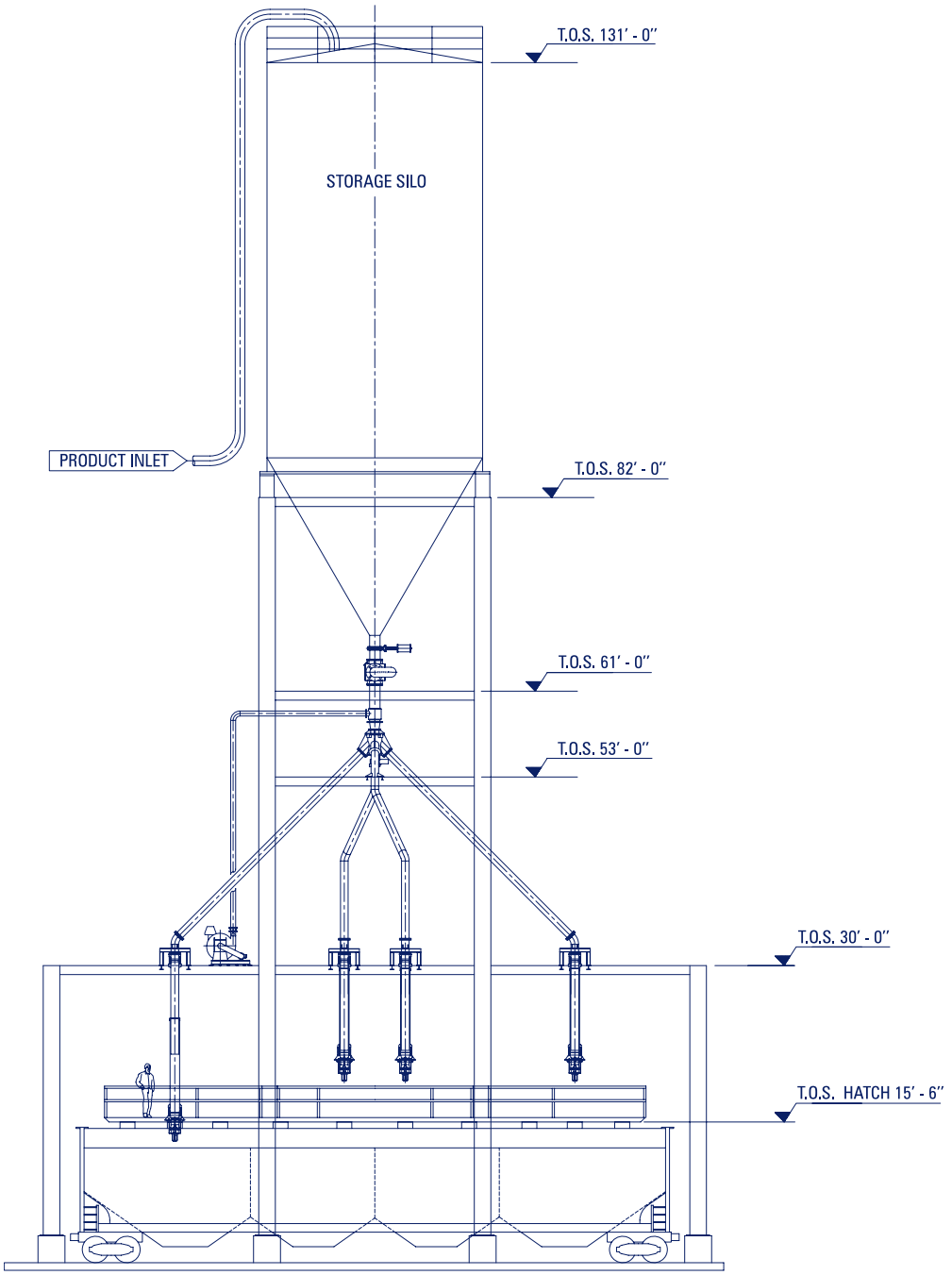
Railcar Loading System



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System Description

Combination of gravity flow and air-assisted flow will allow to design loading systems meeting today's and future requirements regarding capacity and filling efficiency. Selection of the optimum system depends on size of railcar, the bulk density and the permissible shipping weights.

