Tugger Train Logistics Solution at VEMAG Maschinenbau GmbH

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1. VEMAG Maschinenbau GmbH Customer Information

For over 60 years VEMAG Maschinenbau GmbH has developed and produced machines and equipment for the food industry and trade. During this time the company has earned an excellent reputation amongst food producers in Germany and abroad. From humble beginnings in the post-war years a company was also built over time that has shaped the development of continuous vacuum filler machines significantly. The initial focus on the traditional craft was quickly extended to industrial applications in order to take into account increasing focus in the area of food production and the growing size of operations.

In recent years VEMAG has emphasised the systematic character of specific solutions, that means the integration of complex processing steps in the filling or portioning process. The aim is a to create modular system consisting of standard fillers and customized attachments that can be flexibly tailored to the specific needs of the user. One focus here is the development of the VEMAG Convenience System which offers users a flexible system to portion and design innovative products. At the same time the created solutions need to integrate easily into complex production lines.

After outsourcing the VEMAG plant engineering VEMAG Maschinenbau GmbH concentrated on the development and production of machines and system components. The company has around 400 employees. VEMAG is active worldwide and exports more than 80% of its products. Short delivery times and good reliability both play a significant roll in this.

2. Initial situation

To supply the production areas in which the different machines are assembled, individual parts are moved on loading equipment. For this pallet trucks were used. These were taken to where they were needed by individual employees.

For new construction halls the following optimisation opportunities were identified:

- Relatively high transport volumes using individual transport (taxis) and therefore increased personnel and time expenditure
- High use of space by lengthy provision and buffering of materials and corresponding broad operations
- Increased risk of accidents from fork lift trucks
- No transparent material supply process

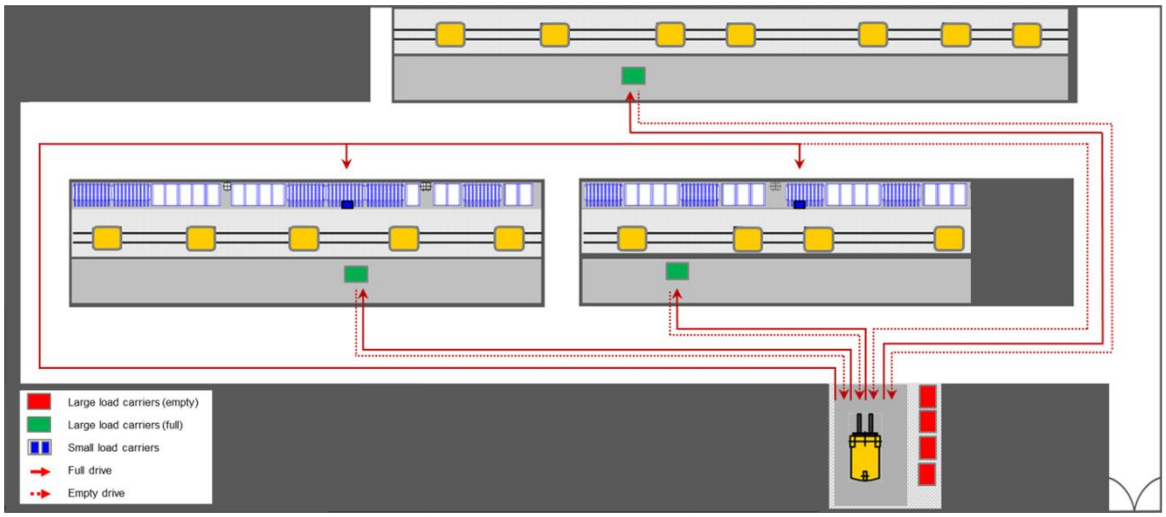


Figure 1: conventional supply process with fork equipment

3. Description of Tugger Train Solution

All processes were evaluated and restructured.with the development of the production and the transformation of logistics. The preparation of parts, transport to where they are needed, assembly and quality management processes were evaluated, in order to design streamlined, clear processes. In general internal logistics face many demands (see figure 2).

