Sutphen – Chassis Engineering 2022

The Sutphen Chassis Powertrain, truck performance & rear axle gear ratios

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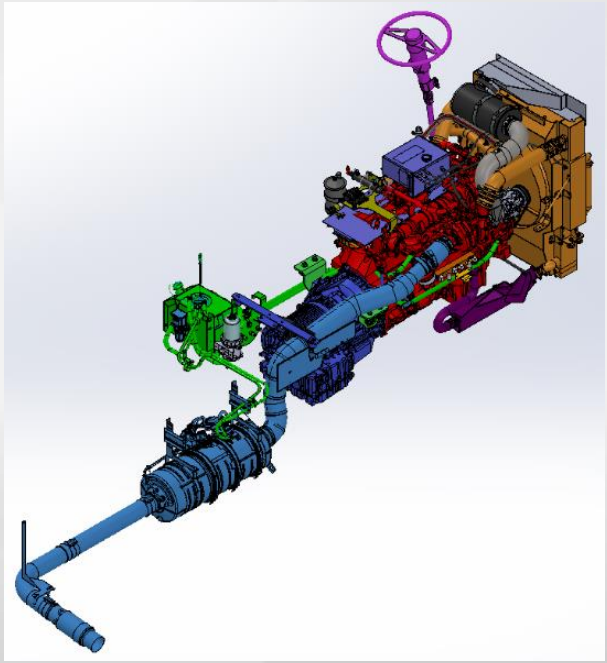
The Sutphen Chassis Powertrain

The powertrain system consist of:

- Cummins engine (L9, X12, or X15)
  - Sutphen Cooling system
  - Sutphen Air intake system
  - Sutphen/Cummins Exhaust system
- Allison Transmission
- Spicer Series Driveshafts
- Meritor or Dana Rear Axle



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Cummins Engine options:

- Cummins L9
  - 380 HP
  - 400 HP
  - 450 HP
- Cummins X12
  - 455 HP
  - 500 HP
  - 525 HP
- Cummins X15 - 605 HP

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Cummins Engine applications:

- Cummins L9
  - Standard on Pumpers
  - Standard on Single Axle Aerials
- Cummins X12 (standard on Tandem Axle Aerials, optional for Pumpers or Single Axle Aerials)
  - Standard on Tandem Axle Aerials
  - Optional for Pumpers
  - Optional for Single Axle Aerials
- Cummins X15 - 605 HP
  - Optional for all truck types

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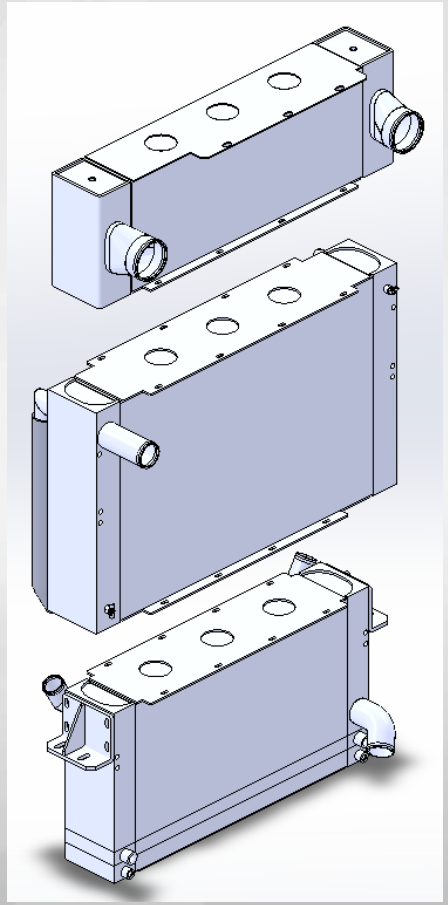
<u>Cooling system: Radiators</u>

- Radiators: Each engine (L9, X12 & X15) has been dyno tested and instrumented w/ radiators from dual suppliers. Multi-sourced for future proof supply chain insurance. The radiators are sectional and easily dis-assembled for removal.
- L9 & X12: Cincinnati Radiator or HYDAC
- X15: Cincinnati Radiator or AKG



