

**Peter Björk, MD**

## Railcars, but no rails!

Air film technology is used to move carriages in railway repair shops.

Nedtrain is a Dutch company providing repair, maintenance and modernisation of transport equipment to the Dutch railway network.

Traditionally the railway repair shops have used wheels on rails for all movement, which is logical as the rail coaches are already fitted with such wheels. However, this makes the handling system inflexible and creates complicated logistics; for this reason Nedtrain now uses a more flexible handling equipment based on air film technology.

Upon arrival at the repair shop for maintenance and repair the carriage's bogies are removed.

The carriage is then placed on two 'pallets', on which it remains

during the repair process. The two air film-based Solving Movers drive under these pallets, lift the carriage and move it to different work stations. A pneumatic drive unit and an integrated control system provide for each Mover to follow a metal tape on the floor. This passive guidance assists manoeuvring in narrow aisles and passages, and radio control allows the operator to walk freely around the load to ensure safe supervision. Used in pairs the total capacity of the Solving equipment is 80 tonnes.

### Square with workstations

Surrounded by workstations the workshop layout forms a square, which functions as the transport



Solving air film-based Movers are used during repair and maintenance.

route and turning point. The square is wide enough to allow the Movers to turn freely in all directions.

The new Solving handling equipment, together with an extension of the workshop containing another "square" with more work stations, and a passage between the buildings, allow Nedtrain to move the railcars from arrival through all their repair processes.

The work stations include

dismantling, reconstruction, sand blasting and lacquering. The Movers are floated on air bearings until they reach the last two stations, where the floor is not suitable for air film technology. However, because the Mover is also quipped with retractable steel wheels, it can then be moved on rails. ▲



Mobile crushers are floated on air bearings through an assembly line consisting of five stations.

## Floating mobile crushers

Air film technology provides silent movement of crushers and a clean production environment.

Metso Minerals is part of the Metso group selling its products worldwide. Their crushing plants produced in Tampere, Finland, are designed for rock size reduction and the end product, crushed stone, is used in civil construction and road building. These large mobile crushers can weigh up to 50 tonnes.

The crushers were previously assembled in cells, but now they are moved on five Solving Movers in a new assembly line.

Various alternatives were evaluated to move the crushers, but the customer chose air-film based Solving Movers based on their advantages and features.

### Five-station assembly line

At the first of five stations in the new assembly line the frame is lifted by crane onto a Solving Mover, where it remains throughout the assembly process. At the end of the line the crushers are driven off the air film Mover using their own tracks and the empty Mover is then floated back to the beginning of the line.

The Solving Mover consists of a low-profile frame with automatically regulated air bearings and integral drive units. A radio remote control unit allows the operator to freely walk around the load during movement to ensure the movement path is clear.

"Our close and flexible cooperation with Solving during development and construction of

the Movers was both interesting and successful", says Development Engineer Janne Hilliaho from Metso Minerals.

He is also pleased that their requirements for the handling equipment could be considered and met, and that Metso Minerals and Solving were able to work closely to create a total handling solution that best suited their needs.

### Same Movers for all crushers

In comparison with alternative handling methods one advantage of the Solving Movers was that only minor changes in their previous assembly method were necessary, because the Movers were specifically dimensioned to suit the size of the crushers. In addition the Movers suited all models of crushers in the assembly line. The large load capacity and the possibility of omnidirectional driving were other advantages of the Movers.

"This was one of the most important reasons behind our choice of handling method", says Hilliaho.

Solving Movers are almost silent, easy to control, provide safe material handling, and a clean and pleasant production environment in which to work. ▲



The 30-tonne moulds for shoe press belts, used in paper machines, are moved on a Solving air bearing system through production.

## 30 tonnes, 12 metres long, total control!

Solving provides a movement solution for one of the leading suppliers of technical textiles.

Tamfelt is a Finnish company manufacturing various types of paper machine clothing, press felts, belts and filter fabrics. The company was founded way back in 1797, and today Tamfelt is one of the world's leading suppliers of technical textiles.

Shoe press belts – Tambelts – were developed by Tamfelt and are used in paper machines to improve paper quality and to save energy in paper manufacture.

