

HAUL TRUCK A-FRAME & PUMP MONITORING

The customer has experienced systemic A-frame bearing failures on their entire haul truck fleet. The customer installed the GreaseBoss Critical Point monitoring and Bulk Flow Management solutions on two haul trucks.

Immediately after installation, multiple major lubrication issues were identified on both haul trucks and reported to the maintenance team. The maintenance team were able to then **apply prescriptive maintenance to rectify the issues** and provide the truck with sufficient lubrication.

Without the monitoring and intervention from GreaseBoss, both trucks would have been operating with severe under greasing that would have resulted in repeated A-frame and other component failures.

CONTEXT

The customer had been concerned that some haul truck components, particularly the A-Frame bearing, were experiencing premature wear and failure from inadequate grease application. The fleet had experienced systemic A-frame failures resulting in expensive repairs and issues with asset availability.

Site reliability engineers had been unable to determine the root cause of these failures and engaged GreaseBoss to run a pilot program to verify grease lubrication on two haul trucks a CAT 793 and CAT 789.

Objectives:

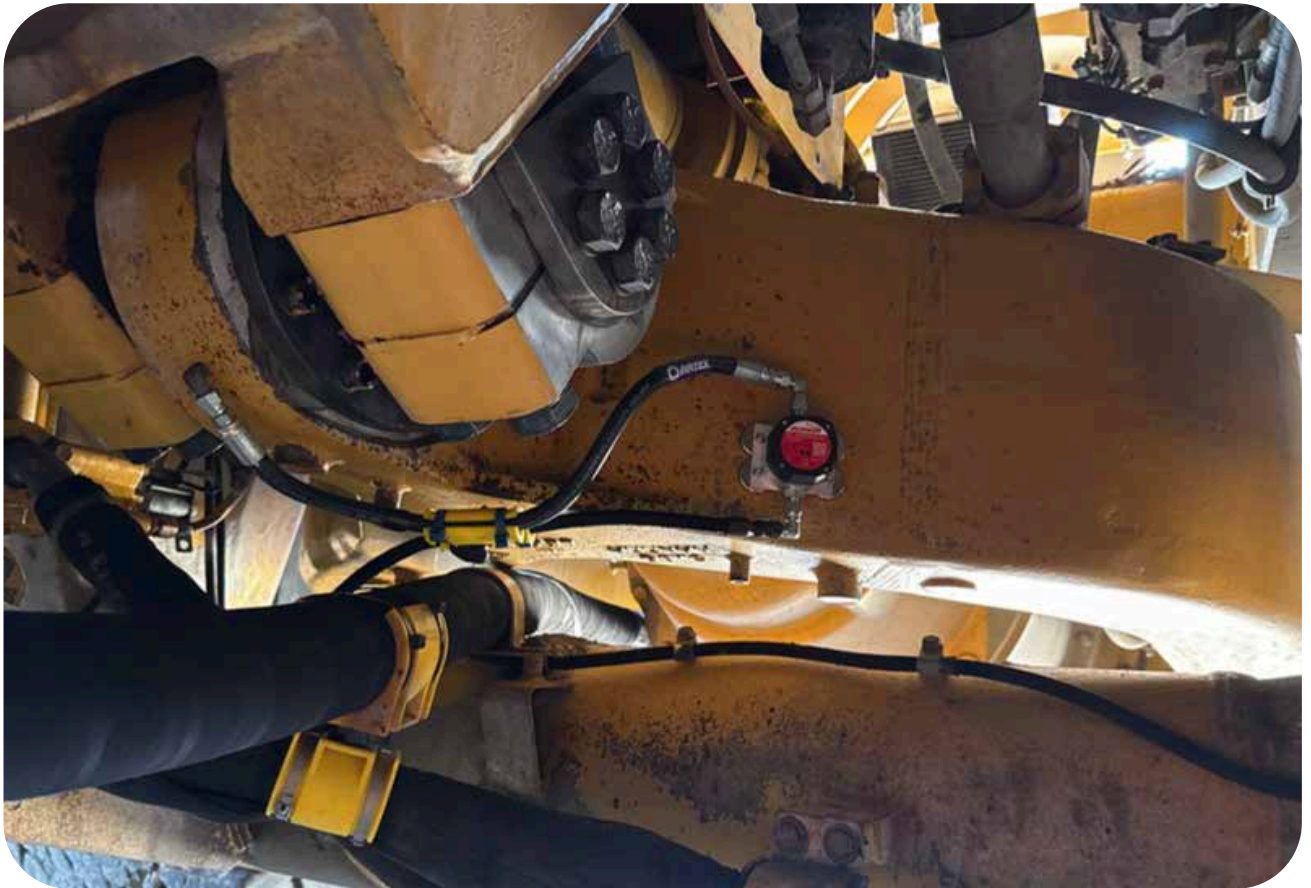
1. Monitor haul truck A-frame bearing lubrication point to determine if grease application was contributing to premature failures
2. Monitor bulk lubricant application volumes across the two haul trucks for overall lube system performance monitoring and grease consumption baselining

