Rubber Track Undercarriage

For Cat® Multi Terrain Loaders

Understanding Your:

- Undercarriage Design and Function
- Factors Affecting Undercarriage Wear
- Operating for Minimal Wear and Best Results
- Track Tension and Adjustments
- Undercarriage Clean-Out
- Evaluation of Worn Components
- Working Conditions – Key Owning & Operating (O&O) Cost Factors

CATERPILLAR®

Contents

Introduction

Caterpillar® offers three similar types of compact loaders—the skid steer loader, the multi terrain loader and the compact track loader—each with their own ideal operator techniques, maintenance and wear characteristics. This guide is intended to help operators of Cat® multi terrain loaders (MTLs) minimize owning and operating costs while maximizing productivity and up-time.

What sets Cat MTLs apart from skid steer loaders and other rubber-track loaders is its unique undercarriage technology. This undercarriage technology gives Cat MTLs superior traction and flotation to enable productive work in ground conditions that can prevent other equipment from working at all. Low ground pressure and low-impact rubber tracks also allow multi terrain loaders to tread lightly on fragile, sensitive ground surfaces, such as turf. Other machines on the same job would damage the surface, requiring expensive and time-consuming repair work.

The Cat MTL undercarriage is designed to fit the needs of customers operating in a wide range of environments that require unmatched suspension, traction, flotation, speed, productivity and versatility.

This guide is intended to help you get maximum value out of your Cat MTL by showing how the undercarriage works, how it wears and how you can minimize wear and operating costs whenever possible. Although wear cannot be avoided, following proper operation and maintenance guidelines, you can maximize the life, performance and value of your Cat MTL.

Undercarriage Design and Function

Rubber track undercarriages on Cat MTLs do more than provide traction effort. Their unique design also contributes to high flotation, low ground pressure, machine stability and smooth ride.

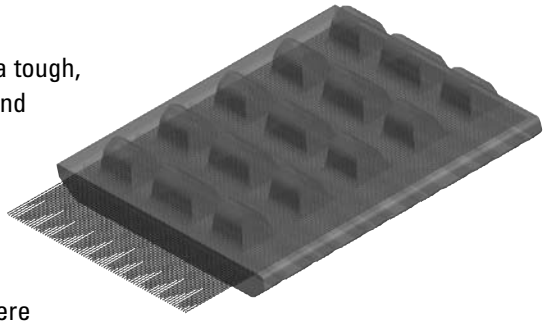
The Rubber Track

The tracks used on Cat MTLs are unique since they do not use steel. This track is part of a patented system and is all-rubber with embedded high-tensile cords that run the length of the track. The cords are coiled like springs, for the ability to stretch when the suspension articulates, and to help prevent track elongation.

Treads are molded on the outside of the track for added traction. Edges of the track are beveled to help prevent damage when turning on sensitive surfaces, like turf.

Track lugs are molded, not glued, to the inside of the track. Lugs serve two purposes. They are part of the drive system that turns the track. They also help guide the track.

The tension at which the track is maintained is important, however the system does not depend on high tension to drive the track like on friction-drive track systems. Some slack in the track is normal and required. Proper track tension will increase undercarriage performance and extend component life. The Operation and Maintenance Manual provided with your machine will specify the proper track tension and tensioning procedure.



The Cat MTL track is a tough, durable component, and proper use can dramatically increase wear life and reduce owning and operating costs. Working in severe applications such as demolition, quarry, or scrap, where the undercarriage is exposed to sharp, ragged edges can significantly impact track and undercarriage component life.

Drive System

Cat MTLs use an internal positive drive to transfer tractive effort from the power train to the rubber track. Drive motors independently drive sprockets on the left and right side undercarriage. The sprocket engages the track lugs inside of the rubber track. Friction and wear between sprockets and track lugs are minimized through free-turning steel sleeves on sprocket rollers. The sleeves are designed to wear and should be periodically inspected. Eventually, the sleeves will wear to a point that they require replacement. Refer to the Operation and Maintenance Manual for more information on inspection and replacement.

