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PTO Troubleshooting



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PTO Troubleshooting

KOZMAKSAN PTO is designed and built to meet the rugged demands of the Mobile Equipment Industry.



On the Vehicle or On the Work Bench

WARNING!



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PTO Troubleshooting

On the Vehicle

- Performance
- Noise
- Leaks

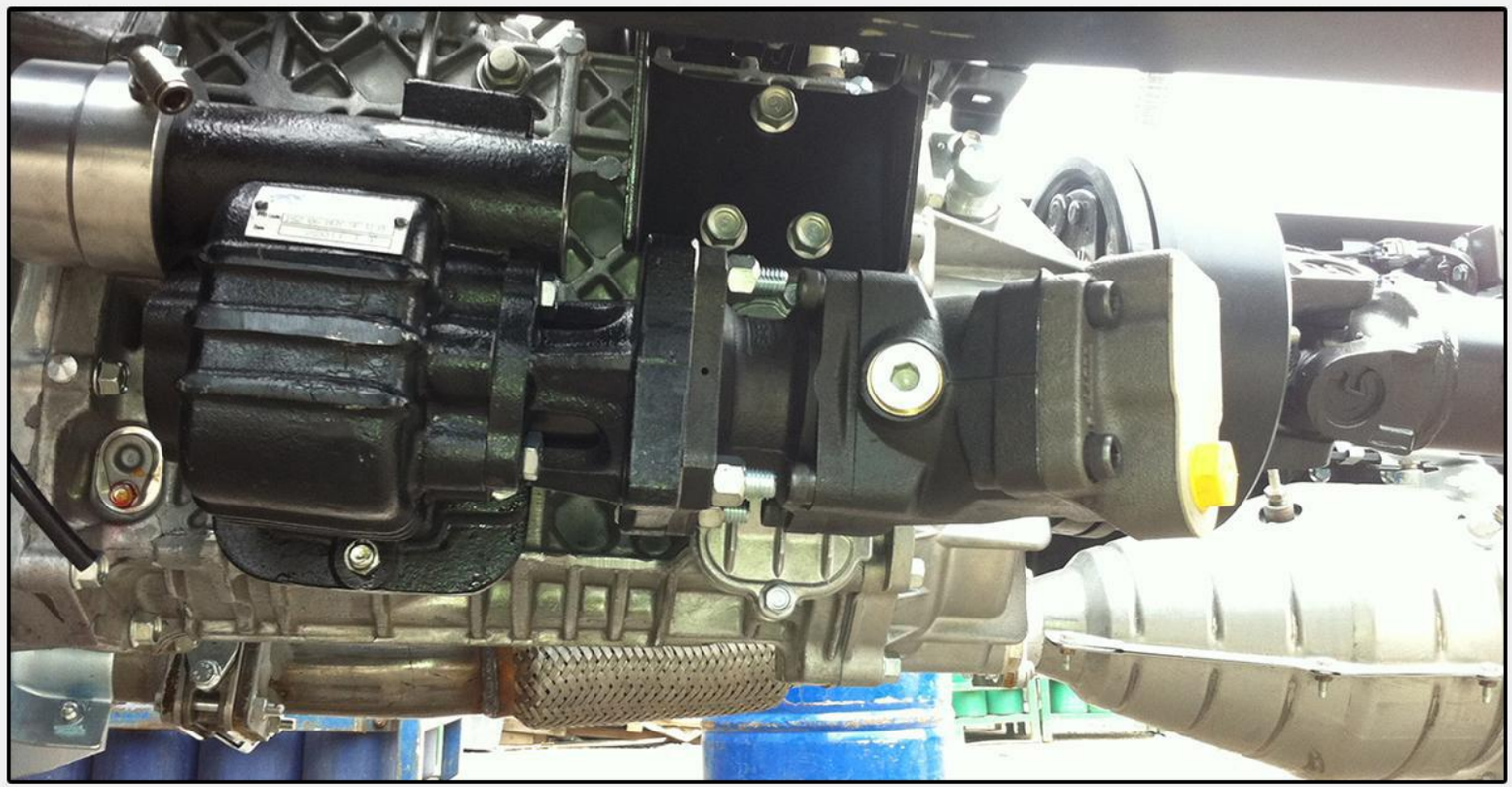


PTO Troubleshooting

Performance

The first place to look when troubleshooting a PTO failure is in the application itself.

Repeated or premature failure may be a sign of an incorrect application.



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PTO Troubleshooting

If the PTO was correctly specified and then failed prematurely, there are two likely causes:

1. Improper installation and/or operator misuse.
2. An improperly installed PTO can normally be identified immediately by the sound (Noise) it makes.

