SILVERI ENGINEERING & TRADING PTY LTD

FUEL DELIVERY | LUBRICATION | FIRE SUPPRESSION | WORKSHOP EQUIPMENT

GreaseMax® CHEMICALLY OPERATED AUTOMATIC LUBRICATOR.

Operates at **a set rate**, for a **set period**, **without maintenance or adjustment**.

- Proven product performance & reliability
- NO maintenance or adjustment
- NO electric components, NO batteries, NO springs, NO mechanical parts - for complete reliability. GreaseMax activates in ONE simple step and uses a PROVEN chemical drive.
- GreaseMax can be mounted in any position, on moving & vibrating applications (brackets may be needed), on long feed lines - even underwater
- NO environmental risk
- Intrinsically safe for use in underground coal mines and petrochemical plants – with no static discharge risk.

Advantages:

- Higher equipment availability
- Improved maintenance outcomes
- Lower maintenance costs
- Reduced site labour requirements
- Bearings lubricated when they are moving - when they need it.
- Dust and moisture are prevented from entering the bearing. A constant grease supply ensures that seals are lubricated and more effective in preventing contamination. Excellent results on labyrinth seals.
- No technical skill required to install or change GreaseMax.

GreaseMax can be utilised in:

- mines and quarries
- factories
- hospitals
- buildings and hotels (air-conditioning, water supply, elevators etc.)
- government facilities, council equipment, military bases
- water and sewerage plants
- electric motors (larger motors which have grease points)
- mobile equipment -e.g. cranes, mining trucks, trailers, prime movers etc.
- underwater
- on moving parts
- in any position
- with extension lines up to 2M
- **-in fact, almost anywhere lubrication is required.**

Key contacts:

- Plant Engineers
- Maintenance Engineers
- Reliability Engineers
- Maintenance Foremen and Supervisors
- Electrical Maintenance Engineers
- Purchasing
- **cover all bases: GreaseMax may be used by several different engineers on site**

Advantages over other products on market:

1. No electrics - no batteries, switches, circuit boards - NO FAILURES
2. No mechanical components - NO FAILURES
3. STEEL BODY -high output pressure, not affected by heat, no ‘ballooning’ under heat / pressure - NO FAILURES
4. GreaseMax provides better PERFORMANCE, higher output pressure, equal accuracy and higher reliability than other brand chemical units and battery powered units.
5. ECONOMICAL - competitively priced

GreaseMax design

We are often asked why GreaseMax is designed the way it is and why we use a chemical operating system rather than an electrical (battery powered) operation. A brief summary of the main details follows:

GreaseMax lubricators are based on a simple, proven, design concept. They deliver:

- accurate discharge
- simple and easy use
- reliable operation in all situations - hot, cold, moving, vibrating, wet, underwater, on feed lines
- economy

NO ELECTRICAL COMPONENTS – No electrical failures

GreaseMax lubricators have no issues with:

- batteries – flat, stolen, or needing replacement on site
- sometimes complex activation and setting requirements
- faults with contacts & switches
- motors
- circuit boards failing from vibration
- daily temperate cycles (hot day/cold night) causing condensation, or humidity, affecting electrics.

NO MECHANICAL COMPONENTS - No mechanical failures

QUALITY & SAFETY: tested and approved, annually, by TÜV Germany for production quality and world-wide safety approval.

PROVEN DESIGN – all aspects of the GreaseMax design are proven

STEEL BODY The performance required, particularly **output pressure**, can only be achieved with a **steel body**. The steel body withstands both **heat** and **pressure** without deforming or 'ballooning' - which will cause failure.

The steel body sometimes raises questions from new users about the piston not being visible. There is no practical advantage in being able to see the piston. The very slow progress of the piston down the cylinder makes it impossible to judge, from one viewing to the next, on a unit with a clear plastic body, how much the piston has moved unless the position of the piston is carefully marked on the unit each time. This becomes a time-consuming task if a large installation is involved, and we think would make the use of the product pointless.

GreaseMax performance, and therefore both its operation and discharge, can be verified with Condition Monitoring, or by checking the bearing temperature, or by the grease discharge through the seals – all positive tests for correct lubrication. Once users are familiar with GreaseMax, piston visibility is not an issue.

NOT ADJUSTABLE To make the unit adjustable would require electronic control or mechanically adjustment. Either method means a more complex design - and more potential for failure. Also, it is just as easy to incorrectly set as to correctly set an adjustable unit. Unauthorized interference is also prevented.

