



ProfilGruppen AB

Automated material transport in a two-storey section store

For the logistical modernisation of the extrusion plant of ProfilGruppen AB in Aseda, Sweden, H + H Hermann + Hieber had to tackle a difficult task. To be able to set up an effective automation of the material flow despite the relatively unfavourable initial situation, an unconventional solution was planned and successfully implemented. This example shows clearly that innovative approaches can successfully automate material transport systems retrospectively even in long-established extrusion plants.

The fact that today ProfilGruppen is one of the most important section suppliers for Bosch Rexroth shows that the Swedish producer is a major European provider of extruded aluminium sections. This position has been achieved by the company, founded in 1981, in little more than 25 years.

In 1981 ProfilGruppen started with just one extrusion press. By 1986 the still young company had already installed capacities for

section processing and that year it also acquired an anodising plant. In 1989 the second extrusion line was put into operation and the construction of a third production line was completed in 1997. In the following years processing in particular was extended, including by takeovers. Finally, in 2001 the individual parts of the company were reorganised. Processing is now concentrated at ProfilGruppen Manufacturing AB and the extrusion activities have been brought together under ProfilGruppen Extrusions AB.

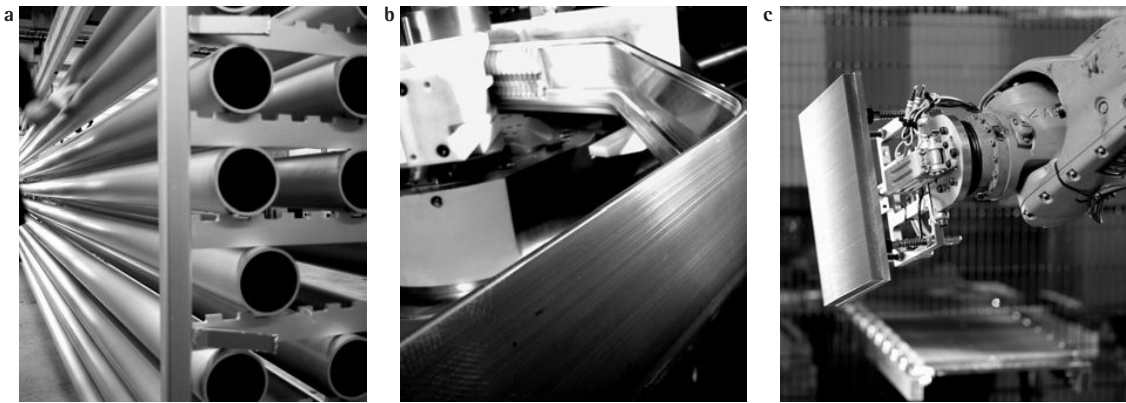
The published company reports show that in the last three years the focus has been on consolidating the rapidly grown company. Under the pressure of changes in the global extrusion markets, ProfilGruppen too has found it necessary to activate rationalisation reserves. Meanwhile, the present economic and financial crisis has increased that pressure substantially. Accordingly, in 2007 the company decided to automate its material transport systems step by

step in the areas of extrusion and surface treatment. The partner chosen for this was the market leader H + H Hermann + Hieber GmbH, which has accumulated comprehensive know-how in more than 50 projects of this type.

Initial status and objectives

At the company's location each of the three extrusion lines is in a separate building. While one of the three presses is housed a few hundred meters to one side, the sheds with the other two presses are arranged directly adjacent and at a right-angle to one another. The areas enclosed on two sides are at present used for the anodising plant and for checking procedures. This basic arrangement is illustrated in the diagram below.

