APPLICATION

In general grease lubrication systems are total loss systems, i.e. the lubricant is only handled up to the lubrication point. Whatever happens to it beyond that is not considered by the lubrication system. Nevertheless the lubricant does not just disappear but will exit the lubrication point (usually a bearing) in a more or less defined way. There are a lot of applications where this is desired because the lubricant will form a barrier against ingress of dirt and moisture. Yet in other applications the escaping lubricant leads to contamination that needs to be cleaned manually, causing big expenses in maintenance.

It is the aim of the Waste Grease Disposal System to reliably and maintenance free capture, transfer and collect the used lubricant.

SYSTEM DESCRIPTION

In order to work properly the Waste Grease Disposal System makes use of an external hydraulic system that needs to follow a defined cycle of building up pressure to a certain degree and release it again before starting the next cycle. In the most simple case a Single Line lubrication system will be used which works on this basis exactly.

The Waste Grease Disposal System consists of the following components:

- **Pressure Transformer**
  The external hydraulic system is connected to the one side of the Pressure Transformer, the actuating circuit of the Waste Grease Disposal is connected to the other side. The pressure is transmitted one-to-one within the transformer, but the pressure media on both sides are kept apart. The internal medium for the actuating circuit is hydraulic oil. The external medium is either hydraulic oil or lubrication grease, allowing the disposal system to be integrated into an existing lubrication system.

- **Single Line Ejector SLE**
  The internal medium actuates the suction elements. Each element can draw in and pump to disposal a maximum of 0.3 ccm of waste grease per pressure cycle. The actuating pressure is 150 to 300 bar and induces an output pressure (for pumping the waste grease to the collecting point) of 90 to 400 bar.

- **Actuating circuit**
  The actuating circuit for the internal medium connects the Ejectors with the Pressure Transformer. This circuit is closed, i.e. the medium is not used up. In case of small leakages there is an oil buffer in the Pressure Transformer that can compensate the loss of oil to a certain degree. An optional electrical monitoring can give a warning if this buffer is used up and the function of the Waste Grease Disposal System is at risk.
**SYSTEM DESCRIPTION (continued)**

- **Waste Grease Collecting Container**
  The waste grease delivered by the Ejectors is pumped through a collecting line to a central Waste Grease Container. The Container is available in different sizes. A breather in the lid of the container ensures the separation of the grease and air that might have been delivered together with it. The unique design of the breather allows for the container to be mounted in rotating areas, e.g. in wind turbines.

- **Waste Grease Disposal Line**
  The Waste Grease Disposal Line connects the Ejectors with the Collecting Container. Depending on the type of lubricant, the temperature and the length of the line it may happen that considerable pressure is needed to overcome the rheometric resistance. Although the Ejectors are capable of providing this pressure it is recommended to choose comparatively large tube diameters in order to minimize the resistance.

The following diagram shows the components described above in the context of a single line lubrication system for a large roller bearing.
Distinction to conventional systems
Suction elements for used grease and Collecting Containers have been available on the market for some time now. In these cases the suction elements are integrated directly into a single line lubrication system, i.e. they are actuated together with the single line injectors on one common main line. This may seem simple and sensible at first glance, but it generates considerable problems:

- **Stagnation and “bleeding” of the grease**
  Lubrication grease that is not exchanged over a longer period of time and yet put under pressure tends to “bleed” sooner or later, i.e. the oil in the grease separates from the soap, the latter hardens and blocks the line.
  By avoiding dead ends in the lubricant lines this problem can be reduced: all branch lines from the suction elements to the main line must be as short as possible, ideally the suction elements are connected directly to the main line. Apart from that a suction element may never be the last device connected to the main line.
  Observing these guidelines may lead to considerable extra effort for tubing, but to ignore them may very well cause the grease disposal to fail on the long run.

- **Hindered relief of the main line**
  As compared to a pure single line lubrication system (without waste grease disposal) the time needed for a complete working cycle is prolonged vastly. This is due to 2 reasons:
  1. The amount of lubricant needed for the lubrication alone (overall output of the single line injectors PLUS expansion volume of the tube system for the pressure build-up) is elevated by the volume needed to actuate the suction elements. The latter is in magnitude higher than the overall output of the single line injectors. Thus the runtime of the pump is increased by ca. 50%.
  2. More critical than the pump runtime is the time needed for relieving the main line after the lubrication cycle is finished. The pressure must drop down far enough for the single line injectors to be able to prepare the next lubrication cycle (typ. <50 bar). In a pure single line lubrication system only the expansion volume of the tube system needs to flow back into the pump reservoir. But in the case described above this volume is increased by the volume needed to actuate the suction elements, thus increasing the relief time vastly. Depending on the ambient conditions (temperature, grease type) this may mean that the lubrication frequency requirement of the application cannot be met and the lubrication fails completely.

A simpler and at first glance less expensive alternative for the active suction based system are collecting bottles. Those are attached directly to the outlets of the lubrication points and collect the waste grease passively. As compared to the active system the material and installation cost are obviously lower while the maintenance expenses are considerably higher and the functional reliability is reduced.
ADVANTAGES OF THE DELIMON WASTE GREASE DISPOSAL SYSTEM

1. DELIMON’s Waste Grease Disposal System avoids these problems by using a patented system separation of lubrication and disposal. For this purpose the Pressure Transformer is linked to the main line as closely as possible to the lubrication pump. The main line can even be led through the Pressure Transformer to prevent stagnation of grease completely.

2. Regarding the complete delivery volume that the lubrication pump needs to provide there is no difference between the two approaches. But the pressure relief in the DELIMON system does not increase noticeably as compared to the pure lubrication system. The reason is that the oil filled actuating circuit of the Waste Grease Disposal does not induce any noteworthy resistance while the short distance between the Pressure Transformer and the pump reservoir helps to minimize the rheometric resistance on the grease side.

3. The unique setup makes the Waste Grease Disposal System very reliable and virtually maintenance free.

4. The optional monitoring of the Pressure Transformer allows remote diagnosis of the Disposal System.

5. Pressure limiters on all Ejectors prevent excessive pressure build-up in the bearing in case of a Disposal failure.

6. Compared to the use of waste grease collecting bottles the maintenance expenses are reduced vastly. The replacement of a dozen collecting bottles located in difficult to access areas competes with the replacement of a single large collecting container in a central and easily accessible position. This effect alone pays off the initial cost after 1 or 2 service intervals.
Example
The following diagram shows a typical application in wind energy. The main bearing of a wind turbine is equipped with a single line lubrication system.
A DYNAMIS MAXX pump with valve block for single line lubrication supplies the system. 3 CXL manifolds lubricate a total of 12 lubrication points.
Waste Grease Disposal System consists of a Pressure Transformer that supplies 3 Ejectors SLE. The overall disposal delivery rate of the Ejectors exceeds the total lubrication amount with a ratio of 3/2 in order to compensate for uneven waste grease flow rates out of the bearing’s outlets.