- It will “Whine” ,“Clatter”, “Click” or “Grind”.
- Sometimes, the vehicle itself may contribute enough noise to mask the sound of the PTO and one may not notice the problem.

If a problem is allowed to continue, then damage to the PTO will result.

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PTO Troubleshooting

Noise Types

- Whine
- Clatter
- Clicking
- Grinding



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Noise Types

- Whine
- Clatter



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Noise Types

- Clicking
- Grinding



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PTO Troubleshooting

Leaks

Possible Locations

- Stud Threads
- Seals



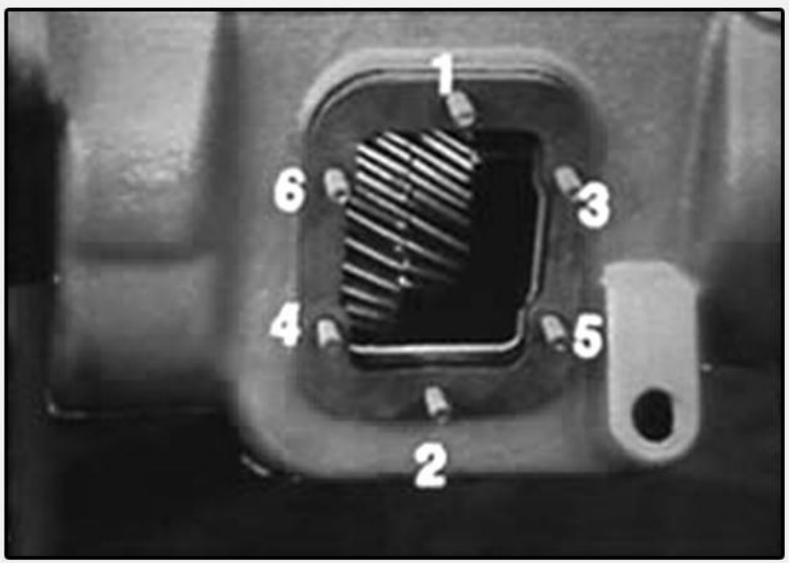
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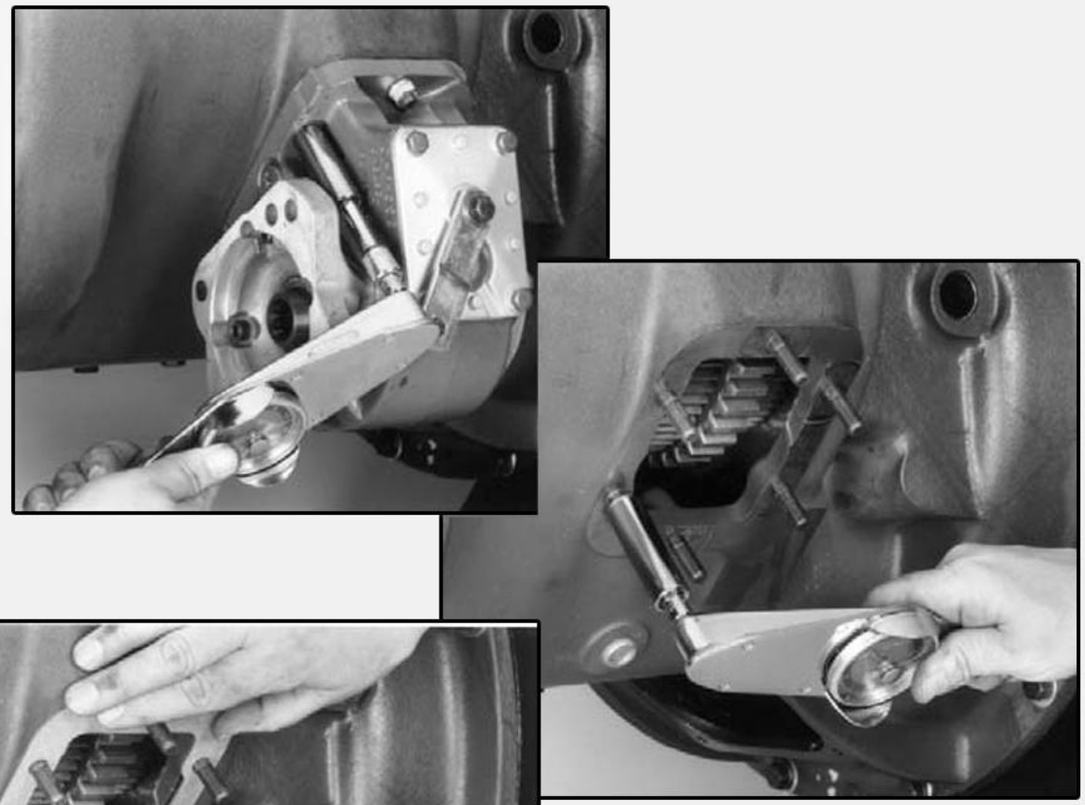
PTO Troubleshooting