NOT REFILLABLE – a refillable is product is more complex and requires incorporation of many of the design features that we reject. A relatively time-consuming on-site changeover of batteries and grease cartridges (which are generally costlier than a GreaseMax unit) without contamination and detailed re-setting requirement, in difficult site conditions – often dusty and windy - is required. It introduces a human element into the product's reliability and performance.

GreaseMax was developed in Germany in 1992/3. It has a world-wide reputation for performance and reliability.

(1) greases containing MoS2 may not allow the piston to be seen and GreaseMax must be changed on operating times

REASONS FOR ROLLING BEARING FAILURE

There are 6 principle reasons why rolling bearings fail:

1 Solid contamination

- contaminants introduced into bearing because greasing equipment and grease nipples were not cleaned prior to use
- contaminants working back into the bearing from worn or poorly purged seals
- foreign matter such as dust and grit in the grease from poorly handled and stored greases

2 Unsuitable lubricant

- grease applied which has lubricant properties unsuited to the application
- grease which is incompatible with the existing grease being applied during re-greasing causing lubricant break-down

3 Insufficient lubricant

- dry running bearings
- bearings with insufficient lubricant to protect against shock or vibration
- insufficient re-greasing to remove grease degraded from water contamination
- insufficient re-greasing to remove grease degraded from heat and oxidisation

4 Aged lubricant

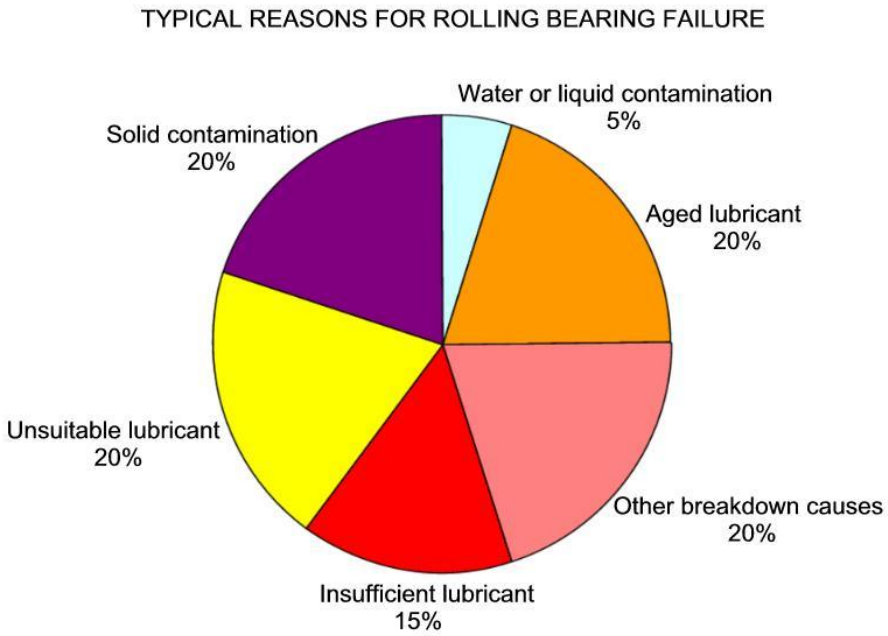
Greases have a finite life. Over time oil will be lost from the grease base which acts in the style of a sponge to hold the oil and accommodate movement of the grease within the moving bearing elements; lubricants and oils become oxidised and harden over time – this process may be accelerated due to heat, load, speed, vibration, water contamination.

5 Water contamination

This may occur from water (or other liquids) entering bearings which are operating in wet conditions, from hose-downs, from humidity, or from daily temperature cycles from hot to cold/cool which will create the conditions which allow a condensate to form in the housing, even in hot and dry climates. **The limit for the absolute water content in mineral oil - the lubrication component of most greases - above which problems will occur, is 200 ppm**[1]. Water contamination higher than this will cause a number of lubrication problems, corrosion and failures of the grease's lubrication and protection properties.

6 Other breakdown causes

- such as poor fitting, poor alignment, loads and speeds outside bearing design parameters, and normal wear and tear occurring to bearings and seals.
- incorrect (or not ideal) bearing selection. Thus the cause of a premature bearing failure could be the selection of the bearing in the first place.