The section racks are transported by floor-level trolleys. This mode of transport is labour-intensive, expensive because of the high cost of the trolleys, and



A broad range of section processing at ProfilGruppen: anodising (a), bending (b), machining (c)

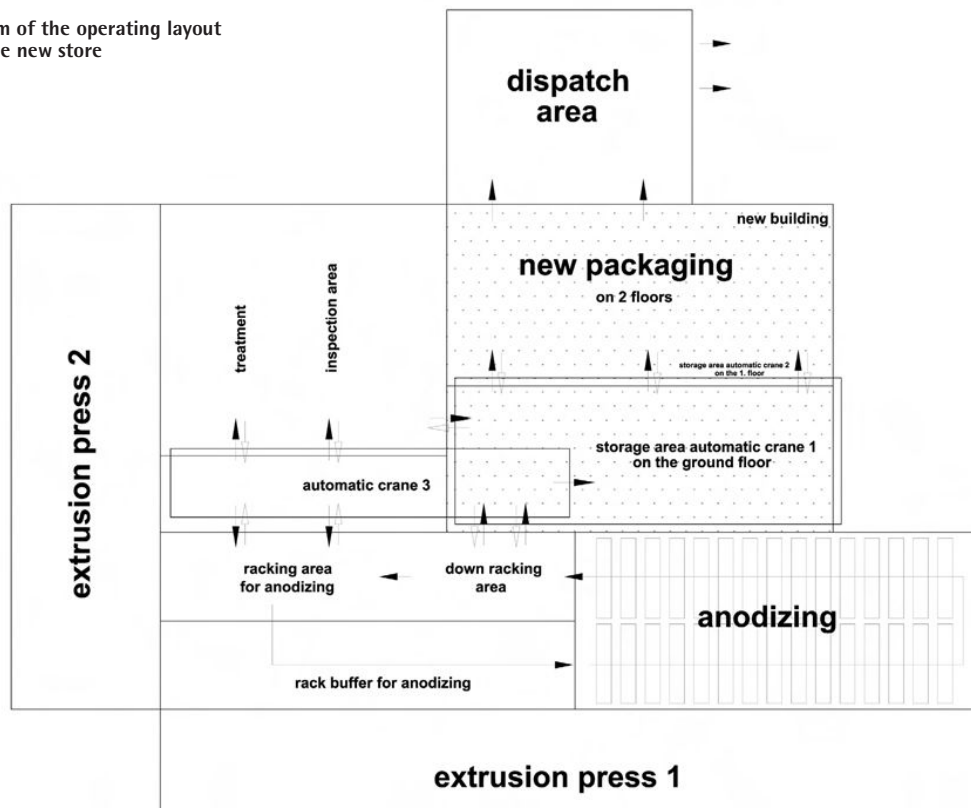
in addition, transport-generated scrap cannot be reliably avoided. So the objective of the project as a whole was to provide automatic material transport through all the production steps and up to dispatch. The total production of the two presses had to be transported fully automatically through the anodising plant, through the store and through the packaging area.

The way to this was developed in a general plan to be implement-

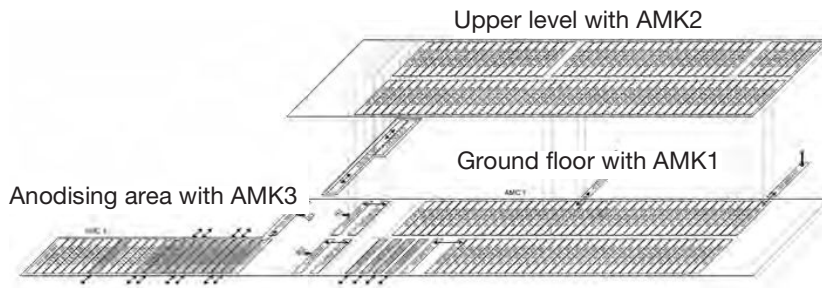
ed in a number of stages. The first and most important stage of the project, which has now been completed, was to construct a new central store and to connect logistically the store, the surface treatment plant and the existing packaging stations. The next step will be to automate the transport of sections from the presses to the store, reorganise the packaging stations, and connect them fully automatically to the store.

From an analysis of the material flow it emerged that storage areas of above-average size are needed, mainly because of the relatively large proportion of sections to be delivered after mechanical machining and anodising. In total, some 700 storage positions should be available for the central storage of section racks.