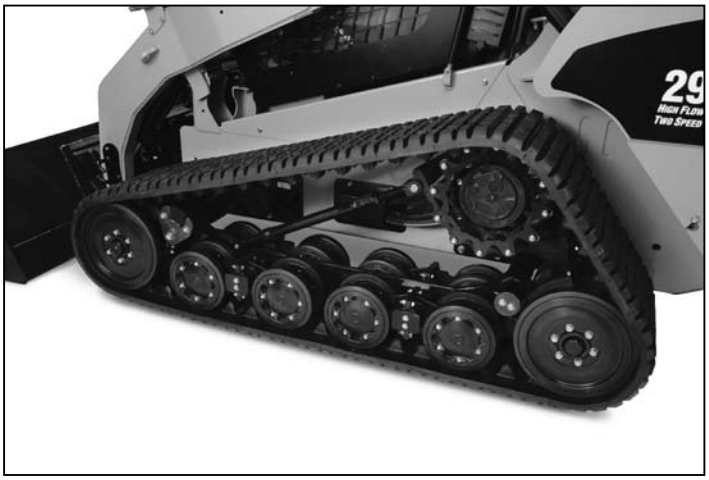
Roller Wheels

Roller wheels mounted to the undercarriage frame transfer machine weight to the track. The wheels, acting as contact points, help distribute machine weight evenly across the ground through the track. As a comparison, a skid steer loader concentrates machine weight on the four points where tires contact the ground. Roller wheels also help guide the track. Track lugs travel between or outside the roller wheels and are kept in alignment when the machine turns or works on slopes.

Roller wheels are constructed of a high-density plastic core with rubber bonded to the circumference. The bonded rubber provides a cushioned surface to minimize track wear where the rollers contact the rubber track. The rubber acts as a cushion to help resist track damage when rocks or debris are caught between the roller and track. This prevents pushing the debris into the belt and damaging it.

Roller wheels are a wear item and need to be replaced periodically. Operation in abrasive conditions, as well as improper operating technique, can cause the rollers to wear faster. Because of the open design of the undercarriage, replacement of a worn wheel can be easily accomplished.

The Cat MTL undercarriage roller wheel hubs incorporate heavy-duty metal face seals which are sealed for life. This design helps to avoid contamination, leaks, and provides a long service life for the bearings. This proven technology is seen in other pieces of Caterpillar equipment, including larger Track-Type Tractors.



Suspension

Undercarriages on Cat MTLs feature a suspension system to improve traction and stability for better operator comfort, bucket load retention and machine durability, even at increased travel speeds. The undercarriage is mounted to the machine frame using torsion axles, which allow movement in an upward and/or downward direction. This not only helps absorb shocks when riding over objects, but it also helps keep the track flat on the ground for maximum traction.

Some Cat MTLs feature a dual level suspension system. This undercarriage system contains oscillating roller wheel assemblies, and is mounted to the undercarriage frame using a torsion axle design. The wheel assemblies will independently pivot when a single wheel encounters an obstruction. This provides more track on the ground, better load retention, improved operator comfort and one of the smoothest rides in the industry.

Factors Affecting Undercarriage Wear

At any given time, several factors affect how fast a Cat MTL undercarriage is wearing. The key to maximizing productivity and service life of undercarriage components is to recognize these factors and make adjustments whenever possible to minimize their effect.

Application

The job application of a machine has a direct influence on undercarriage life. Common applications include excavation (digging), load and carry, trenching, dozing and grading.

The amount of torque and horsepower required by an application has a direct impact on undercarriage component wear. Working any piece of equipment to its fullest potential will cause maximum wear to certain components. In general, tough applications such as excavation and dozing maximize the torque and horsepower being transferred through the sprocket to the tracks and cause increased wear. Easier and less demanding jobs, including trenching and finish grading, require less torque and horsepower and cause minimal wear.

Underfoot Conditions

The materials you work in can have as much or more impact on the service life of Cat MTL undercarriage components than some applications. In general, the more abrasive the material, the faster components wear. As an example, rocky, jagged material or construction debris will cause the most wear on an undercarriage. The least wear will occur when working on soft, loamy soil or non-abrasive surfaces, such as turf and finished landscaping.

Because they have exceptional flotation, traction and versatility, MTLs will work on virtually any material, including scrap or demolition debris, however, harsh conditions may cause significant premature wear on the undercarriage, increasing owning and operating costs. Consider the cost of replacing undercarriage components when working on any abrasive materials.

Operating Techniques

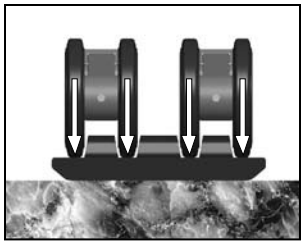
How you operate your Cat MTL can be one of the most influential factors that affect undercarriage wear and operating costs.

