



## Case Study

# Increased productivity with new lubricant solution for continuous casting equipment

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## Summary

One of the most critical areas of operation in steel industry is the continuous casting plant. A constant supply of grease from the central lubrication system must be ensured if the roller elements are to rotate continuously when they come into contact with the strand and prevent a deterioration in slab quality, strand breakage or even a standstill and segment change of the rollers. Under the extreme temperature conditions, however, the grease in the lines must not harden.

Klüber Lubrication has developed Klüberplex HB 98-601, a synthetic high-temperature grease with a high load-carrying capacity. The innovative thickener and base oil concept of Klüberplex HB 98-601 has been precisely adapted to the high loads and temperatures and is suitable for central lubrication systems. In addition, the lower consumption supports the sustainability goals of companies. Already during the test phase, customers noticed a 50% reduction in grease consumption.

The lubrication of rolling bearings in continuous casting plants (strip, pre-strip and slab casting plants) has always been a challenging task for maintenance teams in steel and ironworks. In particular, the hardening of the lubricant in the lines of the central lubrication systems used represents a major challenge for the operators of the systems.

For this reason, many studies have been carried out in the past to effectively and permanently prevent the lubricant from hardening in the lines of central lubrication systems and to rule out any resulting bearing failures.

Insufficient lubrication or even lubricant failure led to production stoppages and high maintenance costs. The profitability of the plants was severely affected by costs and lower productivity.

To tackle these hurdles, modern continuous casting process (CCP) segments were equipped with multiple split rollers, with an increased number of lubrication points. However, with greater slab widths, the performance of lubricants could never be optimal.

### Lubrication method, grease and caster bearing performance: A study

Modern slab casting machines have multiple separate central grease lubrication systems to lubricate different machine elements - mostly bearings.

In general, dual-line central lubrication systems are used. The distributor metering valve for line change over (cracking pressure) varies from 80 bar to 350 bar. The delivery volume varies from 1.5 ccm to 6 ccm with a line diameter of just 8 mm - from the distributor to the roller bearing.

### The challenges faced by the caster maintenance team

Generally in a steel plant the bearings and lubrication lines (distributor to bearing head) are exposed to higher radiation heat because of higher slab width and greater slab thickness.

This leads to line clogging - solidification of grease inside the pipe and does not allow grease to reach the lubrication points.

When the bearing is starved of lubrication for a prolonged period, the result is premature bearing failure or shortened bearing life. With a normal high temperature grease being pumped with shorter lubrication cycles the problem can be arrested, but the lubricant consumption will increase drastically. Nonetheless, frequent roll jamming and segment replacements are common with normal non-effective high temperature lubricants.

### Operational criticality and grease selection

Parameter	Application criticality	Grease property needed
Speed	Ultra low speed	High viscosity base oil with higher shear stability
Ambience	High water/ steam along with micro scale ingress	Good sealing with high base oil with good water resistivity and water washout
Load	Moderate to high at bow area due to high Ferro static pressure	High load carrying with anti-wear (AW)
Temperature	High, specially at end rollers and higher slab width with higher slab holding time	High temperature stability, non-hardening, good oil release at high temperature
CGLS (Lubrication method)	Distributor line clogging	Good pumpability, non clogging in distributor / feeder

## Our solution

A leading Indian steel plant contacted the specialty lubricant manufacturer Klüber Lubrication because of the problem described above and found the solution with the newly developed synthetic lubricating grease **Klüberplex HB 98-601**.

The slab caster in this steel plant produced slabs with a thickness of about 2,000 mm. The CCP slab caster bearings and the lubricant lines were exposed to temperatures of over 230 °C. The temperatures were recorded by fixing two resistance temperature detectors (RTD) at the bender and bow area of the caster.

## Cyclic temperature metal tube test at Klüber Lubrication R&D facility in Mysore

Klüber Lubrication tested standard greases commonly used in continuous casting plants as well as the new lubricating grease Klüberplex HB 98-601 for their pumpability at high temperatures:

All other commonly used caster greases were getting solidified inside the pipe, after being exposed to temperatures more than 180 °C for one hour. **Klüberplex HB 98-601** did not show any hardening tendency, even after being exposed to temperature higher than 230 °C for many hours.

## Cyclic temperature metal tube test: Sample before and after the test

### Before the test



Standard lubricant



Klüberplex HB 98-601

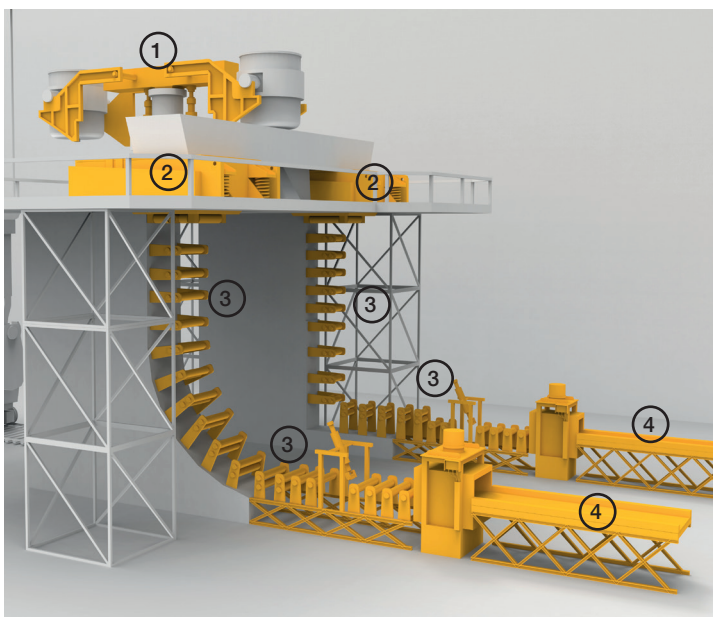
### After testing at more than 180 °C over 1 hour