SOLUTIONS PROVIDED

The trucks were monitored with the Critical Point Monitoring solution and the Bulk Flow Monitoring solutions.

Each Haul Truck was fitted with the following GreaseBoss hardware:

- x1 Endpoint LF - monitoring the A-frame bearing, mounted on magnetic bracket
- x1 Endpoint BF - monitoring the grease pump, mounted on magnetic bracket
- x1 HME Gateway - connected via 4G SIM



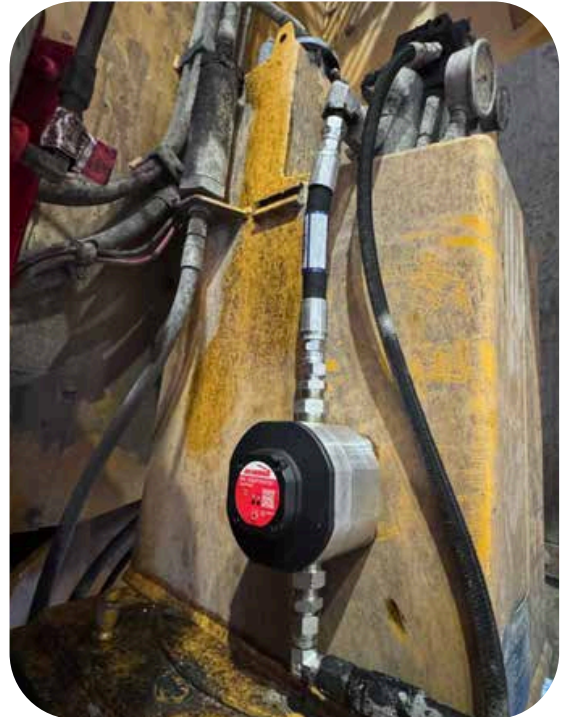
Endpoint Low Flow monitoring the A-frame bearing

FINDINGS – TRUCK 1

GREASEBOSS DATA REVEALED FAULTY GREASE PUMP

Within hours of driving out of the workshop bay, the GreaseBoss data showed that the truck pump was erratic on timing and variable volumes. The A-frame bearing data aligned exactly with the pump data, indicating that this was a pump issue.

The maintenance team inspected and found the A-frame bearing dry and the failed grease pump. A new grease pump was installed.