Leaks

Root Cause of the Leakage

- Improper Torque of Fasteners
- Improper Stud Installation
- Gasket Installation







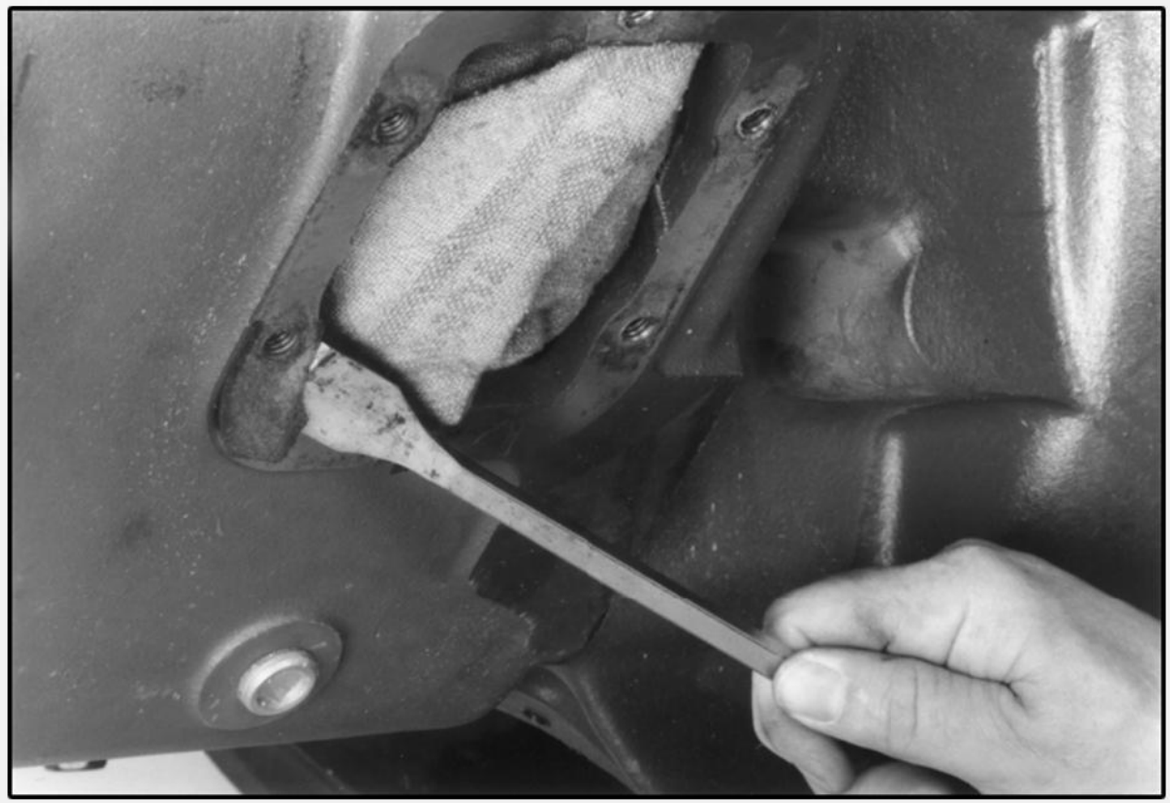
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PTO Troubleshooting

Leaks

Root Cause of the Leakage

- Transmission Preparation
- Worn Seals



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PTO Troubleshooting

Performance

Symptoms & Causes

- Hydraulic System
- PTO Operation
  - Erratic Operation
  - Hard Shifting
  - Jumping out of Gear