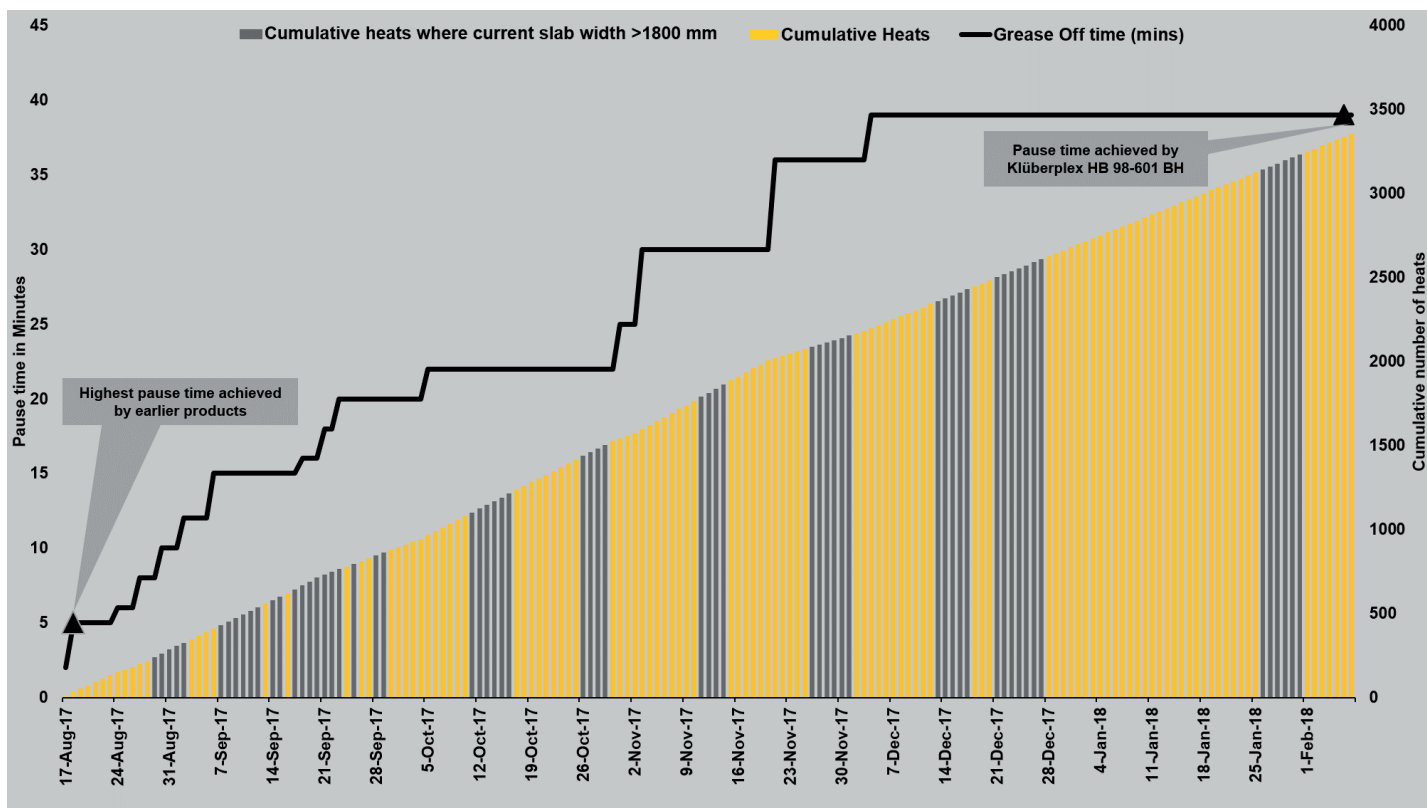
Standard lubricant



Klüberplex HB 98-601



Application	Product
1 Turret	STABUTHERM GH 461 Klüberlub BE 41-1501
2 Oscillating mechanism	STABUTHERM GH 461
3 Roller bearings of segments/ Withdrawal segment (Caster)	Klüberplex HB 98-601 STABUTHERM GH 461
4 Run-out table	Klüberplex HB 98-601 STABUTHERM GH 461 Klübersynth GH 6-320



## Field trial results show increase of lubrication cycle at the customer

The customer started a test run for six months with Klüberplex HB 98-601 in a selected system for six months. The lubrication interval was extended from 8 minutes (5 minutes OFF, 3 minutes ON) to 42 minutes (39 minutes OFF, 3 minutes ON) without any line clogging or bearing starvation issues.

More than 3,500 heats have been casted with Klüberplex HB 98-601 with a highest slab width of 2,100 mm and thickness of 300 mm. The cumulative number of heats with greasing cycles is plotted above (the gray lines plotted above show the cumulative heats where the slab width is higher than 1,800 mm).

## Summary

Klüberplex HB 98-601 has been successfully performing at the CCP caster since 2018. Due to this success, the Indian steel plant converted three more slab casting lines as well as one 8-strand billet casting plant to Klüberplex HB 98-601. In the meantime, several international Indian steel producers now use Klüberplex HB 98-601 in more than ten continuous casting lines. Also, in Turkey and Bulgaria, steel producers have switched to this innovative solution. In all plants neither hardening of the grease nor premature bearing failures due to lubrication-related causes have been observed. As a result, the productivity and profitability of the converted plants increased.

In addition, the reduced grease consumption led to a lower amount of cooling water that had to be treated, and less use of chemicals required for this purpose. Besides lower costs, this is an additional positive effect with regard to the sustainability goals of the iron and steel industry.

### Further benefits for customers:

- Increased productivity
- Longer component service life
- Less downtime
- Less lubricant required

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