GreaseMax lubricators provide an effective and reliable lubrication solution for causes 1 – 5. Lubrication can't overcome the fundamental problems in cause 6 however effective lubrication may assist in delaying the point of failure for bearings that are over stressed or damaged from operating in these conditions, perhaps allowing maintenance to take place at an operationally acceptable time rather than as operationally disruptive and expensive break-down maintenance.

[1] SKF / Machinery Lubrication, Karl & Botts

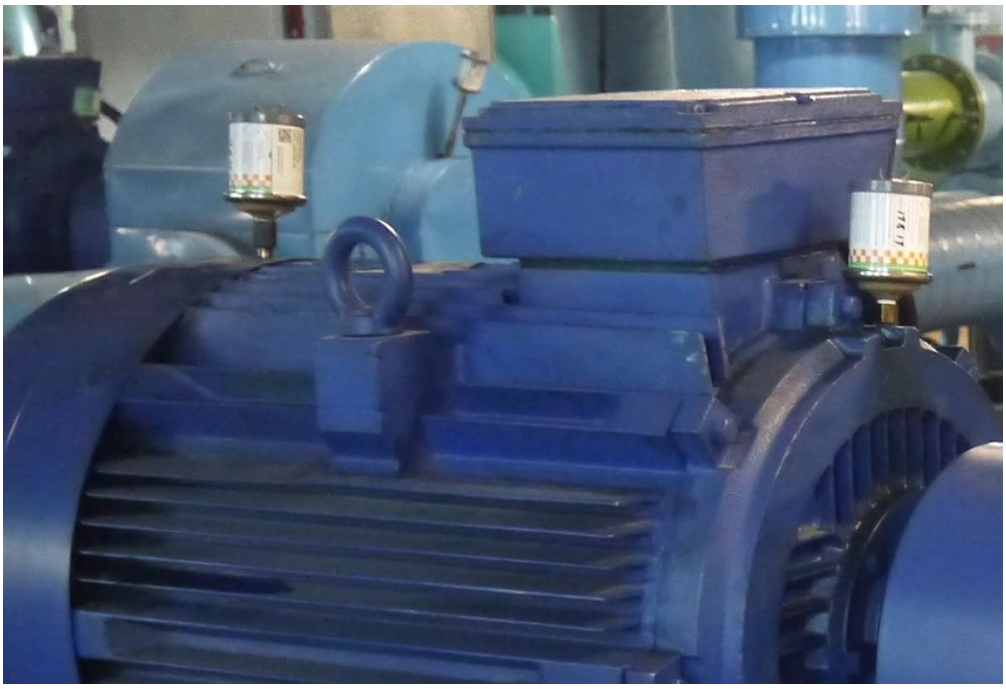
ELECTRIC MOTOR LUBRICATION

Lubrication improvements can significantly increase the reliability of electric motors. Premature motor failure is likely to be caused by bearing failure. Lubrication is a major factor.

Lubricants have a finite life so re-lubrication is essential for long term motor reliability. Manual re-lubrication introduces human error factors such as: the application of the **wrong grease**, **too much grease**, or **lubrication is missed**.

Often manual greasing is done with equipment stopped - so the motor is cold. In these conditions older and colder grease may block the entry of new grease into the bearing. The grease may instead go into the motor internals.

GreaseMax continuous lubrication provides the best lubrication results for improved bearing life. Re-greasing the motor when it is running allows a more effective, controlled result.
Bearing life is improved and there is a reduced possibility of excess grease being applied and contaminating the motor internals. GreaseMax eliminates the problems of the wrong grease being used, foreign matter contamination from dirty grease nipples or lubrication being missed.



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automatic lubricator
simply superior!

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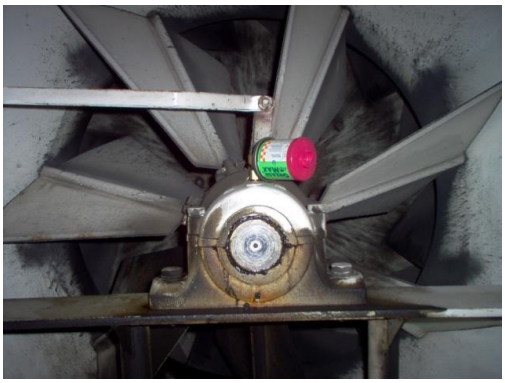
FAN BEARING LUBRICATION

Many industries, such as mining, mineral processing, food processing, petrochemical production, and office, hotel and shopping mall heating ventilation and air-conditioning systems, cannot operate without fans. Often the operating conditions are hot, or humid - particularly in cooling towers. Lubrication is a critical reliability factor.