Aggressive operation may help get the job done faster, but it can also increase the rate of wear and overall operating costs. For example, you can make a quick change in travel direction by counter-rotating, but by doing so you might cause unnecessary wear to tracks and undercarriage components. Turning without counter-rotating may take a second longer, but can significantly extend the service life of undercarriage components.

Operating on slopes also causes wear. Adjust operating techniques when working on slopes to minimize wear. For more information, refer to the “Operating for Minimal Wear and Best Results” portion of this document.

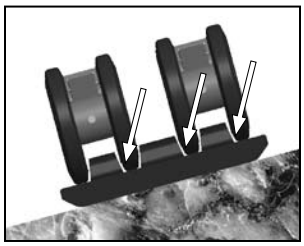
The terrain type—hilly, bumpy or flat—is another wear factor to consider. Working a multi terrain loader on a level surface can cause the least undercarriage wear, whereas working on rugged, heavily sloped terrain can cause components to wear faster.

Cat MTLs are designed to operate continuously on slopes no greater than 3-to-1. A 3-to-1 slope is defined as having one foot of rise for every three feet of run, or about 18 degrees. Machine stability and engine life are adversely affected if operated on slopes greater than 3-to-1.



1

On a flat surface (Illus. 1), machine weight is spread through the roller wheels to the full ground contact area of the track. Minimal machine weight is applied to the track lugs. However, on slopes (Illus. 2), machine weight will shift, and the roller wheels increase contact and pressure to the guiding surface of the track lugs. Uneven or excessive wear to the edge of track lugs is usually attributable to operating on slopes, and is normal.



2

Maintenance Practices

The Cat MTLs undercarriage is not a high-maintenance item, however following some simple preventive maintenance procedures helps you maximize service life and the value of the undercarriage components.

A properly adjusted track not only maximizes the service life of the track, but also maximizes machine performance. Loose or overly tight tracks reduce service life and machine performance. See the following section on "Track Tension and Adjustments" for more information.

Cleanliness of the machine's undercarriage is also critical. Much of the component wear is caused by material that has been ingested and retained in the undercarriage. You can avoid some unnecessary wear by keeping the undercarriage clean and free of debris. See the following section on "Undercarriage Clean-Out" for additional information.

Turnbuckle Maintenance

Cat MTLs use a turnbuckle arrangement to adjust track tension. It is recommended to keep the turnbuckle lubricated with a good, penetrating oil spray. This helps eliminate rusting and seizing of the turnbuckle and makes track adjustments easier when required. Simply spray the threads and nut on the turnbuckle with a suitable lubricant when needed.

Torsion Axle Lubrication

Cat MTLs use front and rear torsion axles for suspension that require daily greasing. The grease points are easily accessible from the ground. Regular greasing of the torsion axles is important to insure the suspension system will continue to provide a comfortable ride and improved load retention while reducing shock and vibration throughout the machine. The Operation and Maintenance Manual will specify the location and procedure for lubrication.

Drive Sprocket Sleeves

All Cat MTLs use an internal positive drive system that allows them to travel at high speeds with minimal friction. The drive sprocket contains a set of rollers that mesh with the track drive lugs. Steel outer roller sleeves rotate freely to minimize friction between rollers and track lugs. These outer sleeves wear over time and occasionally need replacement. Operating in sandy or gritty soils will cause these sleeves to wear more quickly than when operated in less abrasive materials.

Check the condition of all sprocket roller sleeves during your daily machine inspection, making sure they rotate freely, and are within the wear limits described in the Operation and Maintenance Manual. Replace any outer roller sleeves that are below the minimum thickness recommendation.