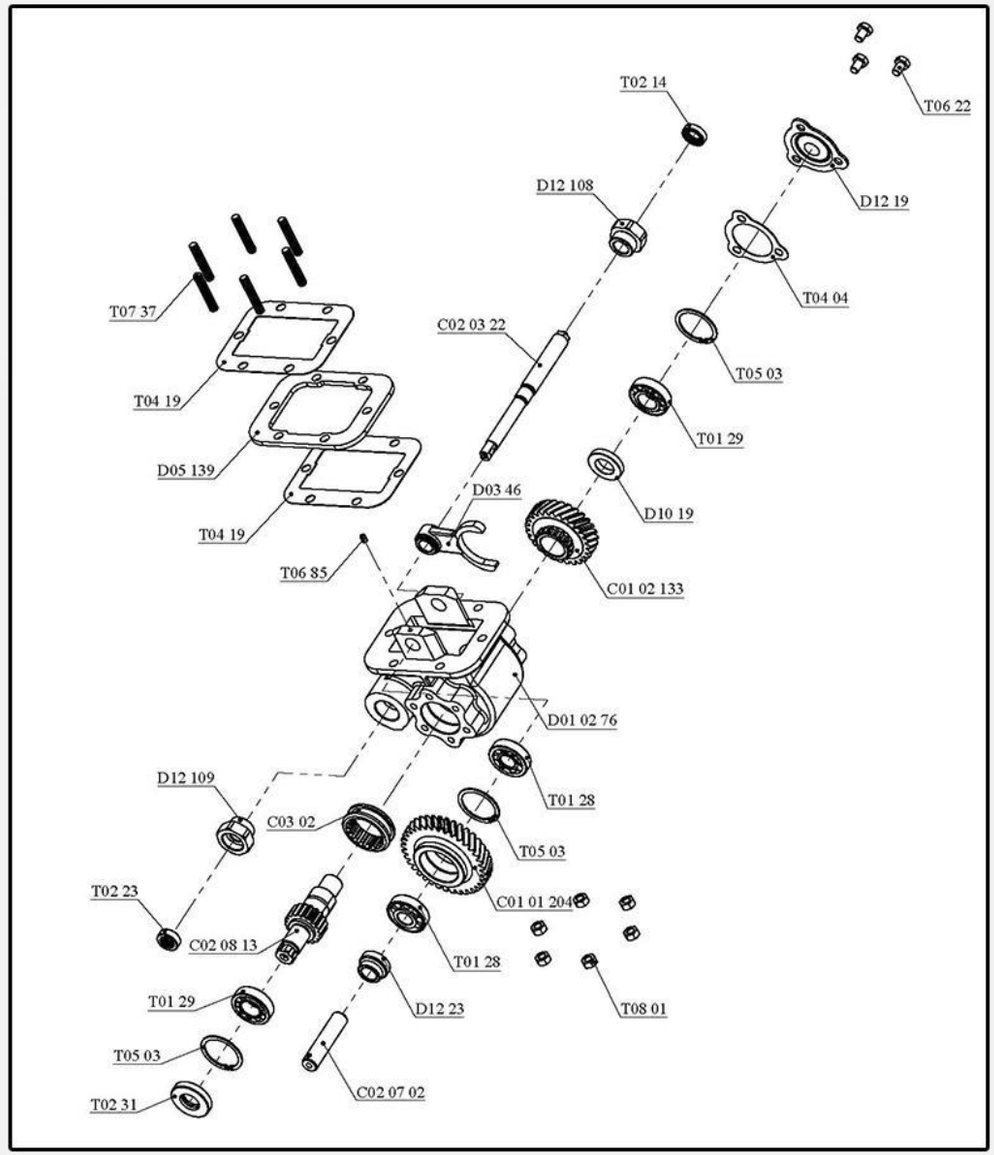
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PTO Troubleshooting

On the Work Bench

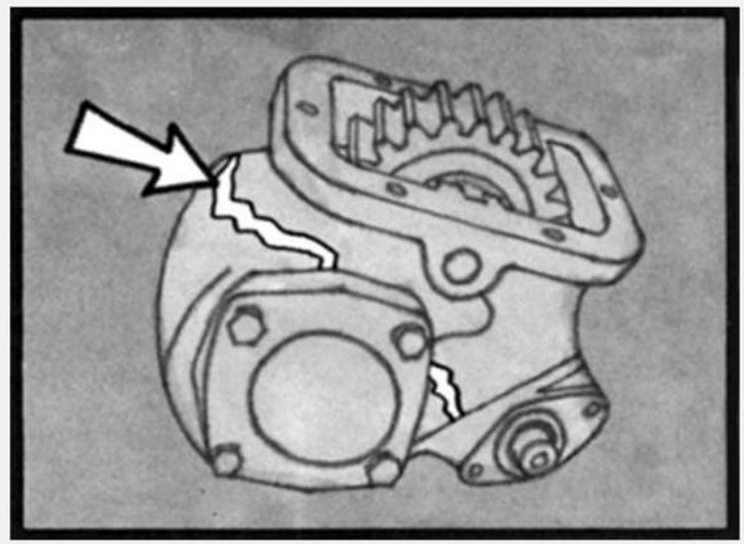
Items to be Examined

- Housing
- Gears
- Shafts
- Bearings
- Shifters
- Clutches



Housing Damage

One of the most serious problems a PTO can suffer is a cracked case. This condition can lead to oil loss and eventual transmission failure.