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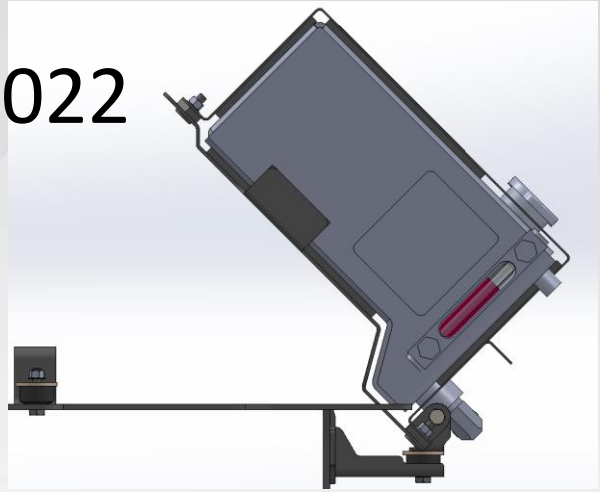
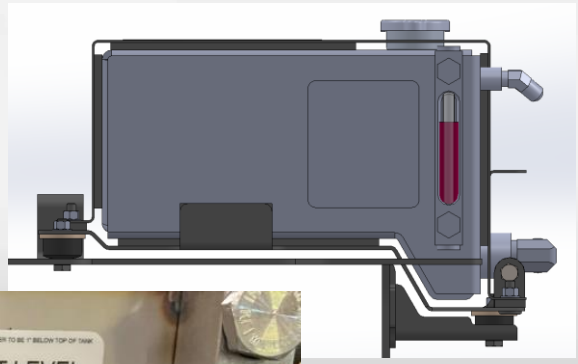
Coolant overflow system:

Surge (overflow tank).

- Tank is suspended in a rubber lined, pivoting (for access) cradle.
- Access to top of motor without removing tank or coolant. Low level sensor can be replaced without spillage.
- Stainless steel construction w/ baffles welded top & bottom prevents oil canning.
- Hi visibility coolant level sight glass.





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Cooling system hoses & coolant:

- OAT (organic acid technology) coolant.

Cummins is transitioning to OAT (organic acid technology) coolant. OAT coolant lasts longer and cools better. But silicone hoses degrade therefore we must use different material. Sutphen new hose material (high quality from U.K.) made from specially developed black internal barrier layer that virtually eliminates permeation through the hose, the hose is constructed with multiple braids of bias cut woven Meta Aramid fabric. Extremely durable.

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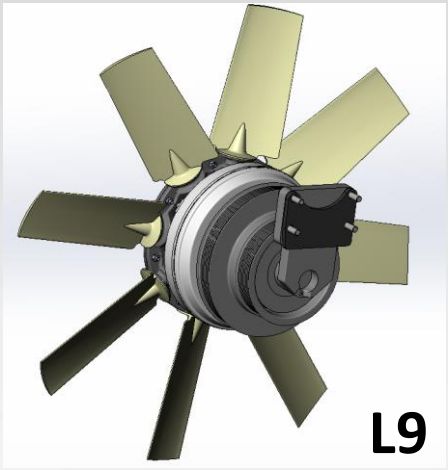
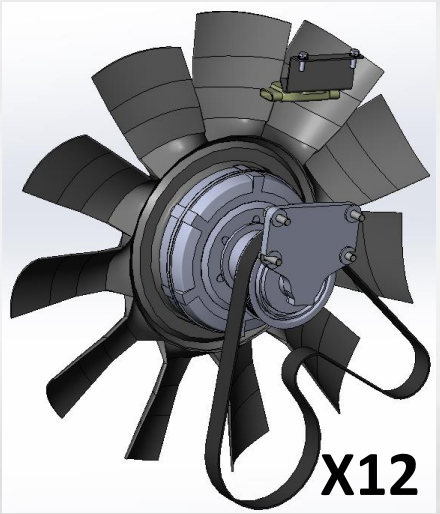
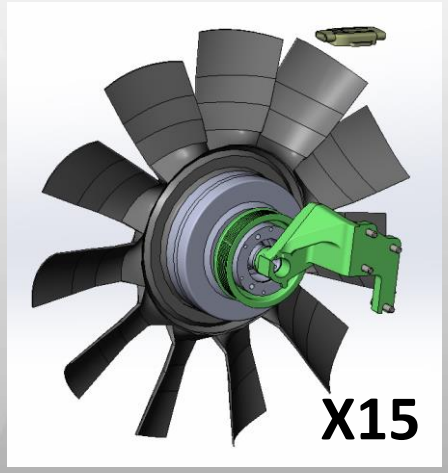
The Sutphen Chassis Powertrain







Fan drive:

- No air actuated fan clutches. All electronically controlled, viscous clutched giving greater reliability and cooling characteristics.
- L9: Viscous clutch, electric controlled. Variable speed, runs always at minimum 300-400 RPM unless activated by the ECM.
- X12 & X15 Variable speed from 0 RPM. Separate Fan controller.