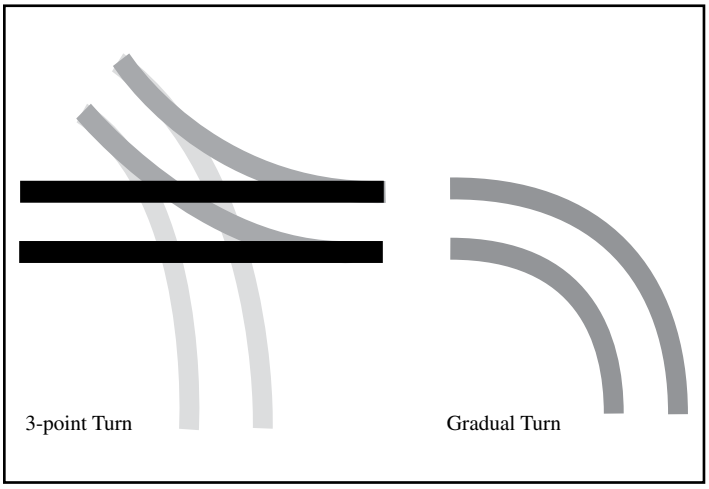
Roller sleeves that don't meet the minimum thickness requirements or don't turn freely will increase friction and cause unnecessary wear to track drive lugs.

Operating for Minimal Wear and Best Results

Cat MTLs are built to withstand the rigors of quick, aggressive operation. Operators familiar with similar equipment, such as skid steer loaders, will quickly maximize a multi terrain loader's productivity by taking advantage of its additional traction, flotation and stability. For operators making the transition from a skid steer loader to a multi terrain loader, it's important to remember that some adjustments in operating technique will improve results.

Turning Techniques

Anybody with skid steer loader experience knows counter-rotating, as a regular means of turning, is the quickest way to change direction. It is also the quickest way to wear out tires. A skid steer can readily counter-rotate because of the relative ease that tires can lose traction, skid and spin. Counter-rotating a multi terrain loader, with significantly more tread on the ground and traction, is more difficult. Counter-rotating a multi terrain loader could also lead to unnecessary wear to the tracks and other components.



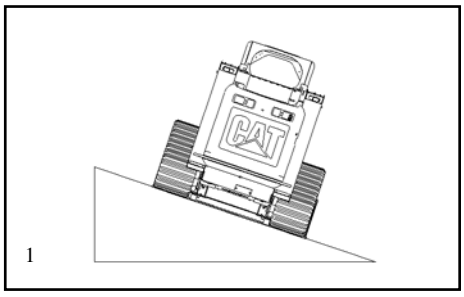
To help maximize the life of a multi terrain loader undercarriage, counter rotations should be used only when required, such as in very confined areas. Instead, use more gradual turns while slowly moving forward or in reverse.

Sharp turns on abrasive material, like jagged rock, will cause premature wear to the track and roller wheels. Gradual turns will minimize cuts and tears and help maximize undercarriage component life.

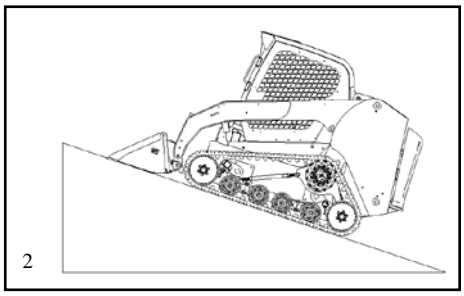
A multi terrain loader is one of the few pieces of equipment that can work over sensitive surfaces, like turf and landscaping, causing minimal damage–particularly when driving straight, forward or reverse. When turning on soft, sensitive surfaces, make gradual turns. Sharp turns and counter-rotations can cause scuffing and unwanted material deposits.

Working on Slopes

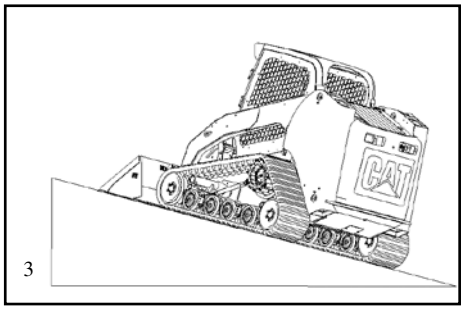
With significantly more stability than similar sized wheeled machines, a multi-terrain loader is ideal for use on slopes. All Cat MTLs are rated for work on slopes up to 3-to-1. As mentioned earlier, working across slopes (Illus. 1) can cause faster wear to undercarriage components. You can reduce unnecessary side-loading wear by operating up and down a slope, rather than across, whenever possible.



When working up and down a slope (Illus. 2), always keep the heaviest end of the machine uphill. You should also avoid unusually heavy loads and always keep loads as low as possible. Consult the Operation and Maintenance Manual for proper machine operation on slopes.