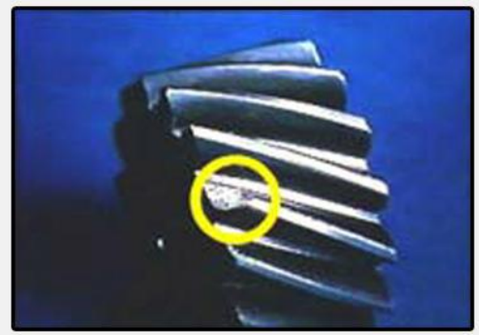


Some causes are:

- Improper installation
- Poorly torqued bolts
- Unsupported direct mount pump
- Foreign objects meshing between the gear teeth
- Severe shock load
- Hitting an obstacle in the road.

PTO Troubleshooting

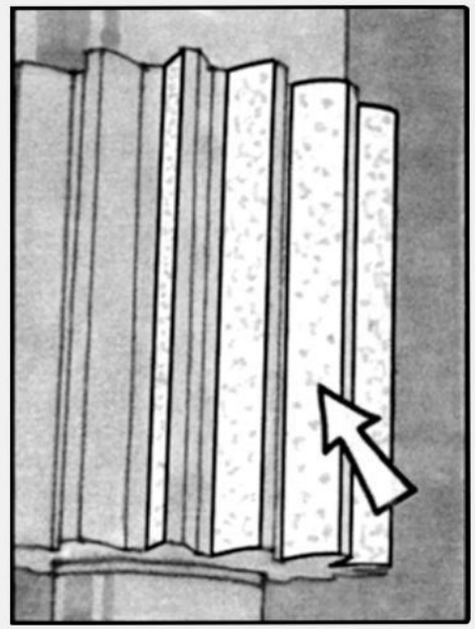
Gear Damage

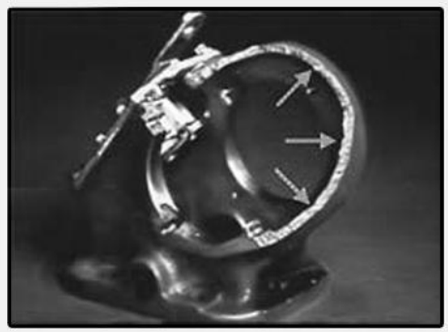


- Tooth
- Spline
- The first parts to inspect should be the gears.

  Check the surface of the gear teeth for signs of pitting.
- Once pitting of the gear surfaces has begun,

  there is nothing that can stop it.





PTO Troubleshooting

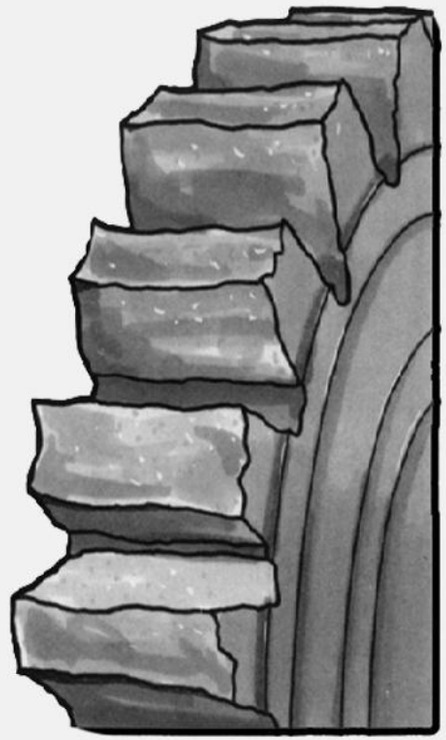
Gear Damage

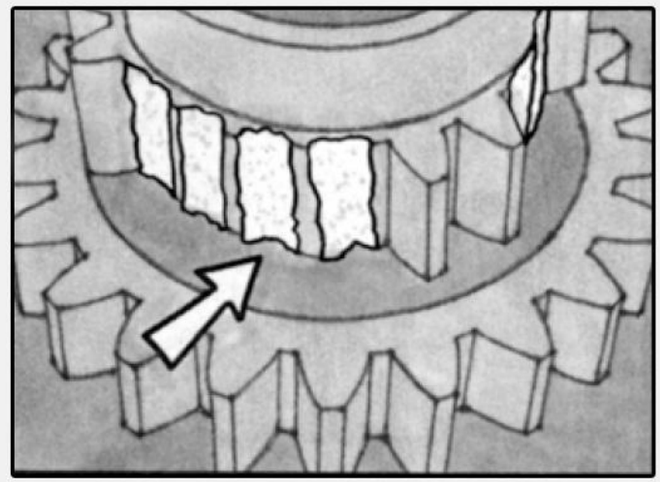
Another possible problem during vehicle operation is “shock load”.

- Deep Mesh Pattern Caused by Improper Backlash Adjustment.