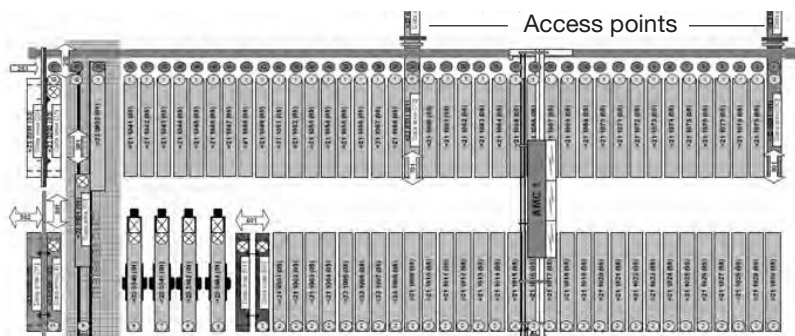
Diagram of the operating layout with the new store



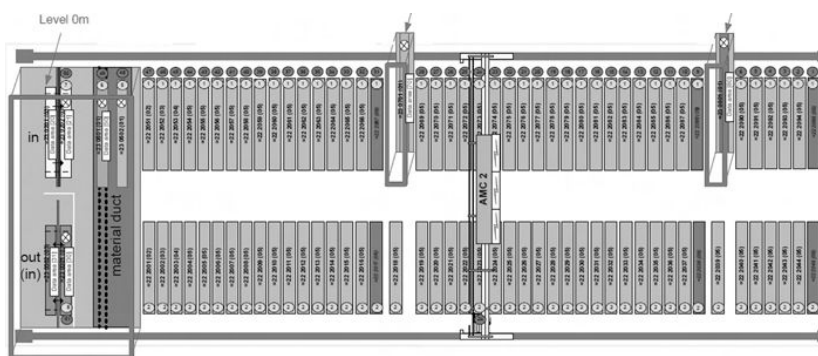
Overview of the three crane transport levels



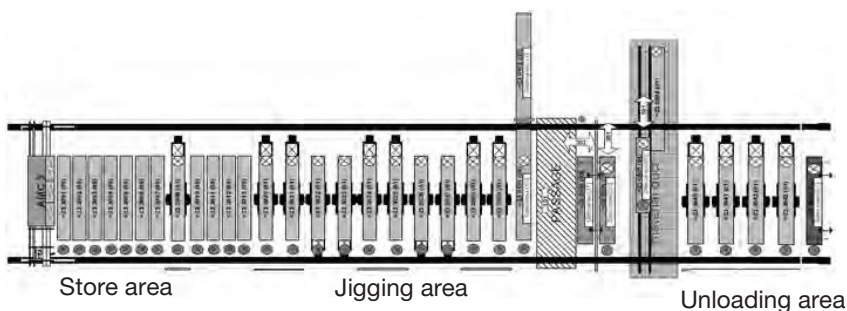
3-D representation of the new store (ground level and upper level) and of the linked anodising plant



Storage at ground level with automatic crane AMK1 and with transfer trolleys at the end (on the left)



Storage on the upper level with automatic crane AMK2 and two gaps for access to ground level