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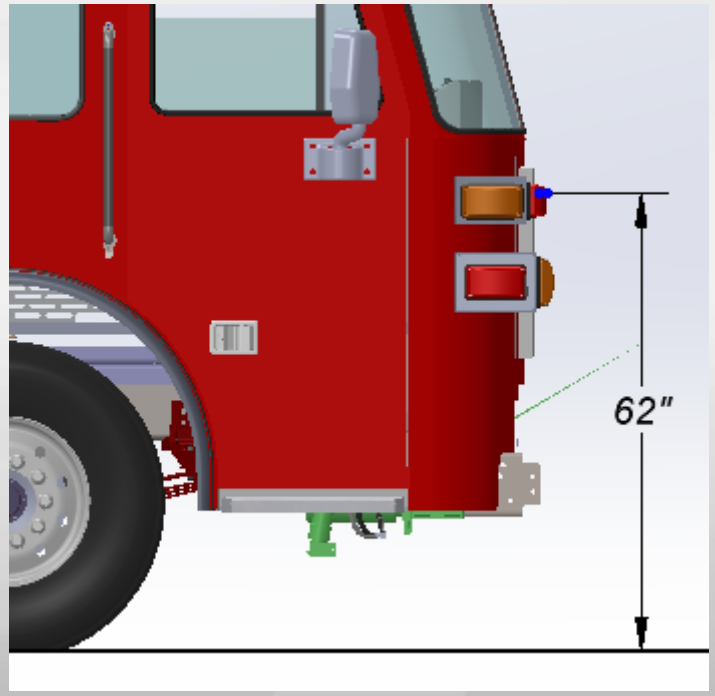
Sutphen Air Intake:

- Sutphen engine air intake is positioned high and above the radiator and grille. This increases the distance from ground level embers and reduces the chance of ingestion.



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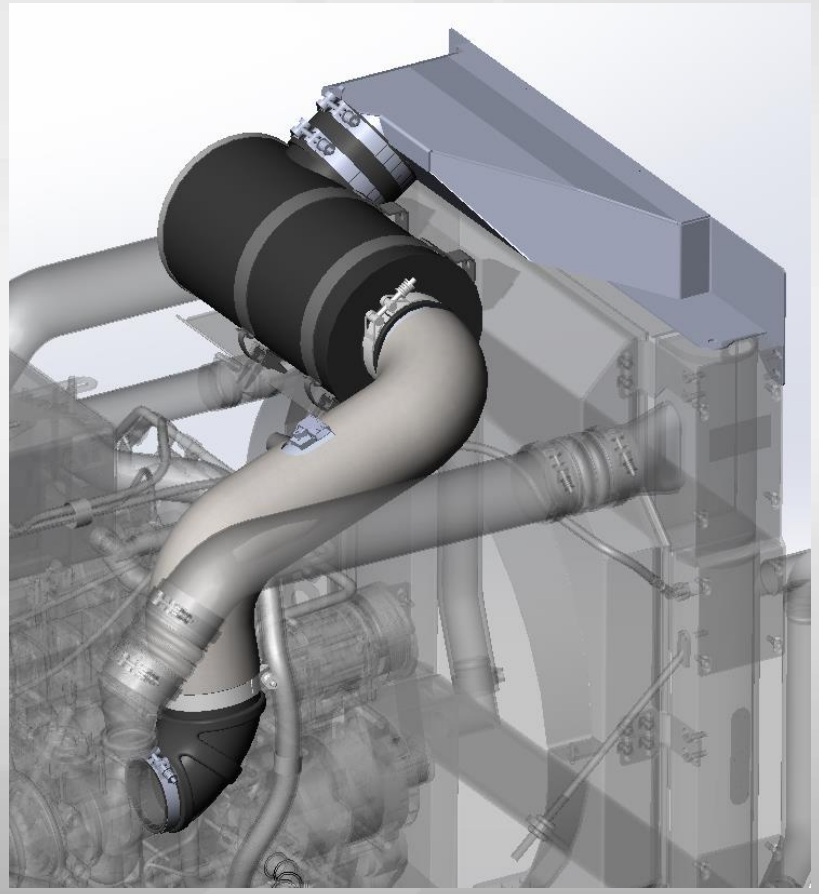
Sutphen Air Intake:

- The air path from inlet to turbo is short which is advantageous for performance. The airpath descends to the turbo, going downhill (compared to long up/down path with accompanying air restriction of other manufacturers) and this reduces the chance of damage due to accidental ingestion of water to the engine.