Worn gears can easily be affected by “shock load”.

If the worn gears are not replaced, they can eventually lead to broken gear teeth.

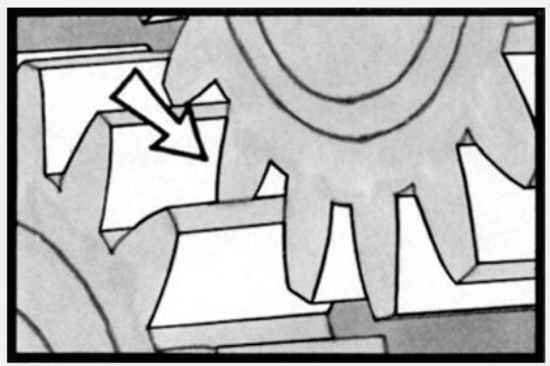


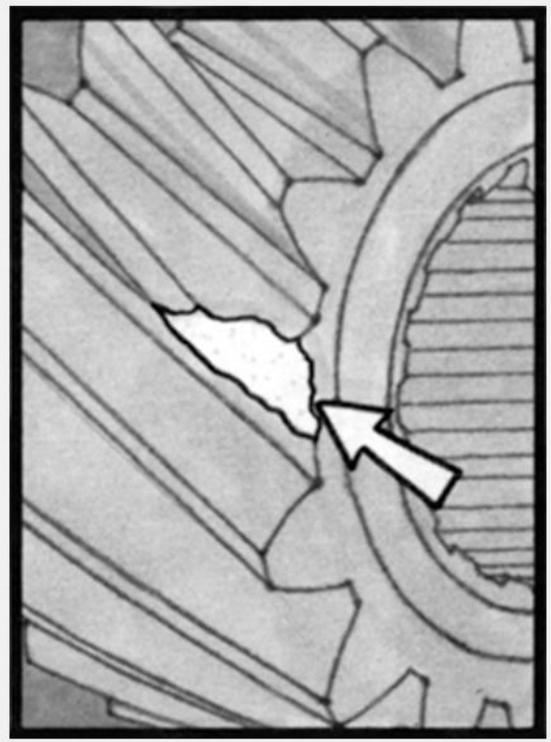


Gear Damage

Sometimes a gear will chip a tooth because of mishandling or improper shifting.

Undershifting allows incomplete gear tooth contact with the driver gear. This means only part of the tooth width is transmitting the torque and RPM during PTO operation.





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PTO Troubleshooting

Shafts

Damage

- Misapplication
  - Overloads
- Shock Loads
- Seals
- Bearing

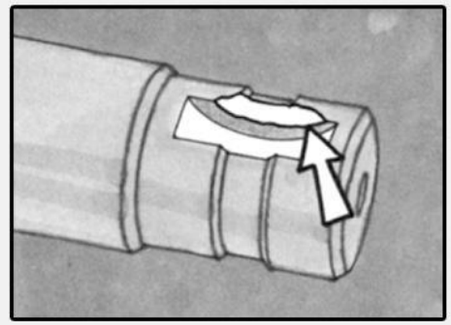
PTO shafts are also vulnerable to operating abuse.

- Torsional overload
- Bending fatigue failure

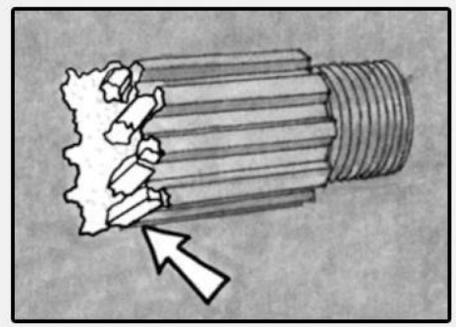
When inspecting a PTO output shaft, always inspect the keyway.