The width of the Tambelt is determined by the paper

machine width, which can be up to 12 metres, and they are manufactured in a special machine using moulds with a dead weight of up to 30 tonnes. The moulds are changed regularly during production, because the shoe press belts of the paper machine and Tambelt diameters and widths vary, and each diameter is manufactured in its specific mould.

### Solving Movers in the late 90s

When production of Tambelts started in the late 90s Tamfelt were looking for a flexible, simple and low profile handling solution for moving the various

moulds; they chose air film-based Solving Movers, each with 30-tonne capacity. The first two Solving Movers were designed to carry the moulds throughout the manufacturing process.

### Another Solving Mover

Tamfelt has recently established a new production unit to provide increased production. As a result of Tamfelt's positive experience with the previous concept, they chose another Solving Mover for their new plant. In their new production facility each mould is placed on its own specific transport pallet, and the Solving Mover then drives under the pallet, lifts the load and moves it

between the production machine and storage area.

Only one Solving Mover is needed to move the various pallets and moulds, thanks to the lifting and moving features of air bearings.

The radio-controlled Solving Mover is both easy to use and safe, and gives the operator full control of the transport.

"We are very pleased with the Solving Movers, which enable us to move our products safely and efficiently" says Production Manager Jari Jännetyinen. ▲

## New orders

### GKN Westland Aerospace, UK

Two Solving Movers, each with a capacity of 6.5 tonnes, will be installed at GKN for picking up, manoeuvring, transporting and loading wing spar mould tools into an autoclave. The 13-tonne, 15m tools will be manoeuvred by a single operator from a hand-held radio control unit.





## Unique assembly method at Volvo uses Solving technology

Method studies carried out at Volvo have resulted in a completely new assembly method, not used anywhere else in the world, for truck manufacturing in Gothenburg, Sweden. This unique assembly method is applied to the final assembly of axles and is also used to mate chassis and axles.

It has been over 75 years since the first Volvo truck was built back in 1928. Today Volvo is among the largest producers of heavy

trucks with 72,000 employees and production in 25 countries.

Back in 1991 Volvo bought their first air film-based assembly wagons with integrated lift tables from Solving. At that time axles and chassis were assembled in stationary assembly cells. This method has been working well, but the requirement for higher efficiency resulted in the new assembly method Volvo has now adopted. In co-operation with Volvo Solving developed and installed inlet (loading) and outlet (unloading) conveyors, turntables and dollies in two new parallel assembly lines, all

achieved in an extremely short installation time.

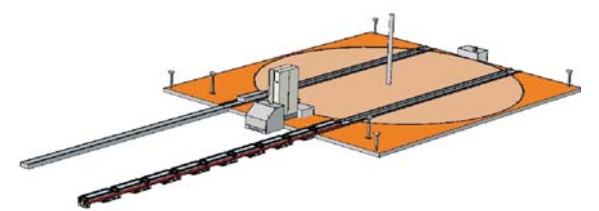
### Short and fast assembly line

This new assembly method provides a production line which is half the length and faster than a conventional line, because a turntable at the end of the line gives it a 'U'-shape. Two similar production lines are installed, each producing a chassis every fifteen minutes or about 33 chassis a day.

The axles are pre-assembled on AGVs and then placed on dollies that are collected by a truck. The

dollies are loaded onto an inlet conveyor in the same sequence as they are to be positioned under the truck. Depending on the model of truck, an operator drives 2 to 5 pre-assembled axles from the conveyor to the turntable and rotates them through 180°. The axles are then transferred to an outlet conveyor, where a pre-assembled chassis is brought in manually – AGVs will be used in the future – and lowered with a trolley towards the axles for docking. The assembled chassis is then moved on a dolly along the outlet conveyor and at the end of the line a truck collects the dollies

Axles arrive on dollies, and the completed chassis assemblies are moved out on an automatic conveyor.



and chassis for further handling through other assembly lines.

“The cooperation with the project management and designers at Solving has worked very well. In projects of this size, situations always occur that need to be discussed to create a good solution, and Solving has provided us with rapid feedback throughout the project”, says the Project Leader of equipment to the new assembly line.