Endpoint Bulk Flow on grease pump

TRUCK 1 – ENDPOINT BF AT PUMP



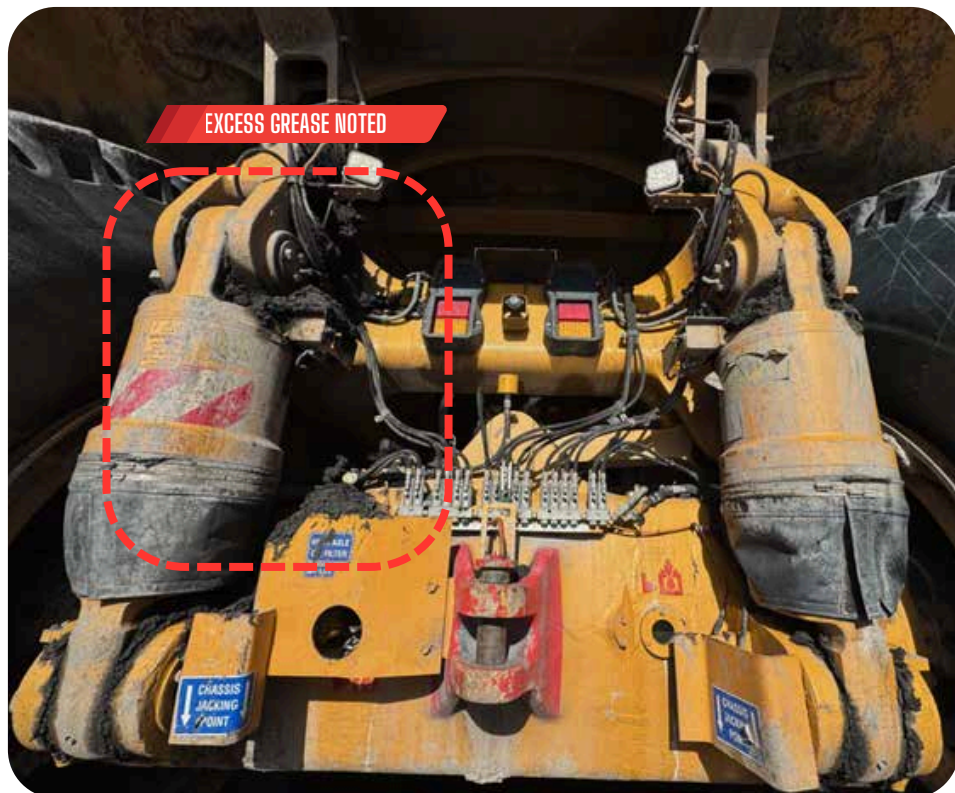
TRUCK 1 – ENDPOINT LF AT A-FRAME BEARING



GREASEBOSS DATA REVEALED EXCESS GREASE BEING DISPENSED

After the pump was replaced, another issue became immediately apparent. The truck has 30 injectors set at 1.3cc and 1 x injector at 5cc for the A-Frame. The expected grease volume is approximately 50cc per cycle (refer below on #TR207 pump volumes).

GreaseBoss data showed 250+cc being dispensed each pump cycle - 5 times the expected amount. GreaseBoss and the site maintenance team were able to use this data to determine that the truck had numerous bypassing injectors. This was confirmed by inspections showing excessive grease on some components. The truck was then scheduled for further maintenance to replace all faulty injectors.