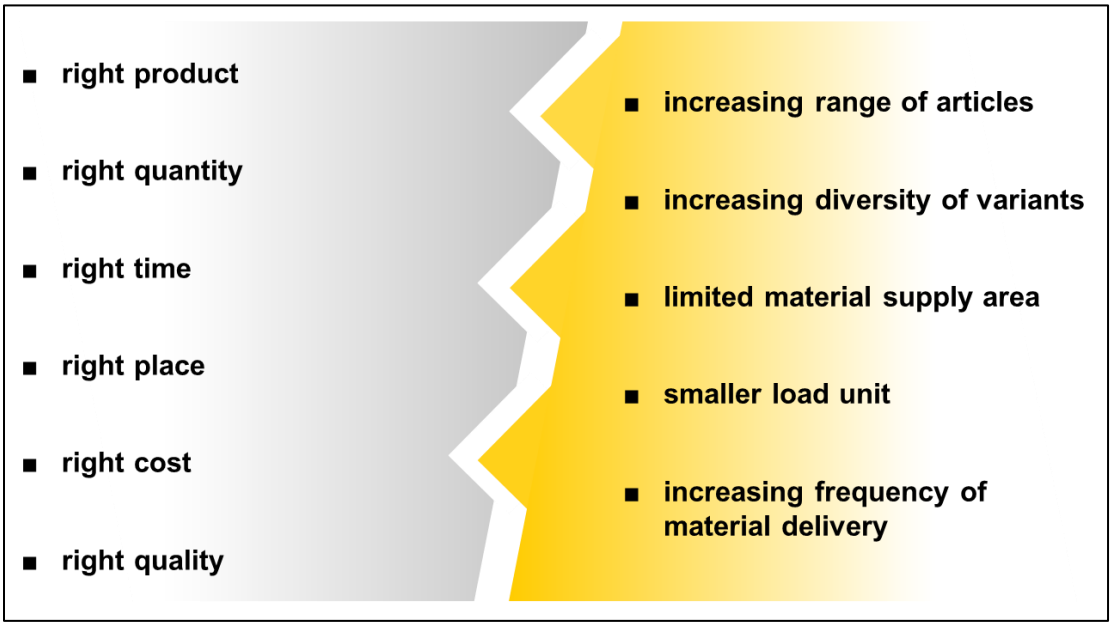


Figure 2: Internal logistic demands

The aim is to have minimal turnaround times and hold less stock by having a continual flow of materials where possible (see figure 3).

Material delivery by forklift

- Delivery of the material to the assembly cells by forklift
- Use of large load carriers to minimize logistics costs
- Push principle for material supply
- Logistics by assembly workers using hand pallet trucks

Focus: optimizing capacity utilization

Material delivery by tugger

- Use of timed route trains
- Use of small load carriers for minimum stocks
- Pull principle for material supply

Focus: Minimum cycle time

Figure 3: Logistic Changes

Tugger trains are particularly good for supplying production since they can deliver the required materials and the required amount to the right place at the right time for a proportionately small overhead cost. Consumption controlled materials can be controlled with help from the Kanban processes. Empty containers are taken back to the logistics centre with the tugger train and at the same time will deliver information about which materials need to be replenished.