Being 'U'-shaped this type of assembly line requires only half as much space as a linear production line, and can therefore be easily installed within existing factory layouts. ▲

## 65 tonnes on air bearings

Automated handling of tambours at Stora Enso using Solving AGVs.

Stora Enso installed an automated Solving air film based tambour Mover when reconstructing the machine line at their Summa paper mill in Finland. Tambours weighing up to 65 tonnes, 3200 mm in diameter and 6880 mm in width, are moved automatically between the machine line, storage area and cutter with a Solving Automated Guided Vehicle (AGV) Mover.

### Low surface pressure

Air film technology, requiring a good quality surface with no rails in the floor, was an alternative to a "conventional" solution utilising cranes and rails. By using air bearings the weight of the load can be distributed over a very large floor area to ensure that the surface pressure is only about 4 kg/cm<sup>2</sup>. Stora Enso had to achieve reduced point loads

to enable them to keep within the maximum loading allowed for each storey of the building, despite the fact that the weight of the tambours had increased with the new paper machines.

The new tambour AGV is manoeuvred along a groove in the floor and carries out its transport tasks automatically from orders given by the operators via push buttons. NiCd battery technology is used as the energy source and the battery is charged automatically at waiting stations between the transport tasks to ensure continuous shift work. The battery provides power for the drive units, steering and safety devices.

### High operator safety

The AGV is loaded and unloaded by crane, and can carry one 65-tonne tambour or up to three empty ones. Solving's new generation tambour AGV installed at Stora Enso's Summa mill is equipped with the latest



technology to guarantee operator safety. The AGV Mover surveys its route with "laser radar", activating creep speed and an

emergency stop if unexpected obstacles, such as personnel or other objects, are detected. The AGV Mover is also fitted

with warning lights indicating automatic mode, emergency stop buttons and a safety guard for foot protection.

Tambours weighing 65 tonnes are moved efficiently with an air film based Solving AGV Mover at Stora Enso's paper mill in Finland.

### Savings in cost and time

This technology has enabled Stora Enso not only to achieve low floor loadings, but also to make savings in both construction costs and time, because only a single groove had to be installed in the floor to guide the load. The automated air film based Solving Mover, whilst ensuring a safe and driverless transport link between various stages of production, has also improved the ambience of the factory environment. ▲

### Stora Enso Kvarnsveden, Sweden

Stora Enso Publication Paper has ordered an AGV system from Solving to handle 10 000kg paper rolls at their Kvarnsveden paper mill in Sweden. The wire-guided AGV will be used for moving paper rolls automatically from wrapping to despatch.

### Valmet Automotive, Finland

Valmet Automotive will extend their assembly line with a new Solving AGV Mover. They already use eight Solving AGVs for manufacturing Porsche Boxster cars.

### Bauer Druck, Germany

Two Solving Reel Movers including semi-automatic lift tables have been ordered by Bauer Druck for their printing house to be built in Poland. The Movers are designed to handle reels weighing up to 10 tonnes.

### Robert Bosch, Germany

Robert Bosch has ordered two air film-based Solving Movers for moving diesel engines between the assembly and test areas. Several Solving Movers are already in use at the company.

### Ponsse, Finland

Harvester manufacturer Ponsse will automate their assembly line for harvesters and has ordered 11 wheel based AGVs from Solving. The battery-driven AGVs use wire-guidance as the navigation method.



**Pilkington Plyglass, UK**  
A 40-tonne Solving Mover picks up and moves heavy packs of glass sheets from the arrival bay to stores and then to the process area. The Solving Mover is fitted with eight air bearings, which provide a virtually friction-free film of air on which to float the glass.



**Solving Reel Mover**  
The Solving Reel Mover is designed to handle reels directly off the floor. Equipped with integrated lifting devices the air film Mover can handle reels and drums of varying sizes.

## A variety of applications

**Patria Vehicles, Finland**  
4-tonne car bodies of Armoured Modular Vehicles are moved on a battery-powered pedestrian controlled Solving Mover from sandblasting to the painting area. Equipped with an electric control system the Movers are easy to use regardless of weight of the load.



**Voith Turbo, Germany**  
A remote-controlled Solving Mover is used to handle Power-Pack sets through a production line on air bearings.