The high wear and attrition rate of the impact plate is greatly reduced by the installation of a patented deflection body in the loading head at the bottom of the loading telescope. This deflection body (invert cone) forms a continuously converging annulus with the outer housing which allows the pellets to flow along a curved line similar to that of a "ski jumper". Airflow from a fan or conveying system accelerates the pellets downward and will assist flow around the annular bend. A small kick at the edge directs the flow of the particles slightly upwards, resulting in a high level of filling inside the railcar. A level indicator underneath the loading head will shut off the system as soon as the compartment is fully loaded.

A winch with an internal stainless steel cable lifts and lowers the telescope. A slack cable switch stops the winch as soon as the loading head contacts the railcar hatch. A time delay will "feed" some extra length in the cable to allow for settlement of the railcar due to the increasing weight during filling. This simple system allows for automatic aligning of the telescopic piping and easy positioning into the hatch. Alternatively, the telescopes can be lifted with outside pneumatic cylinders.

The telescopes have a flexible joint at the upper end and lower end between the telescope and the loading head for adjusting the telescope to different railcar hatch arrangements. Depending on length of the telescopes, differences of up to 3 ft in hatch position can be accommodated.

Field of Application

Achieving the full load capacity in railcars is a major challenge for all industries shipping bulk solid products by rail. When pennies per ton can make the difference in a competitive commodity market, shipping costs are a critical issue. Squeezing the last five to ten percent into each railcar can have a significant and desirable effect.

Zeppelin's patented Railcar Loading System has proven to be effective in maximizing the filling of railcars with plastic pellets. Additional benefits of the Zeppelin System include:

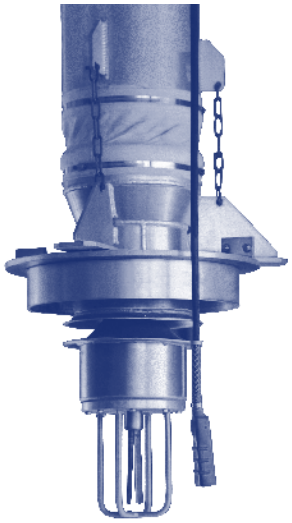
- **Ease of operation:** the unique telescoping spout is easily positioned and lowered into the railcar hatch.
- **Safety:** the distribution of the product is accomplished using accelerating air, so there are no potentially hazardous moving parts or spinning devices.
- **Economical operation:** due to its unique design, all that is needed to spread the product is air from an auxiliary fan or from the conveying system.
- **Flexibility:** the filling spouts are adjustable if necessary for variations in product, capacities, or railcar configuration.

The system is fed either by a conveying system or gravity from a storage silo. As the product is fed through the telescoping spout, accelerating air is introduced from the auxiliary fan. The product is accelerated through the distribution nozzle and discharged horizontally into the railcar compartment. Zeppelin Loading Spouts can be retrofit into most existing railcar loading facilities, or they can be provided in a complete Railcar Loading System in conjunction with a dense phase, dilute phase conveying or pellet cleaning system.

Railcar Loading System

Key Features

The key element of the patented Zeppelin loading system is the distribution nozzle (loading head) at the lower end of the loading spout. The pellets are re-directed from the vertical flow in the spout to a horizontal movement into the corners of the railcar compartment. Horizontal acceleration is achieved by airflow originating either from the conveying system or from an auxiliary fan. The curved and converging annulus inside the distribution nozzle ensures accelerated product flow in horizontal or even slightly upward direction. This results in a higher filling level in the periphery of the compartment than in the center below the nozzle. Thus, there is a small valley below the distribution nozzle which is filled with the pellets once the telescopic loading spout is retracted.



System Configurations

The air-assisted loading system described above can be used in two different approaches. One is directly downstream a conveying system, which usually is a short-distance horizontal conveying line from the elutriator. Alternatively, a gravity system with just little air added from a fan for distribution along (4) inclined gravity chutes and through the loading head.