GreaseMax continuous automatic lubricators provide an effective solution for fan bearing lubrication:

- GreaseMax has the capacity to pump through the long feed lines often needed.
- Physical access issues are reduced.
- Continuous lubrication ensures that grease degradation issues arising in difficult operating conditions, such as where heat and humidity are factors, are eliminated.
- GreaseMax lubrication ensures that lubrication-related failures are minimised or eliminated.



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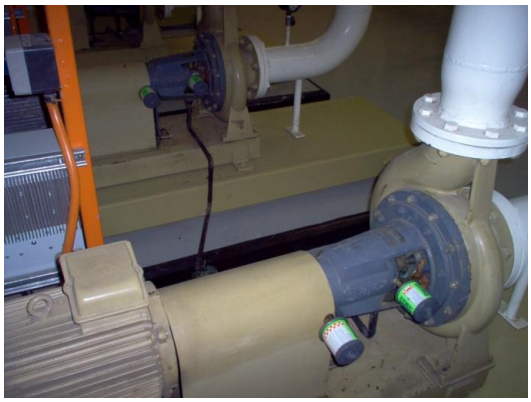
GreaseMax - use in hospitals

GreaseMax lubricators offer an efficient solution for reliable lubrication of hospital plant and equipment.

Applications include:

- **hot and cold water pumps**
- **motors**
- **ventilation fans**
- **cooling tower fans**



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GREASE MAX

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GreaseMax® - mining, mineral processing, quarrying

GreaseMax lubricators have a proven track record for lubrication of equipment in mines, mineral processing plants and quarries.

Applications include:

- **Conveyors**
- **Pumps**
- **Motors**
- **Drives**
- **Flotation cells**
- **Filters**
- **Fans**
- **Thickeners**
- **Drills**
- **Screens**
- **Cranes**
- **Mobile plant**

- Bearings operating in dusty or wet conditions are continuously re-greased and purged
- GreaseMax lubricators have the capacity to pump through long feed lines which are often needed
- Lubrication-related failures are minimised or eliminated
- Labyrinth seal function is improved – continuous greasing & purging prevents foreign matter ingress
- GreaseMax lubricators are intrinsically safe and can be used under-ground
- WHS: physical access & safety issues are reduced: height, process hazards, moving machinery

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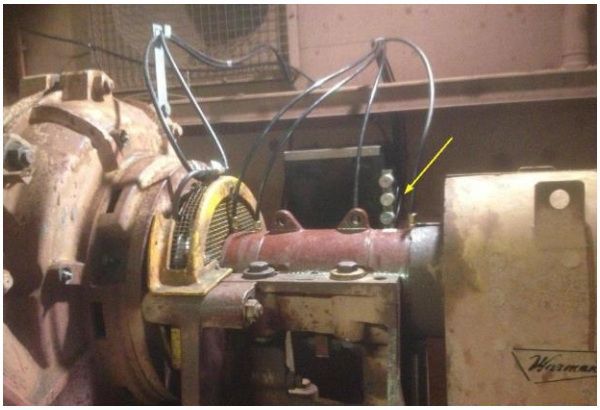
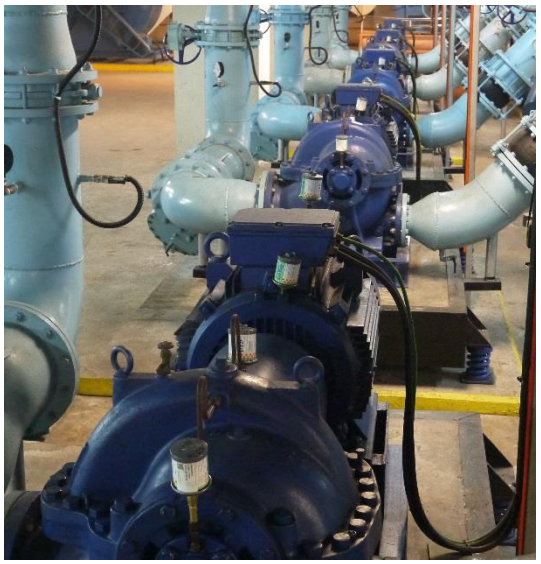
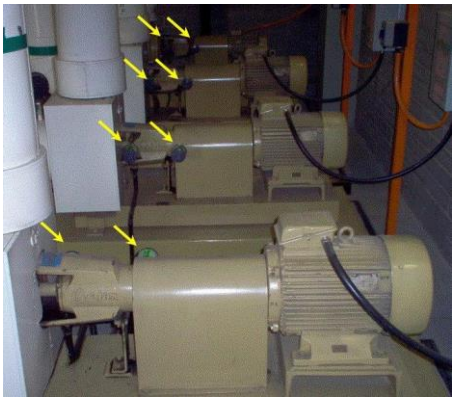
PUMP LUBRICATION