## A new transformer handling concept



**BEST A.S. in Turkey has installed a Solving air film Mover to move large transformers quickly and smoothly through production and test facilities.**

Solving air film based Movers are used for quick and smooth transformer handling.

The transformer industry was among the first users of air bearings in Europe. Back in the 70s Asea in Ludvika, Sweden, and Bad Honnef, Germany, (today both ABB companies) used air bearing modules to move heavy power transformers through production. At that time no drive units were used, but instead the transformers were moved with two large trucks; one in front of and the other behind the transformer.

Nowadays air film-based moving equipment is used by most of the world's transformer manufacturers, and air film

technology is considered ideal for handling transformers weighing several hundred tonnes quickly and smoothly through production and test facilities.

Solving provides a wide range of transformer-handling equipment for the industry today. The equipment often consists of a Solving air film mover incorporating all the necessary technology, designed to lift and accurately move steel pallets (on which the transformers remain during the production process) from one station to another.

The air film mover consists of a rigid steel construction incorporating both air bearings and wheels, drive units, a control system and in some cases also a hose reel for the air supply.

Usually one single operator manoeuvres the system from a portable radio transmitter.

Electrical drive units and integrated batteries improve the flexibility of the mover, and allow it to be operated without load free of any trailing cables or air hoses; these are connected only when a loaded steel pallet is to be moved.

BEST A.S. in Turkey and ABB in Poland are examples of transformer manufacturers benefiting from this new Solving concept.▲

## Automated pallet handling

Solving's AGV Pallet Movers enable our customers to be more competitive.

Solving has developed a new module-based family of Automated Guided Vehicles, AGVs, for handling load pallets between various processes in production – or between production and storage. Solving's AGVs are primarily suited to regular material handling of large volumes.

The fork-shaped Solving AGV Movers are designed for 1000kg EUR-pallets to special pallets up to 15000kg. The basic construction, control system and design are the same for all these AGVs, whilst the load carrying interface is designed to suit specific applications. The width of the movers can be adjusted according to the customer's requirements.

### Automatic storage

Pallet AGV Movers are generally programmed to leave the pallets automatically in cumulative rows on the floor. By arranging buffers of pallets easily and automatically on the floor, driverless time sequences in the production and storage process can be achieved. Automated unmanned storage and retrieval is cost-effective and provides unrivalled flexibility for future changes.

### Laser or inductive guidance

Solving AGV Movers are guided automatically using either laser or conventional inductive navigation. In cooperation with the customer the most appropriate and beneficial guidance system is chosen for each installation.

### Designed for continuous industrial operation

Battery-powered Solving AGVs are usually charged automatically to allow for continuous industrial operation, and thus both investment costs and overtime work can be limited. All service positions are easily accessible and the latest computer technology advises operators of maintenance requirements. The control systems can be fitted with a graphic PC display and integrated memory for registering tasks and events to facilitate fault finding.▲



**The Solving AGV Pallet Mover has a capacity of 2 000 kg.**

## Solving AGV Pallet Movers for Höganäs and Mirka

### Höganäs AB

The Swedish manufacturer of metal powder, Höganäs AB, has used Solving's laser guided air film-based Movers (10–15 tonnes) for more than ten years. Based on their previous knowledge and experience of Solving, Höganäs chose their first Solving AGV for continuous handling of metal powder packages placed on load pallets. With a capacity of 2000 kilograms this Mover is equipped

with laser based safety devices allowing for higher speeds. The Mover's lifting devices are sized to suit EUR and disposable pallets.

### Mirka

Mirka, a Finnish manufacturer of coated abrasives, has installed a customised Solving AGV Pallet Mover for moving large rolls of coated abrasives on load pallets through production and to the

storage area. Sand paper sheets and discs for the retail trade are made from these large rolls. The Movers for both Mirka and Höganäs are fitted with NiCd batteries and automatic battery charging, ensuring 24-hour operation.

Mirka's facilities have been expanded in several stages and moving load pallets automatically between different bays would have been very difficult

to achieve efficiently with any other technology. The AGV lifting devices are designed to suit EUR- and FIN-pallets, and can accommodate extreme centre-of-gravity conditions.▲



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