Railcar Loading Exhaust System

Typically, it is recommended to install railcar-loading systems downstream of an elutriator. Thus, only clean pellets are loaded into the railcar and an exhaust system then is not required. In case of loading pellets containing a higher dust load, an exhaust system may be required. With each railcar compartment having two or more hatches, the one not used for filling can be connected to an exhaust system, which typically employs a fan and a filter receiver.

Powder Loading Systems

The patented Zeppelin Railcar Loading system is designed for polymer pellets. In case other products are to be loaded, such as PVC powder, polyolefin powders or the like, then a different telescoping spout and loading head is used. Due to the fluidization of the powders, a high level of fill is achieved from the easy flowability of the product. However, dust removal from the exhaust air becomes an important issue. A loading spout with an internal annulus connected to a filter and fan then is used.
Our engineers are available to discuss these issues and the special designs requirements for closed-loop loading operations under nitrogen.

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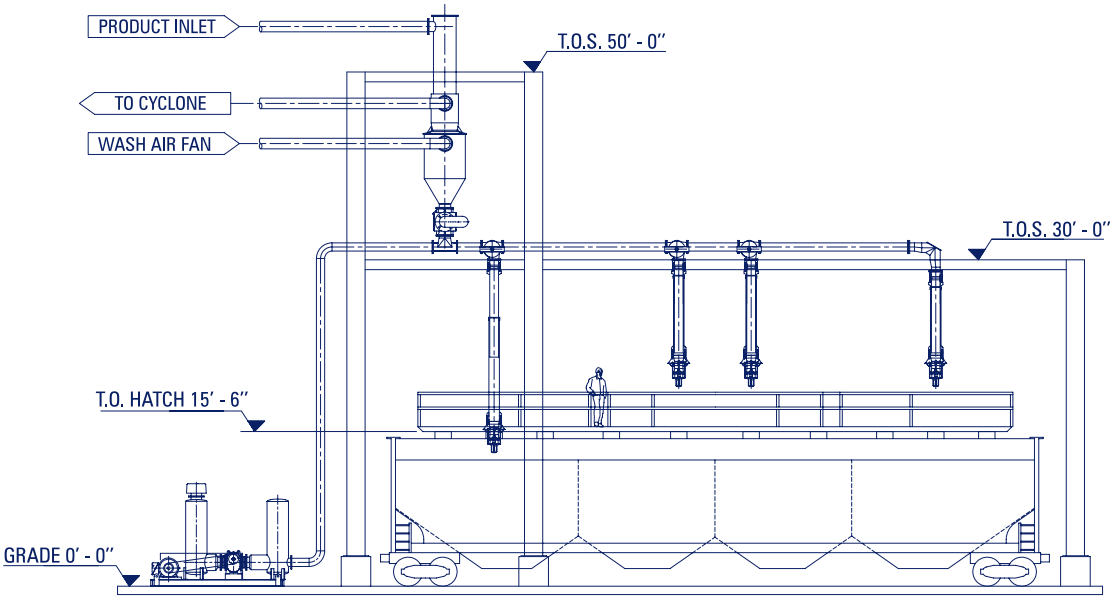
Horizontal Loading System