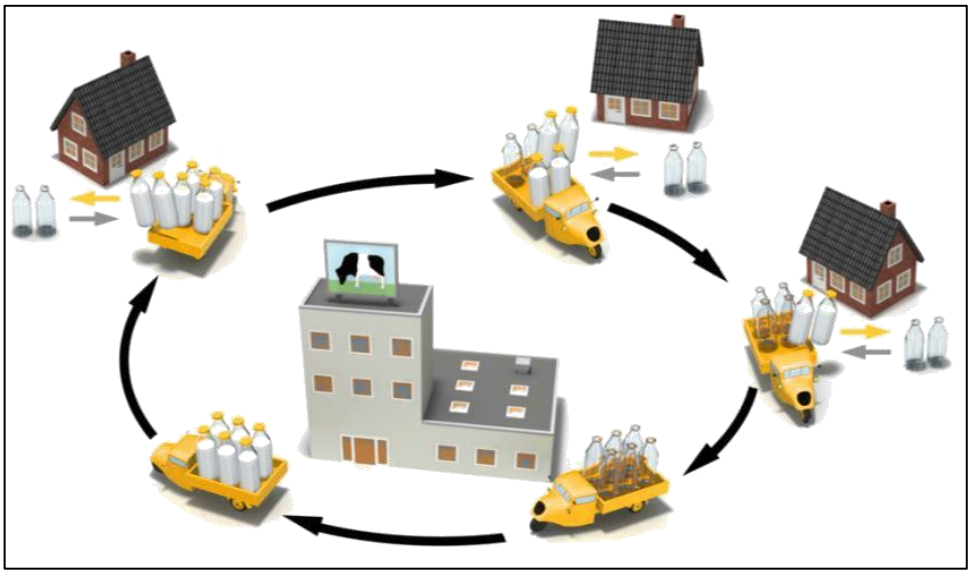


Figure 4: Preparation of materials in the milk run process

When comparing conventional delivery with a fork lift truck and the use of a tugger train, depending on the route, you find a break even level that is advantageous when using a tugger train for delivery. This can vary from customer to customer and conditions on-site but in general a distance of 150m is considered to be the break even point.

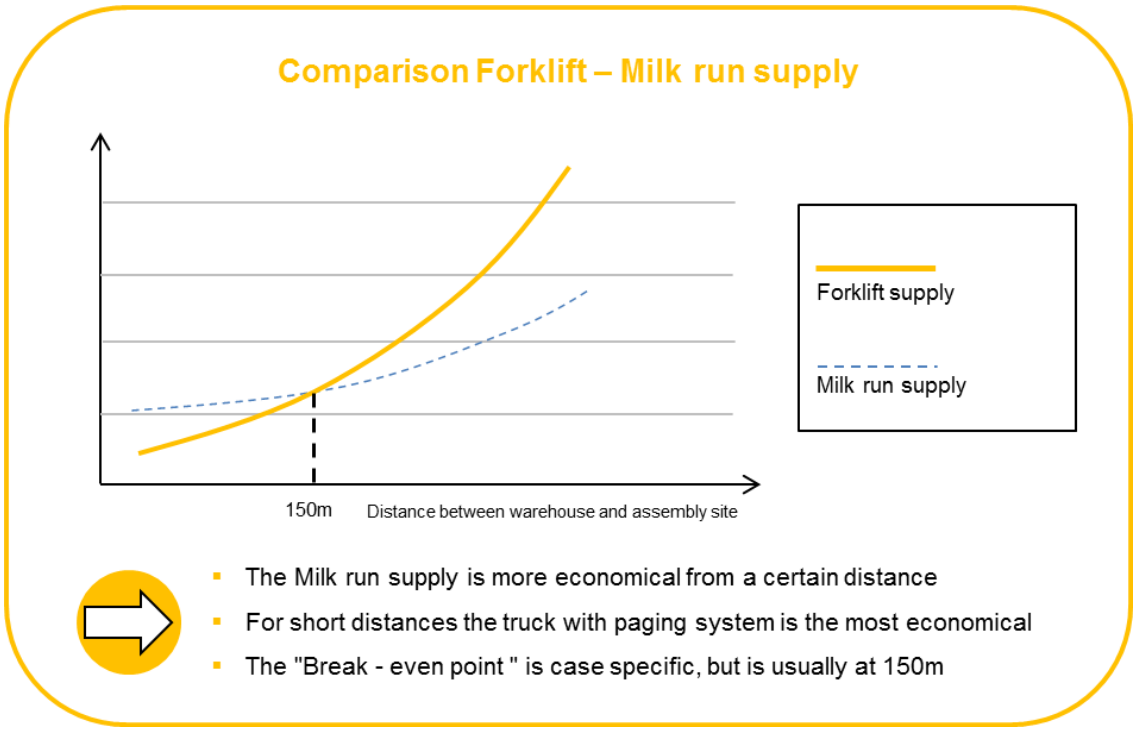


Figure 5: Comparing fork lift delivery and tugger trains

By introducing tugger train solutions transport methods are combined, the number of journeys is reduced and so is the chance of accidents.

a. Consultation and Planning Service by Jungheinrich

Through exact analysis of the needs the tugger train emerged from a tractor EZS 350 and the trailers GTE 312 (E-Frame). With this tugger train a new work flow was able to be designed, which realised efficient and flexible deliveries. A first assessment of the GTE trailers at the CeMAT trade fair confirmed the selection for VEMAG.

