

Armin Daniel

And Everything Fits

Seat Cushion Manufacturing



FRIMO Group GmbH
Hansaring 1
49504 Lotte, Germany
Phone +49 5404 /886-157
www.frimo.com

Special reprint



Mold carriers entering the manual operating area

And Everything Fits

Seat Cushion Manufacturing. The design and construction of production facilities for manufacturing foam parts for vehicle seating has long been one of the more demanding tasks faced by suppliers of polyurethane machines and lines. PURe Floor now offers an innovative modular production system specially designed for the production of vehicle seating, while it also satisfies the requirements for a number of other applications.

ARMIN DANIEL

The list of challenges to the production of seat cushions is quite long. Manufacturing passenger car seats generally involves mass-producing of soft foam parts, in some cases with different compressive strengths. The foam is usually injected into open molds by robots moving in precise paths.

In contemporary production facilities that utilize mold carriers, the foam parts

for both front and rear seats are usually produced in the following constellations: Each mold carrier can accommodate either two molds for two front seats, or two molds for symmetrically or asymmetrically divided rear seats, or one mold for manufacturing the seat or back of a one-piece rear seat. In fast running production facilities for seat cushions, production cycles as short as 8 s per mold carrier are being achieved, i.e., the production cycle is approximately 4 s per front seat part and approx. 8 s for one-piece rear seats.

Due to the increasing variety in the individual series of passenger car models, as well as because most seats have to be

produced and delivered by suppliers to the OEM's particular assembly line just in time, customers for plant lines almost always demand high flexibility and fast production changes. For mass production at the very short cycle times mentioned above, only continuous conveying concepts make technological and economic sense.

The most common ones on the market are the so-called oval plants, i.e., conveyor systems in which mold carriers that can be flexibly attached to a roller chain circulate at standard intervals. Two chain wheels attached at specified intervals to the shop floor cause them to trav-

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Fig. 1. Mold carriers guided by the low monorail traversing the shop floor

el in an oval path 180° on the chain conveyor. Usually, the conveyor chain is driven electrically directly via countershafts in one of the turning wheels and tensioned hydraulically via the horizontally mounted, displaceable second turning wheel.

A conveyor system developed especially for application in the polyurethane industry by the Frimo Group, Lotte, Germany, has meanwhile proven itself in several instances on the market. This PURE Floor conveyor system (**Title figure**) offers a number of advantages over previously common production lines.

A Modular Conveyor System

The floor conveyor system is based on a completely standardized modular construction kit. The following design features and the technical possibilities resulting from them characterize it:

- The mold carriers can traverse right on the (if necessary, sealed) shop floor and are guided constantly and precisely in a single rail – with a height of approx. 40cm only – mounted firmly above on the shop floor behind the mold carriers (**Fig. 1**).

In addition to precise guidance and the elimination of special tracks, this also enables lowest mold installation heights;

irritating operating platforms are usually not required.

- The layout for the mold carrier guide rail can be freely configured. By contrast with known chain conveyor lines, the rail can be made to represent any geometric contour, in particular, the rail can be bent both convexly and concavely. Thanks to this free configurability, the line can be adapted to existing hall geometries. Shop obstacles can

be circumvented, production logistics can optimally imitate circumstances specific to the company. In conventional systems, the system has to have a rigid layout, since the chains allow only an oval circuit.

- In the PURE Floor System, the mold carriers have their own, usually frequency regulated drive systems. Not only can each mold carrier be equipped with its own drive, but the system also makes it possible to conjoin several mold carriers. This means several mold carriers are articulated with each other by a coupling rod on each one, have just one common drive and only one set of controls and auxiliary aggregates for the production process (**Fig. 2**).

This drive concept makes it possible for mold carriers to traverse different production areas at different speeds, for example, for optimum adaptation to reaction or manual handling times. The known oval systems on the market can only be run at one defined speed, since the mold carriers are firmly joined to a driven conveyor chain. The PURE Floor System requires no cost intensive construction work; there is neither a central drive, nor a chain tensioning station. There is no conveyor chain, so the line does not stretch due to chain wear.

- Thanks to individual drives and speeds for the mold carriers, production can be flexibly expanded. It can begin with a few mold carriers at first and be expanded module by module, by simply including additional mold carriers and molds. The investments required for this do not have to be made prior to in-



Fig. 2. Combination of four mold carriers with a single drive in the operating area