Linking of the anodising plant to the store by automatic crane AMK3

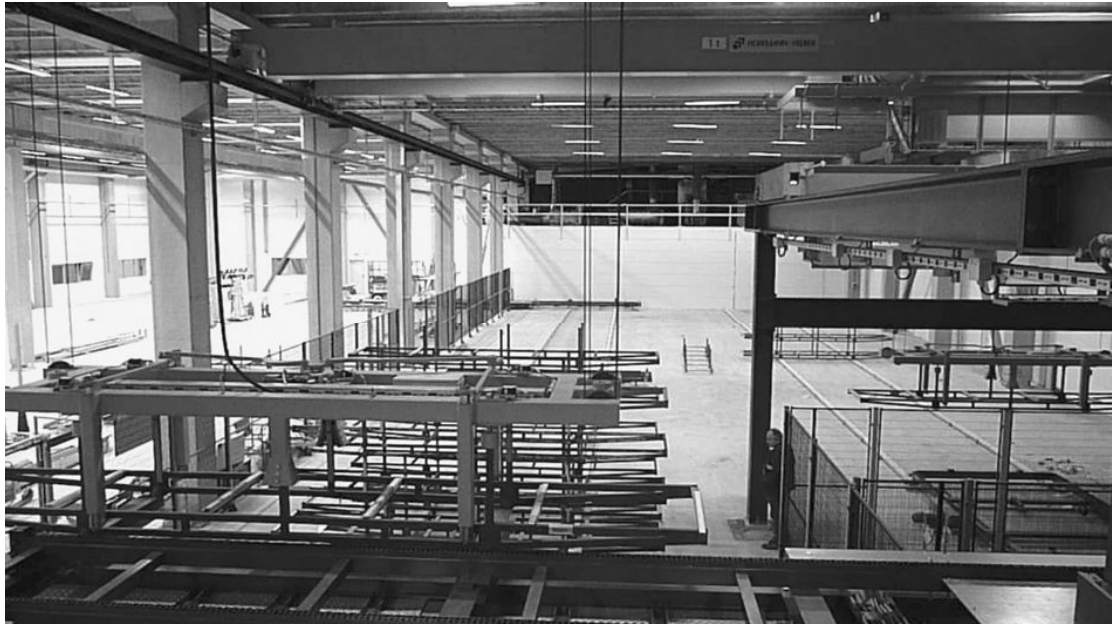
New store and anodising plant

With the above starting situation it seems sensible to use the still available area, bounded essentially by the two extrusion sheds, for building a central store and for the packaging and dispatch stations. The planned use of the areas is

shown in the diagram.

However, the necessary large store volume cannot fit into the available area without additional measures. For that reason it was generally decided to build the store on two floors one above the other. On both levels the racks are stacked five at a time in two rows

next to one another. On the ground floor are stored the finished goods ready for packaging, while the upper floor holds goods to be transported to the anodising plant. However, this separation is not absolutely fixed and when necessary the storage areas can certainly also be used flexibly.



The new store under construction: collaboration of all three automatic cranes

For transport in rack stores built in this way, transport by crane is the generally accepted method. In a two-storey store this means that each of the two levels must have an automatic crane of its own.

As can be seen in the diagram of the areas involved, the anodising plant is in a shed nave of its own between the newly built store and the existing extrusion shed I. To link the anodising plant to the new store a third automatic crane is installed. This crane has special protection systems so that it can also operate above work areas. Material transport to and from the anodising plant is carried out by manually operated trolleys which are loaded with racks by the said automatic crane.

In accordance with the working mode for anodising, the goods coming from the store are first taken to jiggling points where the sections are removed from the racks and suspended on special cross-beams. The beams are designed so that they make the necessary electric contact, hold individual sections a distance apart, and with the help of a crane, can move through the baths one after another. After moving through the baths, the goods are taken off at unloading points, put back into

empty racks, and transported in these back to the store.

Store transports

To be deposited in the new store building, the section racks are at present still moved from the process to the store using floor trolleys. For this, the store has two entrances on the ground floor.

Each automatic crane is responsible for rack transport on one level of the store (ground floor or upper floor). The two cranes (AMK1 and AMK2) are designed with three axes so that they can move the rack freely to any part of the store area. The automatic crane

(AMK2) on the upper level is responsible for transport between the two store levels, and this can access the lower level in three places (at the two ends of the lower store area and about mid-way between them), through gaps in the floor.

For this purpose the upper crane AMK2 must be designed for a lifting height of up to 12 meters. Besides an extremely vibration-resistant design of the individual components, this also demands exceptionally precise, above-averagely high-grade production quality in order to ensure safe and trouble-free uptake of the racks despite the large distance between the drum and the loading point.



Cranes: AMK1 at ground level and AMK2 on the upper level of the store



Automatic crane AMK3 in the anodising plant – the lowest of the crane transport levels

Moreover, in this case a sophisticated technical solution is needed for the energy supply to the gripping drive of the special load-uptake means, as well as optimum regulation of the drive units used.

This working mode makes particular demands on the control of the crane transport sequences, because the working ranges of the two automatic cranes AMK1 (on the ground floor) and AMK2 (on the upper floor) overlap. Control technology must be applied to ensure that collisions are excluded. At the same time, however, the transport performances should be compromised as little as possible, i.e. sequence planning should see to it that there are no idle, waiting times.