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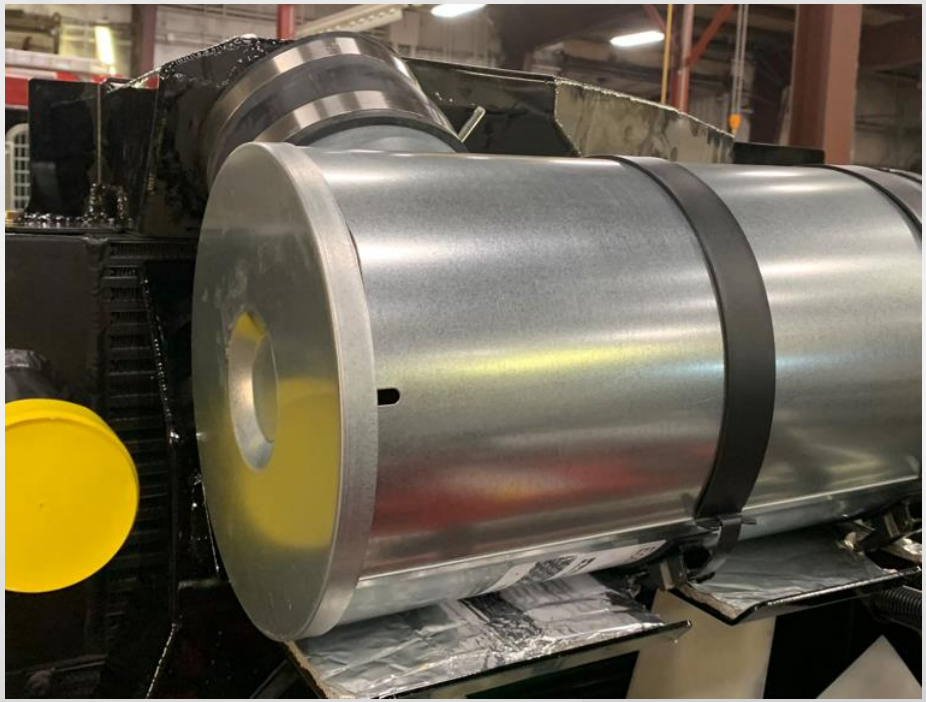
Sutphen Air Cleaner:

- The air filter is easily accessible for maintenance or replacement and is an economical standard OTR unit which can be sourced from multiple suppliers including Parker, Donaldson, Fleetguard and others.



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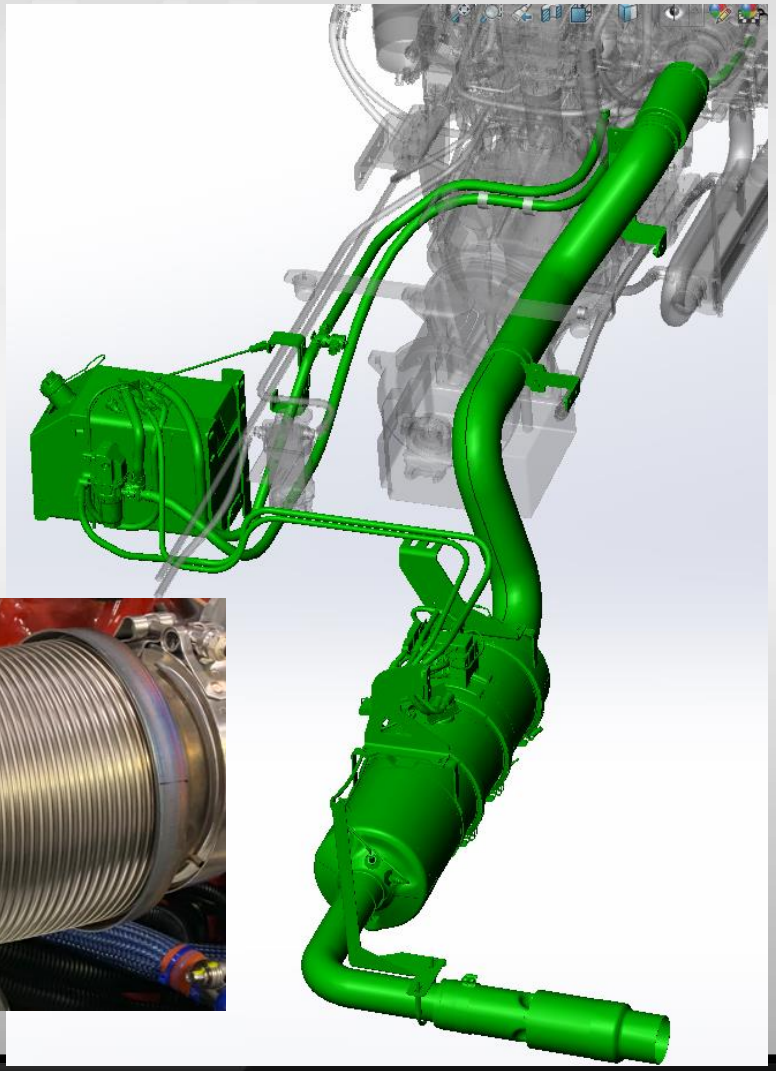
<u>Sutphen/Cummins exhaust system:</u>