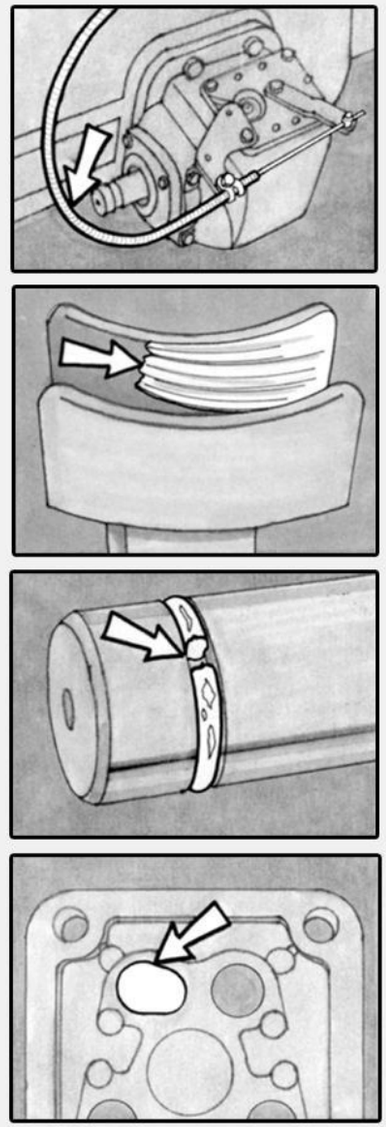




PTO Troubleshooting

Shifting Problems

- PTO is hard to shift.
- Most shifting complaints are caused by improper shifting procedure or incorrect linkage installation.
- Shifting problems can also be caused by a worn or elongated shifter poppet hole.
- Seals and O-Rings may cause special problems in PTO operations.

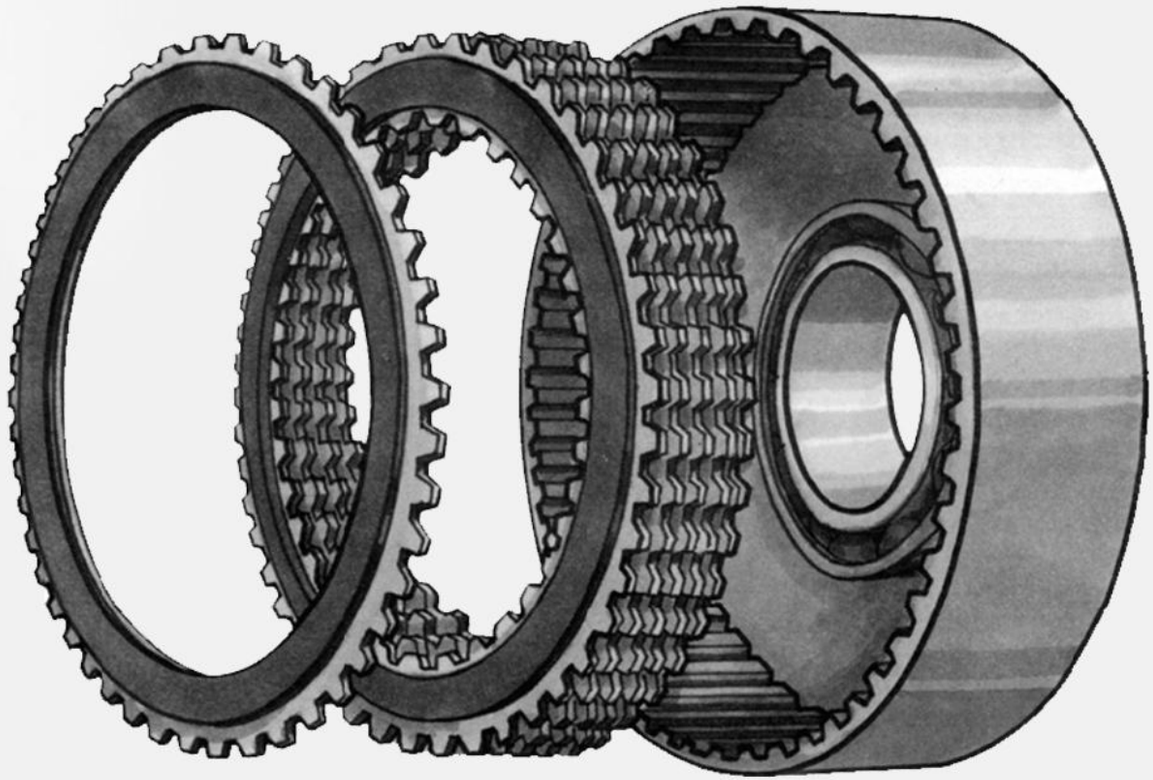


Remember, a lever-operated shift linkage should not be connected to a wire shift cover. The mechanical advantage of the lever is often too great for the wire shift cover and could severely damage it. Also inversely, don't use a cable with a lever shift cover. The cable isn't capable of transmitting the force necessary to shift a lever mechanism.

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PTO Troubleshooting

Remember, when troubleshooting any clutch-operated PTO carefully inspect all components for wear or damage. Burnt clutch plates, welded clutch pack, or a burnt driving hub are three easily identifiable conditions that lend themselves to failure analysis.



Burnt Clutch Plates?