Material transport between store and anodising plant

The goods to be surface treated are stored on the upper level of the new store. From there, the racks have to be transported either to a buffer store of the anodising plant or directly to the jigging points. For this rack transport a third automatic crane (AMK3) is provided in the anodising plant. The buffer store, which helps to prevent idle

times, has around 50 storage positions.

The working ranges of AMK1 on the ground floor of the store and AMK3 in the anodising plant also overlap. This enables direct transfer of the racks. For that purpose the automatic crane AMK3 moves under AMK1 at a height of about 4800 mm. Since the crane track of AMK3 covers only one row of crates, an additional trolley has been installed at a height of around 3000 mm. This trolley moves the racks if necessary from the adjacent rack rows to within the working range of AMK3 (or conversely in the case of returning to store).

The remarkable situation in this area is that as many as three cranes are working at three levels one above the other. Whereas even with a simple overlapping working mode particularly elaborate control means are needed, this is all the more so for the triple overlap of the crane working areas in this part of the plant. In Aseda it is the first time that such an arrangement has been set up – and this, successfully.

The jigging and unloading points are arranged between the crane track of the AMK3 and the anodising baths. On the opposite

side of the crane track are the control area with the straightening machines, and the packaging station. Rack transport from the area under the crane track to the individual work positions is by means of special trolleys, a total of nine of these being provided for serving the four jigging points. The trolleys move under the crane track into a completely closed-off safety zone. When the AMK3 crane has deposited a rack on the trolley, the door can be opened and the trolley moves to the work position. For transport to the straightening station or to packaging four more trolleys secured in the same way are installed, which move the racks away from the crane track area on the opposite side. The unloading points are served in the same way by a total of four trolleys of their own.

The necessary transport of empty racks from the jigging point to the unloading point takes place again by means of trolleys. In addition, to enable empty racks to be separated off from the system, a further transfer station is planned.

Finally, the racks loaded with the finished, surface-treated sections have to be transported from the unloading points back into the store. The goods ready for dispatch

are held on the ground floor of the new store building. Transfer takes place at the front end of the AMK3 crane track with the help of a transverse conveyor, which moves the racks transversely to the axis direction into the working range of the AMK1. There they are taken up by the AMK1, put into store, and are then ready to be called up for the packaging stations.

Results

With the new store and logistics concept, an elaborate and cost-intensive rack transport method has been transformed into a flexible, automated material flow system. When, in later extension stages, the linking of the press lines to the store system and of the store to the fully automatic packaging stations has been completed, then no operating personnel at all will be needed in this area. Compared with conventional operation, fully automated section transport has a number of substantial advantages:

- ❑ Expenditure on personnel and floor trolleys is drastically reduced.
- ❑ A further advantage is the gain in flexibility. The capacity of the plant can now be adapted to market needs without additional expenditure or effort. If demand increases capacity reserves can be used, while if the market weakens production cuts can be made at little cost.
- ❑ With automatic transport the proportion of scrap is reduced drastically. This is because damage during transport is excluded as much as possible.



Under the crane track: Manual trolleys for moving racks to the jiggling areas in the anodising plant



In the foreground: Transverse conveyor for anodised section being transferred from AMK3 to the store

To derive an economic advantage from the above, these benefits must stand in an appropriate ratio to the costs. From that standpoint the extrusion plant profits from the competence of its specialist logistics partner. This begins at the planning stage, in which mistakes or even non-optimal solutions can lead to substantial extra costs during later operation. Then comes the delivery of often tried and tested standard components, which work without any problems right from the start. Finally and most importantly, however, almost every individual project shows that at

difficult points innovative, customised problem solutions have to be worked out.

What this last point means in specific individual cases, is demonstrated particularly clearly by the ProfilGruppen AB project described here. The automated material transport on two store levels, automatic cranes at three levels with mutually overlapping working ranges ... – all this and numerous other details make the Swedish extrusion plant in Aseda an outstanding achievement.