- Accordion style bellows for better vibration isolation and flex.
- Exhaust from turbo to tip is stainless construction.



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The Sutphen Chassis Powertrain

Sutphen exhaust insulation:

- Pipe insulation has integrated fasteners and can be easily removed for access.
- Silicone Coated Fiberglass Fabric Outer face w/ 1” Multilayer Vitreous Silicate Fiber Mat insulation and a knitted Stainless Steel Wire Mesh inner.
- Exhaust is well insulated w/ temp drop from turbo to aftertreatment canister of approx 3 deg F - well under Cummins max guideline and providing better powertrain performance.

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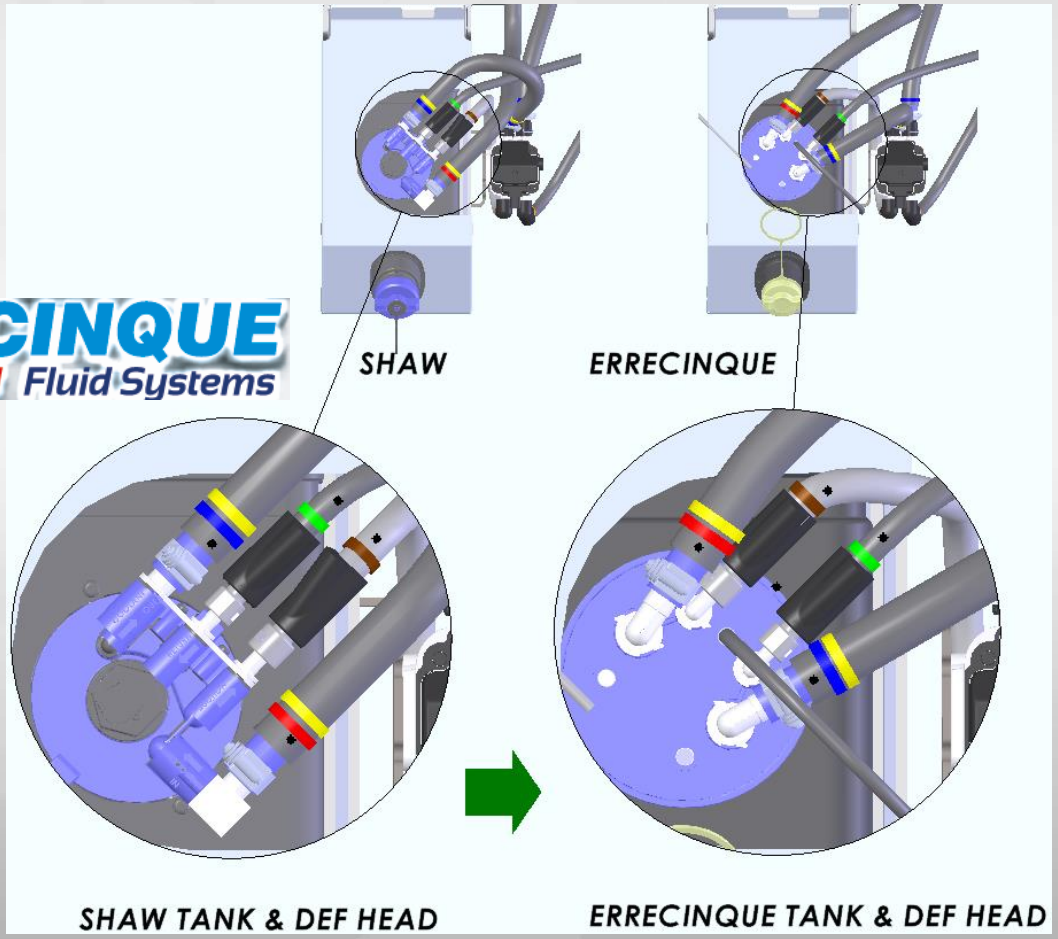
Sutphen DEF system:

- Switched supplier from ERRECINQUE Fluid Systems Errecinque (high quality from Italy). Same footprint and backwards compatible w/ most Shaw systems. If changing from Shaw to Errecinque must change head & tank. Multi-sourced for future proof supply chain insurance.



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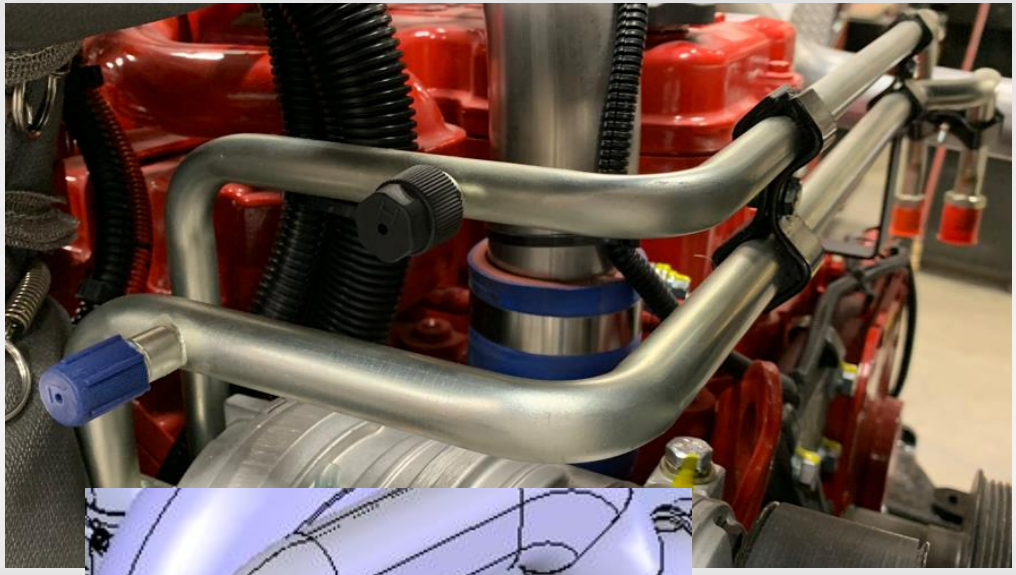
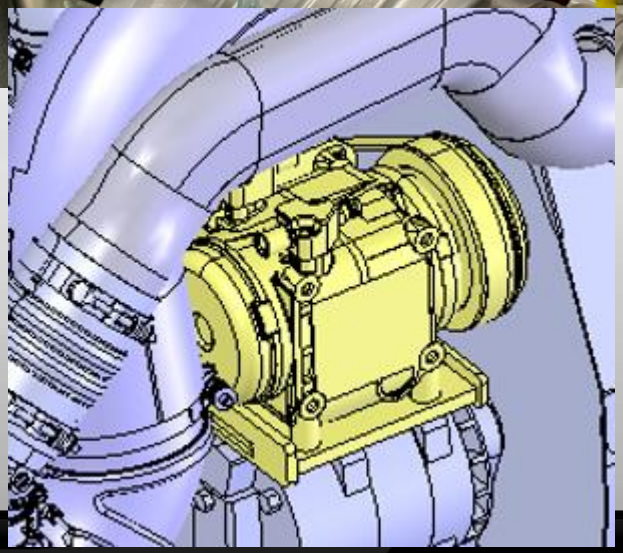
<u>Sutphen AC systems:</u>

- Stainless steel tube manifolds w/ easily accessible refill/charge ports. Compressors can be multi-sourced for future proof supply chain insurance.
- TM31 now available on X15's. therefore TM21 & TM31 compressors available on all engines.