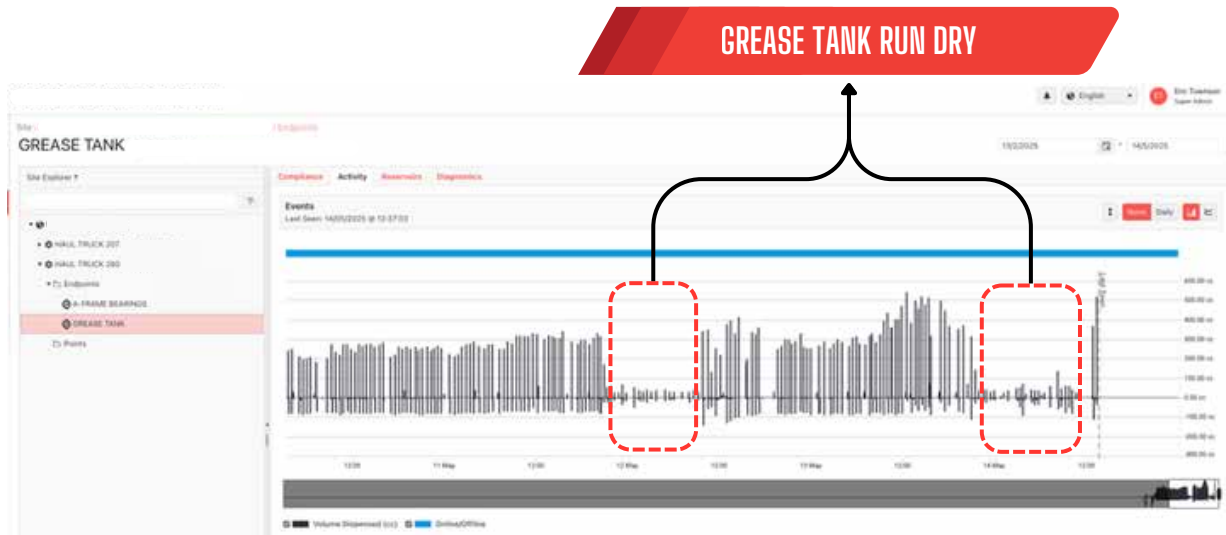


ACTUAL GREASE DELIVERY
≈250cc

EXPECTED GREASE DELIVERY
50cc

INDICATED EMPTY GREASE TANK

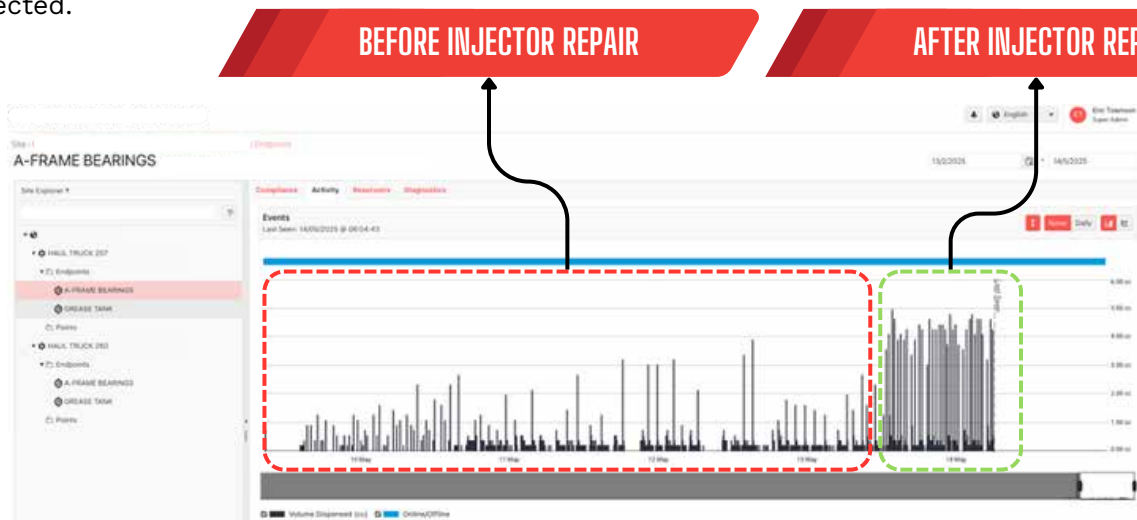
Due to the higher-than-expected grease volume being pumped into the truck's lube system, the grease tank ran dry twice, both times this was detected by the Endpoint BF data, allowing the team to schedule an ad-hoc grease tank refill, limiting the amount of time that the truck operated without grease to 12 hours each time. The standard grease tank filling regime was for fortnightly fills, so **without this visibility, this truck would have operated without grease for approximately 250 hours every fortnight (approx. 75% of the time).**



