NEUERO Continuous Ship Unloader for Feed Mill

Tomas Kisslinger, *NEUERO Industrietechnik, Germany*

Abstract

After close to 50 years working with an unloading system, a new system which would serve today's needs and be compatible was planned. Flexibility, operation, maintenance, the environment and especially the cost had to be considered for a quick return of investment.

INTRODUCTION

The Garant feed mill is located in a beautiful tourist area, near Pöchlarn between Linz and Vienna on the Danube river. The raw materials can be received by train, truck or ship. Garant delivers more than 250 different mixtures for their clients every month. Each client also has his own secret additives for different applications. The feed mill is equipped with a modern visualisation and computer control system and processes 35,000 tons per year, of which 30,000 tons is expected to be received by ship.

The Feed Mill has used a pneumatic system since 1938, which was still running. However, it required three to four people in order to help the material enter the nozzle. This was not an easy job, because the men had to stand on the material. The normal pneumatic system is suitable for free-flowing material, but for meals and other damp material mechanical help was needed to feed the nozzle, which caused a drop in the average capacity.

The unloader is stationary and directly integrated to the Feed Mill via a steel bridge. The old steel structure was made of riveted construction and therefore difficult to adapt to the new equipment.

PRELIMINARY STUDY

In 1994, a study was started to look at alternatives for unloading. The study quickly centred on the choice between using a grab crane or a pneumatic continuous unloader.

The grab crane was the first idea because the materials are not free-flowing. The advantages of the multiple use of a grab for different products, even fertilizer, are strong if a multipurpose discharging is needed. This, however, was not sufficient to outweigh the necessary space for the installation. The batch operation of the crane must be