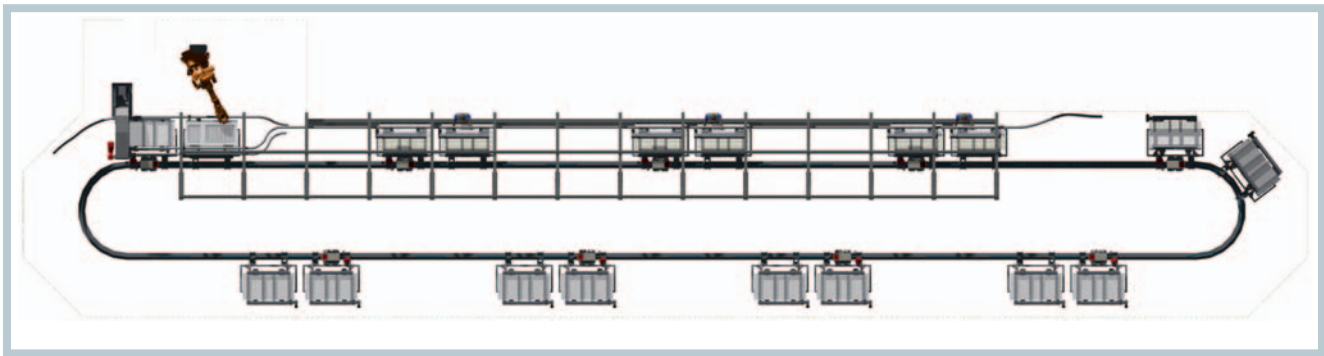


Fig. 3. System layout with the original set of mold carriers

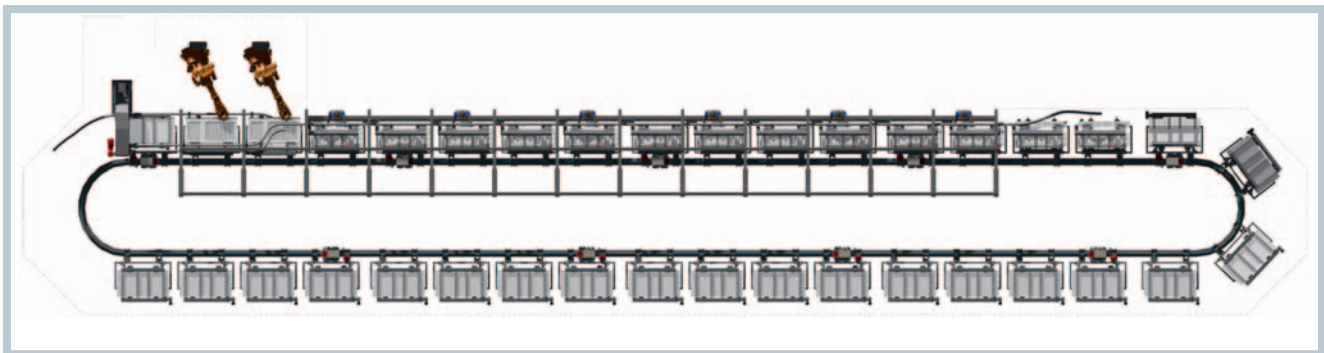


Fig. 4. System layout with the final set of mold carriers (figures: Frimo Group GmbH)

creases in production volume. Previously common ovals that run only at constant speeds can function best only when completely full of mold carriers (Figs. 3 and 4).

- Not only automatic production change, even with no loss of cycle time if required, can be technologically and economically realized by this system. Since switches or cross conveyor systems can be integrated into the guidance system, mold maintenance and cleaning can be done separately from production; even single process steps can be executed simultaneously. Previous production concepts either could not do this, or were uneconomical. Fully automatic mold changes are not always absolutely necessary, and each individual mold carrier does not always have to be completely self-sufficient. However, individually driven mold carriers enable the options mentioned.
- Thanks to individually driven mold carriers and/or conjoined mold carriers, as well as to the low guide rail behind the mold carriers, the PURE Floor System enables free access to the system interior (through a gap between two mold carriers), i.e., auxiliary aggregates for molds and mold carriers can be reached easily for required setting and maintenance work. The aggregates should not be located between two mold carriers, but in order to re-

duce the length of separation and therefore to reduce the conveyor speed they should be installed behind the mold carriers. Until now, complicated stairs and platforms were required above the chain conveyor lines, in order to access the drive, tensioning station and auxiliary aggregates in the interior, or to get behind the mold carriers.

Between 16 and 44 mold carriers are suitable in systems for producing car seats. The required number is calculated from the particular production cycle required for the necessary individual processing times, such as reaction, handling, etc.

Four mold carriers are usually required to produce the seating for a passenger car. Combinations of four mold carriers each usually constitute meaningful, self-sufficient production units with a common set of auxiliary aggregates, such as a tempering device and an air compressor. In one and the same system, completely self-sufficient single mold carriers can be arranged together and simultaneously next to individually driven combinations.

Positive Echoes

The Cab Automotive Company is one of the first customers to use a PURE Floor System in the series production of seat cushions. John Faulkner, Director of Cab Automotive, is quite pleased with the re-

sult. This English automobile supplier located in Tipton, West Midlands, specializes in the manufacture of high-end seats for the automotive industry. In premium brands, such as Aston Martin, Bentley, Jaguar, Landrover or McLaren, one not only sits especially comfortably, but also on rear seat cushions produced, e.g., by Cab Automotive. Large system suppliers such as IAC, Faurecia, Magna or Toyoda are also customers of this English seating specialist.

The owner-managed company decided for development and growth during the crisis of 2009. At that time, the company still employed some 300 workers; today there are more than 500. In order to configure series production of car seats productively, and thus competitively and sustainably, the people at Cab went looking for an innovative production solution: away from a markedly manual process and toward automated production.

According to Faulkner, they can now produce not only much more productively and ergonomically, but thanks to system's expandability, have the flexibility required to launch planned production of front seat cushions, as well, in 2014. ■

THE AUTHOR

DIPL.-ING. ARMIN DANIEL is the Technical Director of PU machines at the Frimo Group, Lotte, Germany.