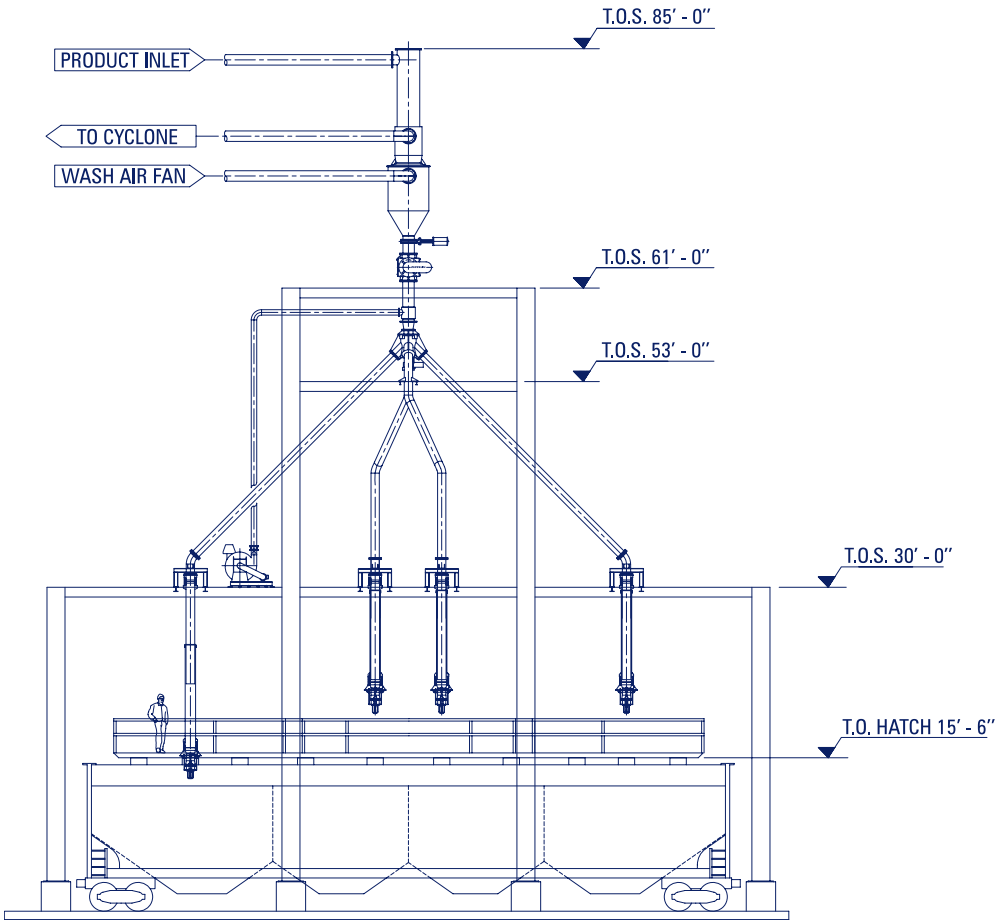
The first option is called a horizontal loading system. The pellets are conveyed from a surge hopper, cyclone or preferably an elutriator via diverter valves to the vertical loading spouts. All 4 loading spouts will be lowered into the loading hatches after positioning of the railcar. Then the system is started with loading one of the central compartments. When the first compartment is full as indicated by the level switch underneath the loading head, then the rotary feeder underneath the surge hopper or elutriator is stopped for the time it takes to switch the diverter valve to the next position. The surge hopper or elutriator has capacity sufficient to hold the pellets coming from the blending or storage silos for this short period.



Railcar Loading System

Vertical Loading System

With the vertical arrangement shown, the surge hopper or elutriator is located higher up in the steel structure. Underneath the rotary feeder of the elutriator, an aeration nozzle is used to introduce assisting airflow from a fan into the gravity flow of the pellets. This air is used for increasing the velocity down the inclined piping and to accelerate the pellets out of the loading head. With this system, the least amount of air is used and consequently the most gentle pellet handling is achieved. The system, however, requires a higher steel structure. The loading telescopes with the air-assisted loading heads are located in the lower bay of the loading system structure.



Any changes are reserved:
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Accessoiries

- ✖ Exhaust system
- ✖ Level indicator
- ✖ Steel structure
- ✖ Elutriator

Advantages

- ✖ High filling efficiency of railcars
- ✖ No moving parts in the flowing pellets
- ✖ Easy operation with automatic, sequential filling of compartments
- ✖ Simply design allows the integration of pellet cleaning systems
- ✖ One man system operation

System Design Capacities*

8″ system – up to 75,000 lbs/hr (35 t/hr)

10″ system – up to 130,000 lbs/hr (60 t/hr)

12″ system – up to 180,000 lbs/hr (80 t/hr)

* System capacities are average rates and can vary depending on product characteristics and system layout.

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