Figure 1
Old installation of the Garant feed mill

Figure 2
Factors considered in the study

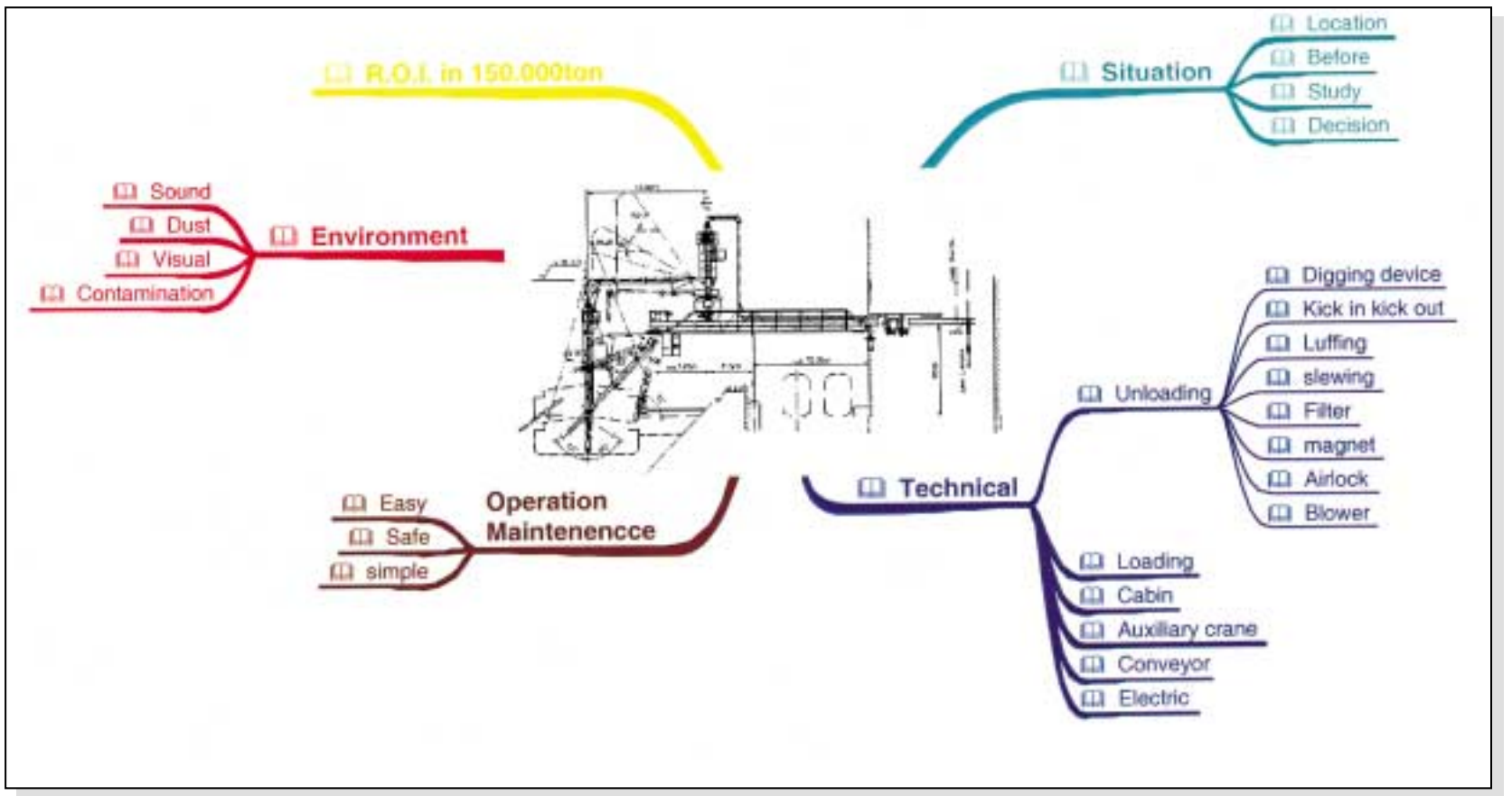

Figure 3
The NEUERO stationary flexiport

compensated for by using a hopper. The grab and the hopper must be large because of the low specific weight of the material handled. This hopper must also be equipped with an efficient dedusting system.

A normal pneumatic system was not suitable because of the non free-flowing characteristics of the material. This was solved by using a system that has a nozzle equipped with a digging device. Depending on process characteristics and climate conditions, the meal can arrive in a very hard packed condition, sometimes similar to ice. The feeding device must be strong enough to cut or break up the material and feed it into the nozzle. If the unloader is not designed for this material, the system will only make holes in the material. The difference will be shown in the loss of average capacity.

Additionally the new equipment should:

- not interrupt the rail system
- nor the bicycle way along the Donau
- optimise the reception capacity
- accomplish the environmental requirements
- fit the space conditions.

DECISION

The decision was made in favour of a new FLEXI-PORT pneumatic unloader with a digging device from NEUERO, rather than a mechanical grab system. The main points that guided the decision were:

- space available
- environmental protection costs
- continuous operation
- can be used in small hatches
- easy operation and maintenance.

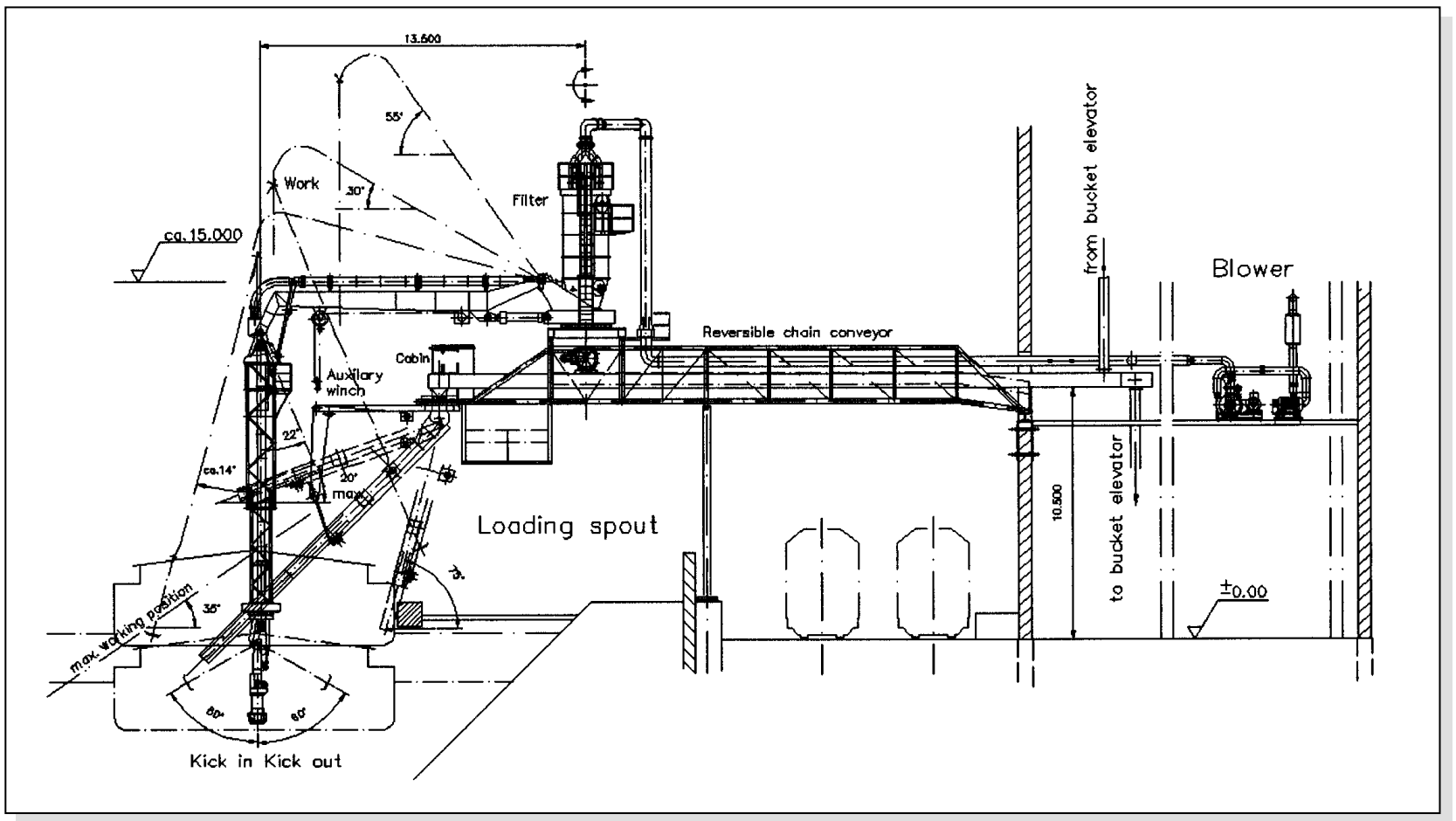

Figure 4
Drawing of the complete Flexiport

Figure 5
The bridge structure

Figure 6
The rotating hoe

NEUERO received the order in the spring of 1998, and the equipment was successfully installed in the winter of 1998.