The final confirmation was a test of the tugger train with the corresponding components. In the process the required handling and manoeuvrability when going through the tugger train route in a planned layout could be proven. The operating conditions were able to be confirmed and verified. Thus, the compact and clean tugger train for this use was found.

For VEMAG it was especially important that the trailers connect to the power transmission only electronically, creating a simple, uncomplicated and very clean connection. As a manufacturer of machines for food production VEMAG paid particular attention to clean and also visually pleasing solutions. In contrast to traditional solutions, which use hydraulic energy transmission and therefore may leak, the electrical connection will never affect cleanliness.

Directional stability and low space requirements when cornering are better for layout planning. Therefore compact and efficient logistic routes can be realised. The very directionally stable E-frame trailers follow the narrow tractor securely.

Detailed advice on the technical characteristics of the trailer helped VEMAG to plan and optimise details. Already close cooperation between VEMAG and Jungheinrich emerged in the planning phase.

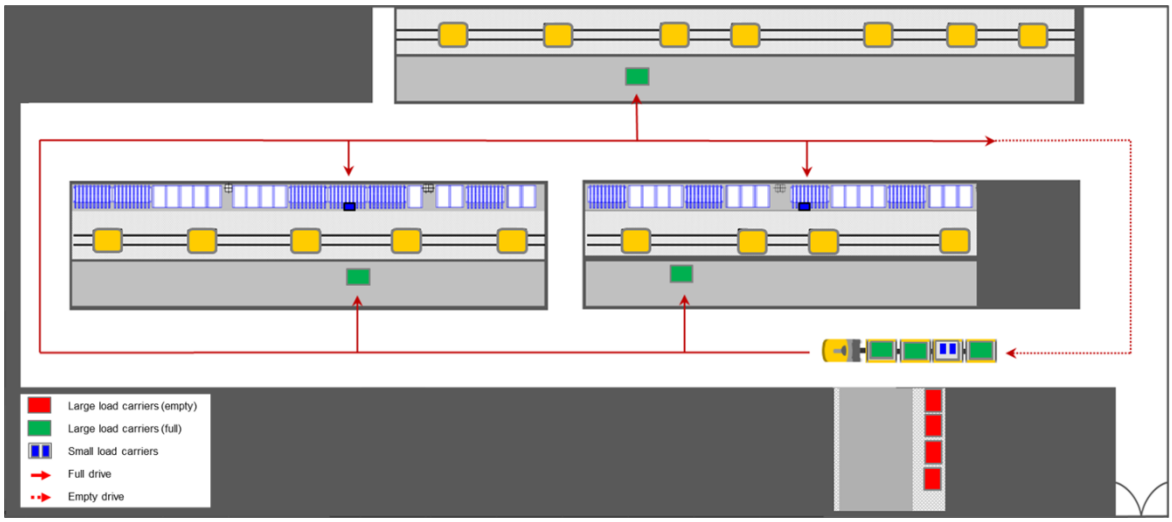


Figure 6: New process with tugger train delivery

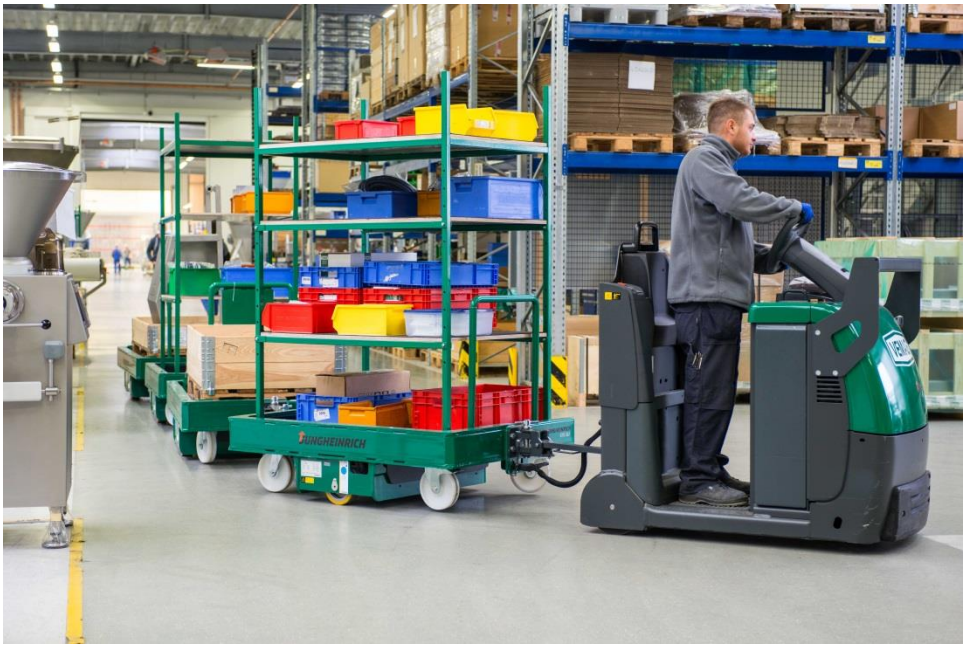
b. Vehicles

- **EZS 350 Tractor**

  The EZS 350 tractor is a standing tractor that is used particularly in tugger trains that stop often. Easy to get on and off and powerful acceleration are therefore important characteristics. Ergonomic operation, in particular here is JetPilot, which allows for fatigue-free working and allows the driver to enjoy the drive.

- **GTE 312 Trailer**

  These trailers with an E-frame are designed to take equipment up to 1,200kg on a European sized pallet. The loading is carried out with the help of trolleys which allow for loading on the go. The lifting of the load is carried out by fully-enclosed, compact hydraulics. The energy is made available from the tractor in pure electrical form. Thus, the GTE 312 moves best in clean production environments since no leaks can occur.



4. Illustrated processes

The new logistics solution includes tugger train loading, the delivery to production areas and the return of empty containers.

a. Tugger Train Loading

In the logistics centre the tugger train is loaded: The parts needed for a job are pre-picked and loaded onto the trolleys in use. These are then loaded onto the tugger train trailers after the empty containers are removed.

b. Delivery to Production Areas