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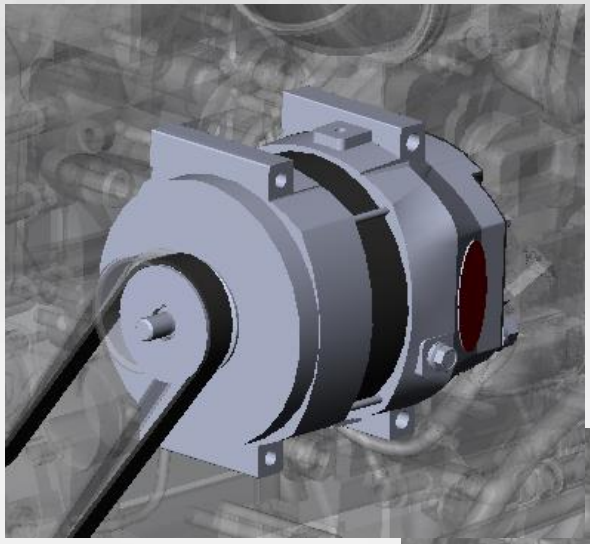
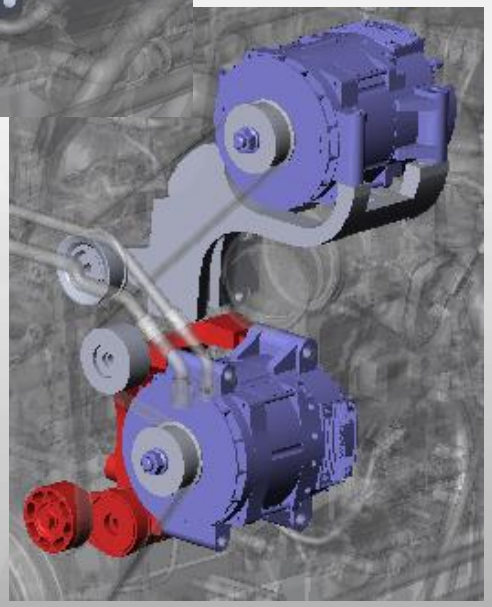
Sutphen Alternator systems:

- Large CE Niehoff 430A available on X12 & X15 engines (requires different bracketry).
- Standard size up to 415A CE Niehoff & Delco all engines.
- All Aerial SPH's come w/ 415A.
- X12 w/ Dual 270A alts special availability – consult w/ tech sales rep.

We recommend 320A min size alternator on all trucks.





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Allison Transmission options:

- EVS3000, paired with L9 engine
- EVS4000, paired with either the X12 or X15 engine
- EVS4500, optional for either the X12 or X15

We recommend 6 speed programmed transmission on all trucks.

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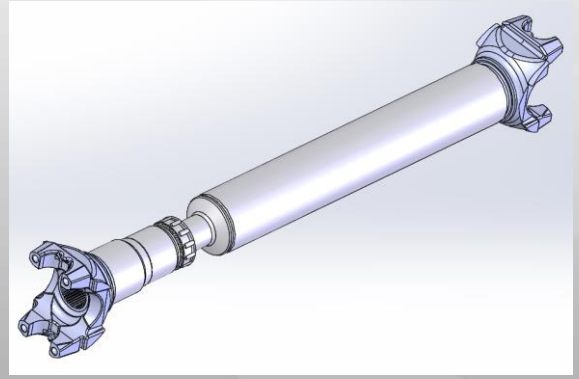
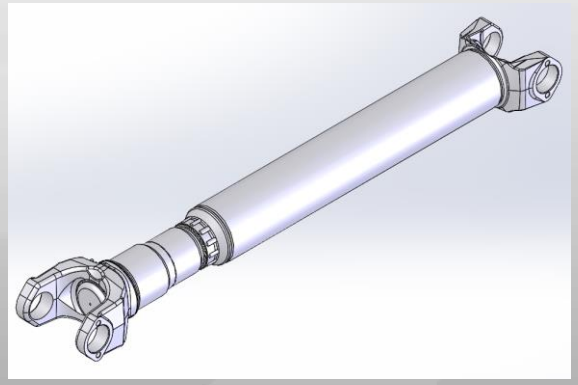
Driveshafts:

- Spicer 1710 Series, paired with L9 engine
- Spicer 1810 Series, paired with the X12 engine
- Spicer SPL250 Series, paired with the X15 engine

- Half round yokes standard, full round yokes optional for enhanced performance





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Single rear axles:

- 24K/27K rear axles:
  - Standard on Pumpers
  - Available from Meritor or Dana
- 31K rear axles:
  - Optional for Pumpers
  - Standard on Single Axle/Mid-Mount Aerials
  - Available from Meritor or Dana
- 35K rear axles:
  - Optional for Pumpers or Single Axle/Mid-Mount Aerials
  - Standard on Single Axle/Rear-Mount Aerials
  - Available from Dana

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Tandem rear axles:

- 40K/44K rear axles:
  - Standard on Tankers
  - Available from Meritor
- 48K rear axles:
  - Standard on SP100 & SL100 Tandem Axle Aerials
  - Optional for Tankers
  - Available from Meritor
- 52K rear axles:
  - Standard on SPH100 Tandem Axle Aerials
  - Optional for Tankers, SP100/SL100 Tandem Axle Aerials
  - Available from Meritor
- 58K Rear axles:
  - Standard on Industrial Tandem Axle Aerials
  - Available from Meritor

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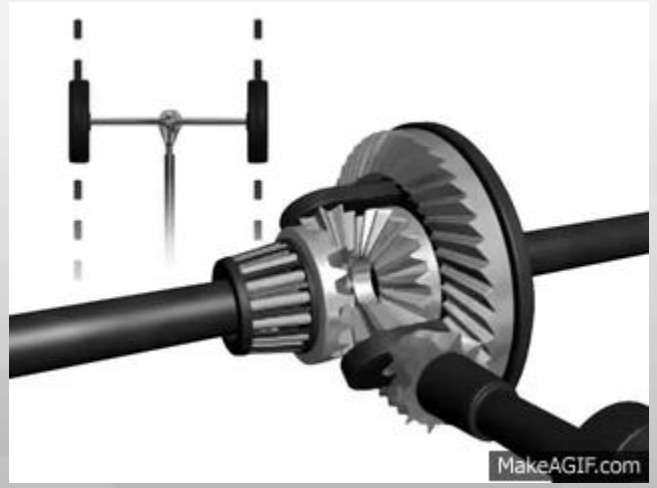
Truck performance & rear axle gear ratios

Truck performance depends on several conditions. Variables include but are not limited to vehicle weight & height, road grade, engine, axle ratio, transmission programming, tire size/model, top desired speed, etc.



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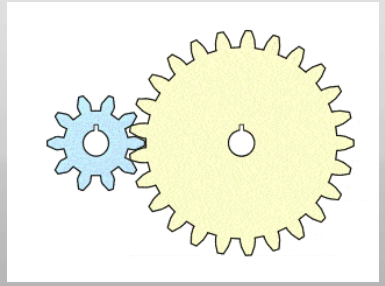
The higher the axle ratio number the faster the truck will accelerate from a stopped position, however, higher speed acceleration may be decreased

A higher axle ratio will provide better acceleration performance but poorer gas mileage

A higher axle ratio would be recommended for trucks performing in mostly hill or mountain terrains



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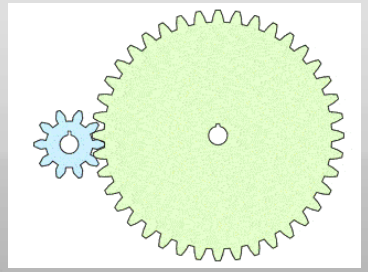
The lower the axle ratio number the slower the truck will accelerate from a stopped position, but higher speed acceleration will be increased, resulting in better cruising

A lower axle ratio will provide less acceleration performance but better gas mileage

A lower axle ratio would be recommended for trucks performing in mostly flat or highway terrains



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6th speed programmed transmission is recommended for all trucks

- Changes shift points to maximize acceleration in each gear vs. 5 speed programmed transmissions
- Allows higher top speeds to be reached vs. 5 programmed transmissions

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Refer to the Chassis Catalog for available axle ratios & more info

Your Project Coordinator & Sutphen Engineering can review on truck-by-truck basis and recommend best options for optimal performance based on the conditions mentioned and history of previous trucks to determine best gear ratio for your truck

SUTPHEN

Family Owned and Operated since 1890!

Date: 10/25/2022
Sutphen Chassis Engineering