OPERATION

The NEUERO Stationary FLEXIPORT stands vertically mounted on a steel bridge. The unloading and loading capacity was designed for 150 m3/hr because this was the maximum of the existing receiving and exporting conveying system. The operator's cabin is specifically located in order to facilitate the unloading as well the loading system. The bridge structure is a square boom made of square steel tubes. The unloading boom, filter and airlock are joined to the blower station by a suction air pipe. The blower station is inside the building and the exhaust air passes through a silencer and is directed to the top of the building. For unloading, the material is conveyed to a bucket elevator inside the mill. For the loading operation, the same chain conveyor operates in the reverse direction and receives the material from another bucket elevator spout. The operation of the equipment is described in detail below.

UNLOADING

This is the main operation of the installation. The parts of the installation are:

- nozzle with digging device and other movements
- vertical pipe with kick in / kick out
- horizontal pipe with luffing movement
- filter with slewing movement
- airlock
- blower station.

Figure 7
The digger reaches all areas of the hatch

Figure 8 (below)
NEUERO Rotary airlock

Figure 9
The blowers are driven by 55 kW electric motors

1. Digging device. A rotating hoe cuts the material and feeds the suction nozzle. The rotational speed can be adjusted and the system is protected by torque limitation.
2. Kick in / kick out at the vertical pipe, and the 360º rotation of the digging device together with the filter slewing movement, means all areas of the hatch can be reached, especially material located in the corners of the ship's hold.
3. The luffing movement of the horizontal boom is from 0º to +55º.
4. The slewing movement of the filter column allows the entire upper part to rotate 210º.
5. The filter system has reverse air flow cleaning. This type of filter does not introduce external air to the system. This avoids water condensation in the bags and therefore the loss in capacity. The use of a turbo blower instead of an air compressor practically eliminates the maintenance.
6. A permanent pipe magnet is installed between the filter and the airlock to separate impurities that might otherwise enter the airlock. A manhole is installed for inspection and cleaning.
7. The airlock receives the material and separates the air from the material. Rotor tips are welded with a high alloy and then ground to the proper tolerances.
8. Two NEUERO single stage turbo blowers which are connected in series provide the necessary air volume and pressure for the system. Each NEUERO blower is driven by a 55kW electric motor via V-belts. An automatic air flow regulator is used to control the air speed during operation and idle condition.

LOADING

The loading system receives the material from the chain conveyor and loads it into the ship's hold. The movements of the loading system are:

- slewing
- telescoping the loading spout
- luffing.

The system is controlled with joysticks from the operator's chair in the heated cabin.

The electrical system is located in the silo together with the blowers.

A PLC controls all movements and the interlocking of the system components.

The chain conveyor is reversible as required for loading or unloading.

There is also an auxiliary crane with a capacity of 2 tons used to load a payloader into the ship's hatch and also for small cargoes.

OPERATION AND MAINTENANCE

There is easy operation using joystick commands. The movements are slow and continuous. The machine is designed to take into consideration all safety regulations to avoid accidents. No impact, slow movements also help in the prevention of accidents. Because there are fewer moving parts in the pneumatic system, the maintenance is easy.

ENVIRONMENT

Environmental protection was an important point in order to receive all necessary permits, since the location is in a valley close to individual homes and a tourist area.

Figure 10
The loading system

Figure 11
The reversible chain conveyor

- The sound level is less than 85 dBA at 1 metre distance.
- Dust is virtually eliminated by the use of the filter. There is no product contamination because of the enclosed conveying system.
- The appearance of the installation is not a visual intrusion into the attractiveness of the area.

RETURN ON INVESTMENT

The expected return of investment is in less then 5 years, taking into consideration the annual unloading volume of 30,000 tons. This is comparable to the costs of rail and road transport in the region.

ABOUT THE AUTHOR

Tomas Kisslinger has eighteen years' experience in bulk handling, specialising in pneumatic conveying. Since 1992 he has been General Manager at NEUERO Industrietechnik.

IF YOU HAVE ANY ENQUIRIES REGARDING THE CONTENT OF THIS ARTICLE, PLEASE CONTACT:

Tomas Kisslinger

NEUERO Industrietechnik

Buersche Strasse 60

49324 Melle

Germany

Tel: +49 5422 950320

Fax: +49 5422 950350

E-mail: neuero@neuero.de

Web site: www.neuero.de