GreaseMax automatic lubricators provide an effective solution for pump lubrication and improve pump reliability.

- GreaseMax has the capacity to pump through **long feed lines** which are often required.
- GreaseMax lubricators are used on both the **bearings** and the **seals**.
- **Mechanical seals** are kept in perfect operational condition with continuous lubrication.
- **Packed seal** performance is improved with grease lubrication
- GreaseMax operates perfectly in **hot**, **cold**, **wet** and **vibrating** conditions.
- **Remote mounting** which is possible with GreaseMax means that when required by site OH&S rules, unit change-overs can be done without stopping plant and losing production.







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GreaseMax - operational reliability

We are sometimes asked how the user can be assured about GreaseMax reliability and operation, particularly as GreaseMax has a **steel body**.

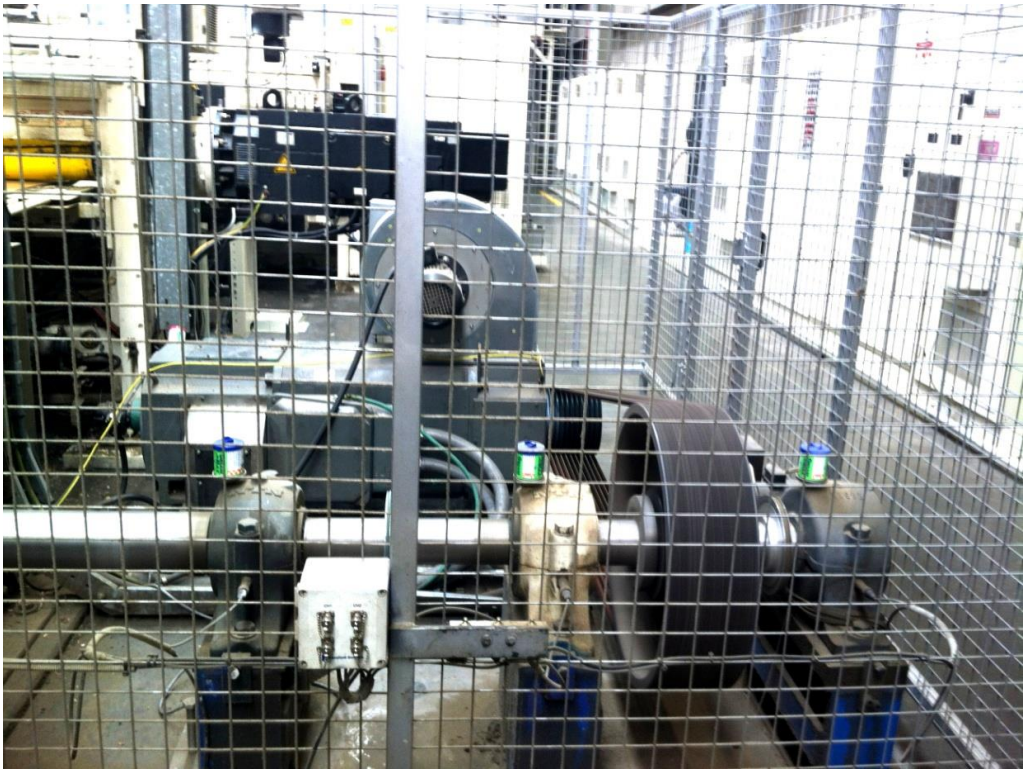
The GreaseMax gas pressurisation system has been thoroughly proven in 25 years of production. A steel body is used as it is essential for performance and reliability. The performance required, particularly **output pressure**, can only be achieved with a **steel body**. The steel body withstands both **heat** and **pressure** without deforming or 'ballooning' - which will cause failure.