The tugger train then drives with the four GTE trailers and trolleys into the production areas. The lifting of the trolleys is carried out automatically after they are inserted and locked and therefore no further work steps are required. When lifted the trolleys are driven to where they are needed. There the trolley driver can unlock the trolleys which is carried out via a foot pedal. The trailer lowers precisely and the trolley can be removed. When lowering, which causes the trolley to move forwards slightly, the wheels are locked into the direction of removal which allows for an easier extraction of the load. In the next step empty containers are reloaded in order to drive back to the logistics area.

c. Return of Empty Containers

By returning the empty containers to the logistics area production space can be saved. This returns process is very simple, is largely self controlled, any problems can be quickly identified visually and allow for quick reaction times.

5. Customer benefits

The new supply process using the tugger train increase flexibility, efficiency and safety at VEMAG Maschinenbau GmbH.

Flexibility

- Lower use of space and flexible use of trailer solutions for the most diverse loading equipment
- Easily adapts to variations in demand

With an adaptable tugger train solution the customer stays flexible.

Efficiency

- Optimised use of resources: Vehicles, employees, space, time
- Lower investment, maintenance and personnel costs
- Fewer single and empty journeys by combining transport: One tugger train with four trailers replaces many fork lifts/journeys

Logistics costs are reduced by 75%.

Safety

- Reduces transportation volumes
- Less traffic contra and cross flow

Accident risks are reduced significantly.

6. Innovation

The Jungheinrich tugger train system is an economical, time saving alternative to traditional material transport for all industries.

Of particular note are the following innovative components of the overall solution:

- **Material flow consulting:**

  In order to define an optimal tugger train solution Jungheinrich worked together with customers in accordance with the "Go to Gemba" principle. The professional material flow consultancy ranges from detailed analysis of the hardware selection to determining the supply rhythm.

- **Vehicles:**

  The EZS 350 tractor is characterised particularly by its ergonomic operation as well as its powerful acceleration.

- **Trailers:**

  The GTE 312 E-frame trailer can raise its load by using a fully enclosed compact hydraulics. The energy is made available from the tractor via an electrical connection. Thus, the GTE 312 can be used even in clean production environments since no leaks can occur.