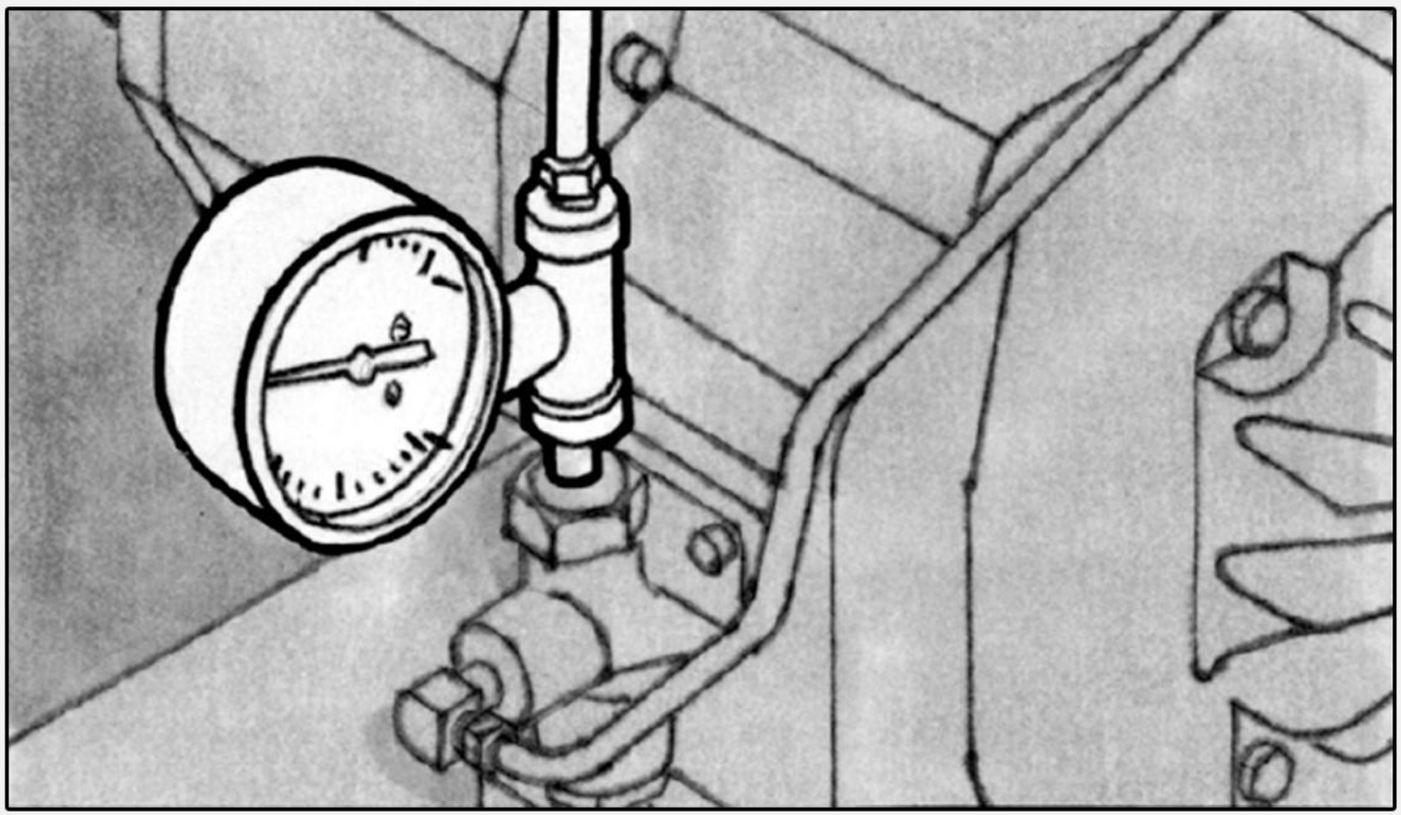
Welded Clutch Pack?

Burnt Driving Hub?

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A sure sign of potential trouble with a clutch operated PTO is erratic operation.



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PTO Troubleshooting

The 3 Most Common Complaints

Noise

Whine or Pitched Squeal
- Gears too tight
- Bearings
- Hydraulic Noise

Rattle
- Gears too loose
- Torsional Vibrations

Engagement Problems

Powershift PTOs
- Blocked Hoses or Fittings
- Bad Connections
- Solenoid

Mechanical PTOs
- Low Air Pressure
- Improper Cable Installation
- Back Lash too tight

Disengagement Problems

Powershift PTOs
- Blocked Hoses or Fittings
- Frozen Clutch Pack
- Solenoid

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PTO Troubleshooting

- KOZMAKSAN PTOs are designed and built to match a vehicle's transmission.
- The gears of a PTO are of the same quality as the transmission's gears.
- Successful operation depends on proper specification and installation.
- Always consult your KOZMAKSAN Applications Guide and Installation Manual when working with KOZMAKSAN PTOs.
  Doing this will prevent serious PTO problems.

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