There is no practical advantage in being able to see the piston. The very slow progress of the piston down the cylinder would make it impossible to judge - assuming GreaseMax had a visible piston - from one viewing to the next, how much the piston has moved unless the position of the piston is carefully marked on the unit each time. This would be a time consuming task if a large installation is involved and in our view would make the use of the product pointless.

GreaseMax performance, and therefore both its operation and discharge, can be verified with Condition Monitoring, or by checking the bearing temperature, or by the grease discharge through the seals.

Once users are familiar with GreaseMax piston visibility is not an issue

GreaseMax does not need to be regularly inspected. In the application in the photo below the bearing condition is monitored with CM and the GreaseMax units are changed on scheduled dates. Nothing more is needed. This provides for efficient, cost-effective bearing maintenance and better productivity as the process does not need to be stopped for access.



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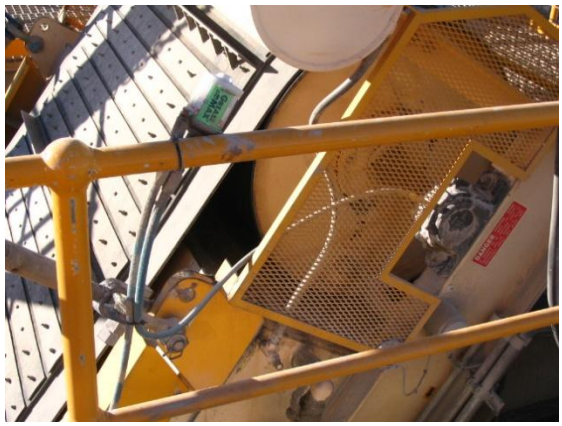
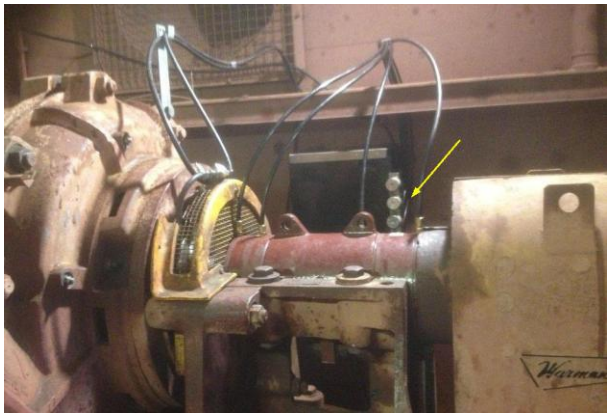
GreaseMax use on feed lines

GreaseMax lubricators can be remotely-mounted on long feed lines.

Advantages:

- Production does not need to be stopped for lubrication
- GreaseMax units can be changed when plant is in operation
- Improved maintenance outcomes from continuous lubrication
- Plant safety is improved





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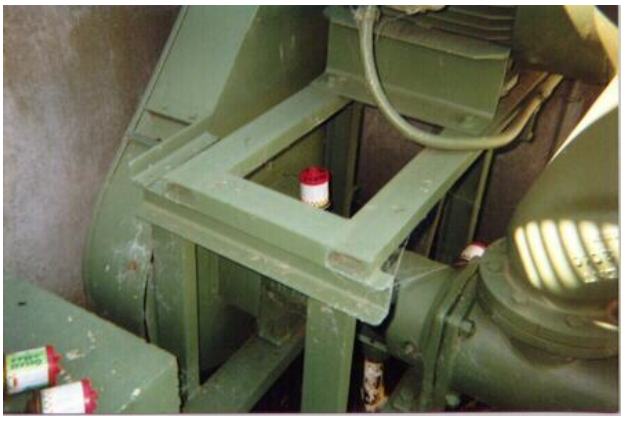
GreaseMax use on grain handling and milling plants

- **Screw conveyors**
- **Elevators**
- **Screens**
- **Motors and drives**
- **Chemical pumps**

GreaseMax lubricators are ideal for the lubrication of grain handling and milling equipment

- WHS: physical access issues are reduced: height, dusty conditions, heat, moving machinery
- Bearings operating in dusty conditions are continuously re-greased and purged
- GreaseMax has the capacity to pump through the long feed lines often needed
- GreaseMax lubrication ensures that lubrication-related failures are minimised or eliminated
- GreaseMax is available with food grade grease



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