OPERATIONAL OUTCOMES – TRUCK 2

HIGHLIGHTED ERRATIC GREASE TO THE A-FRAME BEARING

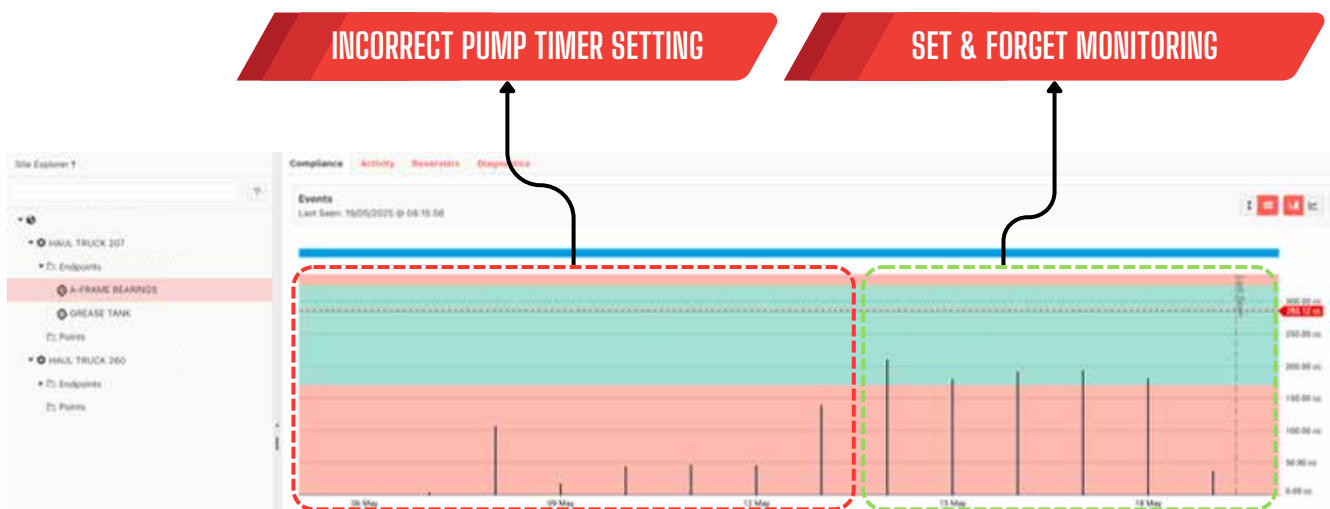
Immediately after installation, the GreaseBoss data revealed that the A-Frame bearing was not receiving the expected 5cc per pump cycle. Data highlighted erratic grease to the A-Frame bearing rather than the expected, consistent injector volume. Site investigated and found the **injector had been incorrectly installed and tuned.** Once the injector was correctly installed and tuned, it behaved as expected.



DETECTED INCORRECT PUMP TIMER SETTING

The GreaseBoss data indicated that the pump cycle time was running at over 60 minutes, instead of the desired 30 minute cycle. The maintenance team investigated and corrected the pump setting to 30 minute cycles.

After making these informed improvements to Truck 2's lubrication system, the truck is now being lubricated as expected and the automatic monitoring and alerting has been enabled. This automatic monitoring allows the maintenance team to now set and forget. Ongoing monitoring will ensure that the site's maintenance team are alerted if the truck's lubrication falls out of the set specifications.



PILOT OUTCOMES

The primary objectives for the GreaseBoss pilot was to;

- Monitor haul truck A-frame bearing lubrication point to determine if grease application was contributing to premature failures
- Monitor bulk lubricant application volumes across the two haul trucks for overall lube system performance monitoring and grease consumption baselining

Several serious issues have been identified which site has actioned and corrected.

#TR260 excess grease is still to be closed out (at the time of writing this report) but the A-Frame supply has been corrected.

#TR207 grease pump performance and grease delivery into the A-Frame now meets, and possibly exceeds, both OEM and customer expectations.

Within 5 working days of installation, the GreaseBoss system met the pilot Objectives - highlighting the rapid ROI of the system.

Without the monitoring and intervention from GreaseBoss, both trucks would have been operating in severely undergreased condition which would have inevitably lead to premature component failure and reduced asset availability.

RECOMMENDED HAUL TRUCK MONITORING KIT

REAR AXLE TO CHASSIS STRUCTURAL CONNECTION

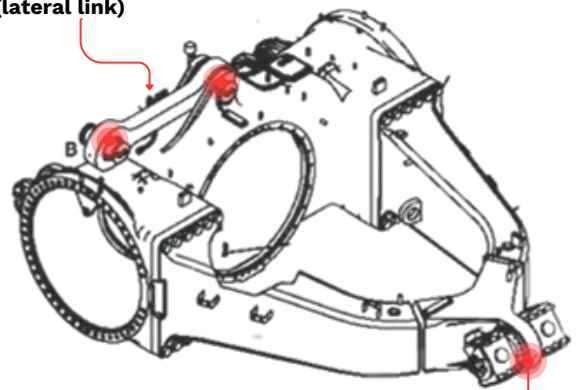


FAILED A-FRAME BEARING

Components:

- A-Frame bearing (trunnion bearing)
- Dog bone (lateral link)

Dog bone
(lateral link)



A-frame
(trunnion bearing)

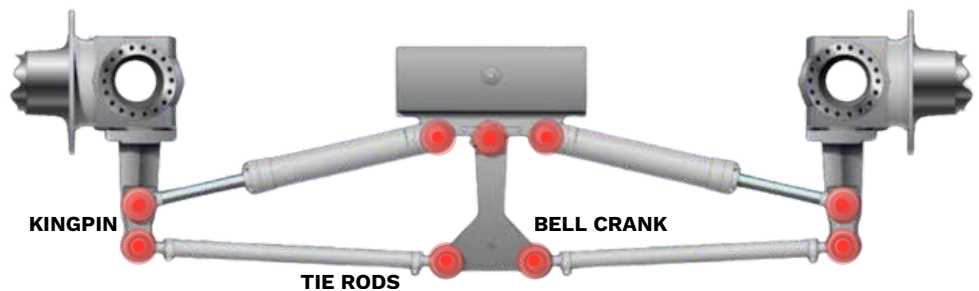
GreaseBoss Monitoring Scope:

- x2 Endpoint MP2 units

STEERING SYSTEM

Components:

- Kingpin/Ball Stud
- Bell crank/Y-Link
- Tie rods and linkages

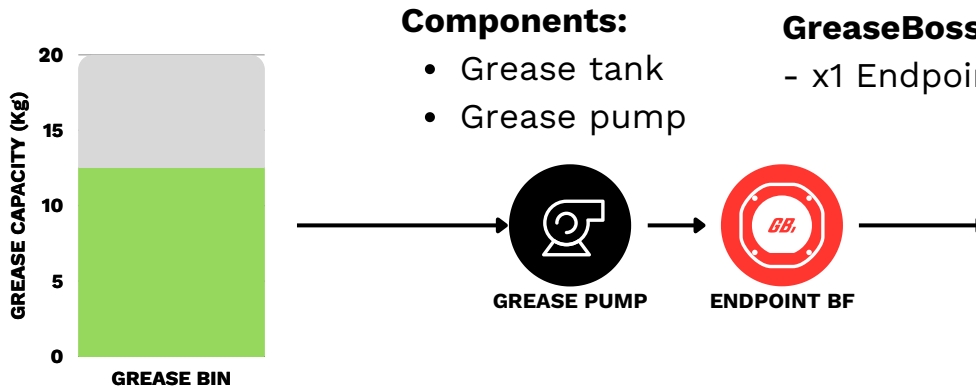


FAILED STEERING COMPONENTS

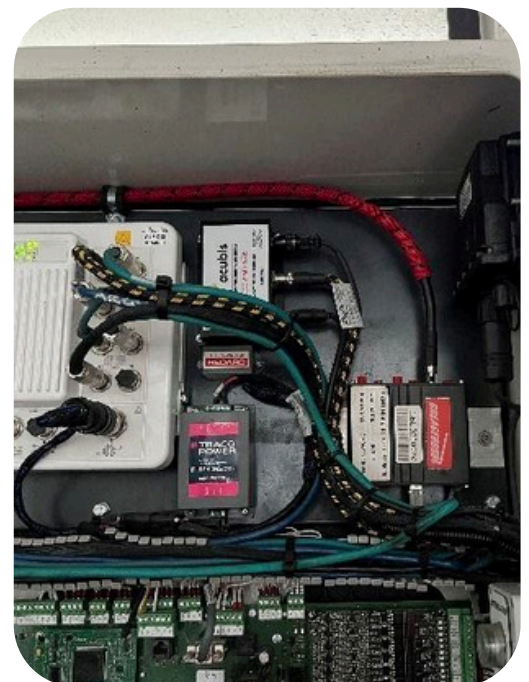
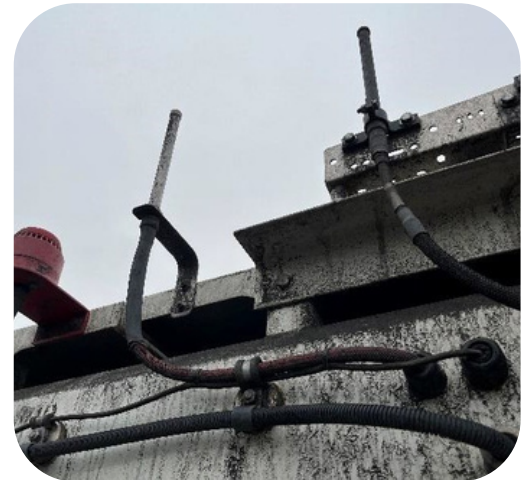
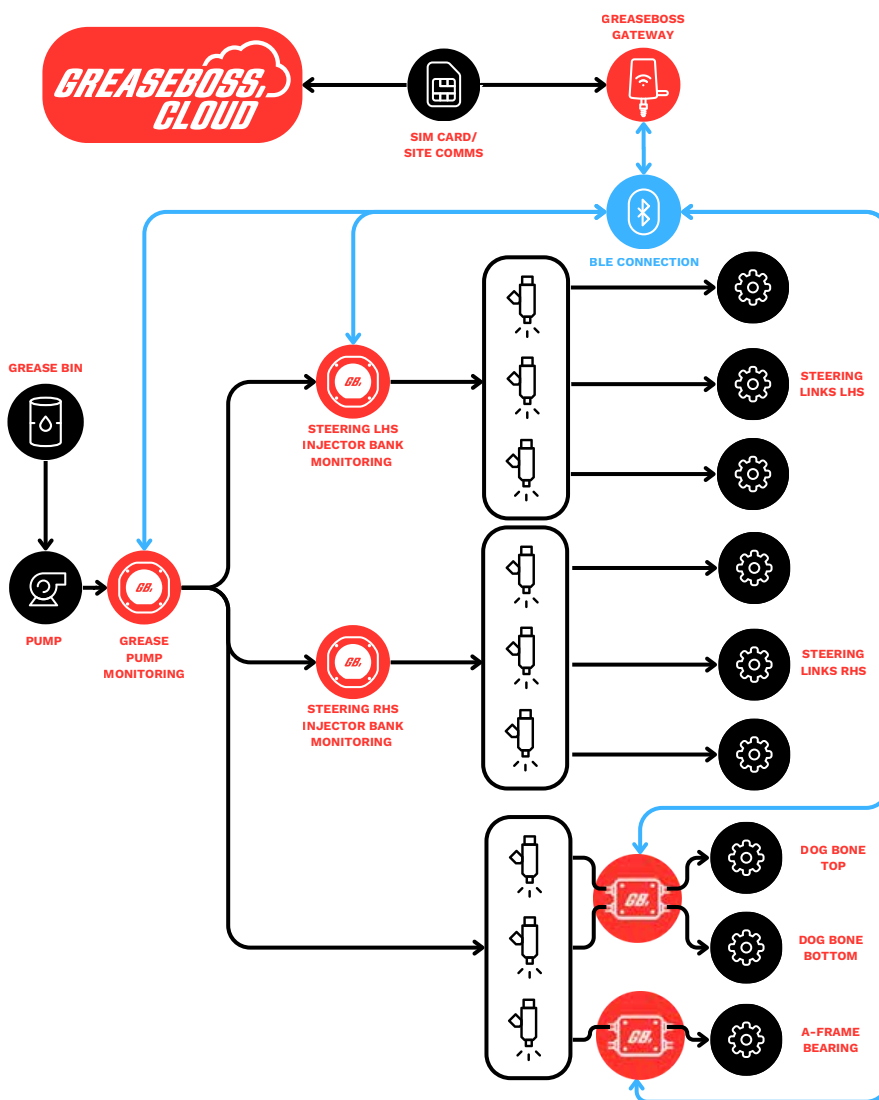
GreaseBoss Monitoring Scope:

- x2 Endpoint HF units
(each monitoring injector bank on each side of truck)

GREASE PUMP PERFORMANCE



SYSTEM CONNECTIVITY



GreaseBoss Monitoring Scope:

- x1 HME Gateway