Turning when on a slope is an operation that requires special attention. When turning to go DOWN a slope, first stop the machine. Then slowly turn the machine while backing down the slope (Illus. 3). When turning to go UP a hill, stop the machine, and turn while you slowly back down the slope or until the machine is facing the desired direction of travel. Then carefully proceed forward.



Avoid making direct 90-degree turns when operating on a slope–either on a side hill or straight up and down. Sharp turns on slopes cause unnecessary wear on track lugs and can shove material between the track and roller wheels. In some cases, this could lead to track derailment and track damage.

Working over Transitions

A transition is any place you encounter a change in slope or elevation, such as where a level surface changes to a slope. A curb or ledge can also be considered a transition.

If you must travel over transitions, do so with the machine 90 degrees to the transition. Avoid working along a transition where one of the machine's tracks is not fully supported by the ground. Without the full support of the ground, the track and the roller wheels are subjected to side stress that could lead to track derailment or track damage.

Backdragging

Some skid steer operators like to apply enough down force on the loader to raise the front tires off the ground, maximizing down-pressure on the bucket when backdragging. Using this same technique with a multi terrain loader has the opposite effect – you lose traction, spin the track, and promote premature wear of the track and rear roller wheels.

Keeping the full length of track on the ground provides the most traction and takes advantage of the machine suspension. You can get excellent results and maximize the life of your undercarriage by backdragging with loader arms in the FLOAT position. If more down pressure is needed, the suspension system on an MTL will allow for additional down pressure to be applied without raising the undercarriage off the ground. Add only the pressure required to smooth the surface.

POINTS TO REMEMBER:

- Applications that require higher horsepower and torque will cause faster undercarriage wear.
- Abrasive materials (rock, gravel, debris) accelerate undercarriage wear.
- Operating on rugged, sloped terrain can cause undercarriage components to wear faster than operating on level terrain.
- Aggressive operation, like counter-rotations, increases the rate of undercarriage wear.
- Proper track tension can prevent unnecessary undercarriage wear.
- Keeping the undercarriage clean of mud, rocks and debris reduces wear.

Track Tension and Adjustments

The rubber tracks on a multi terrain loader are critical components of the undercarriage. Proper adjustment of track tension is required for optimum performance and maximum service life. Some slack in the track between the drive sprocket and front roller wheel is normal.

New tracks normally have a break-in period during which the embedded cords settle and reach their maximum length. How much and how fast they settle is dependent on several factors, such as application, machine model and operating techniques. As a general rule, it's recommended to watch a new set of tracks for the first few weeks of use for signs of break-in. This applies to a new machine as well as to new replacement tracks.

The process for checking track involves using a specified amount of weight applied to the midpoint of the track to cause it to deflect. The track tension is determined by measuring the amount of deflection in the track with the weight applied. If needed, the track can be adjusted within the specified range of deflection using the instructions found in the Operation and Maintenance Manual supplied with the machine.

Once new tracks have settled and have been readjusted, they normally do not need constant readjustment. However, periodically check the track tension. Tracks that are run out of the recommended tension specifications cause accelerated wear of undercarriage components. A track that is too loose can allow the track drive lugs to jump over sprocket rollers. This condition, called "ratcheting," can cause accelerated wear or damage to track drive lugs. A track that is too tight also causes accelerated undercarriage wear. It's important to note that over-tensioning tracks (too tight) is not a solution for track derailments that result from improper operating techniques. Consult the Operation and Maintenance Manual for proper track tension, inspection and maintenance procedures and intervals.

Undercarriage Clean-Out

The machine's undercarriage is often exposed to mud, gravel, debris and other abrasive materials. Cleaning the undercarriage on a regular basis is recommended. How often the undercarriage needs to be cleaned depends on the material being worked in. A daily cleaning is normally sufficient. Cohesive and abrasive materials, like mud, sand, clay and gravel, should be cleaned out as often as possible, even several times a day, to reduce unnecessary wear to undercarriage components.

Pay particular attention to cleaning the areas around the front and rear roller wheels where material can accumulate. A pressure washer works well if available. If not, use a small shovel or similar tool to dislodge and remove foreign materials from the undercarriage, however, be careful not to damage any of undercarriage components. If working in scrap or debris, remove any loose strands of material, such as wire, that can wrap around roller wheel axles.

When the undercarriage is cleaned can be a factor in how easy or difficult the job becomes. Removing materials like mud at the end of the day is much easier than trying to remove it the next morning, after it has dried.

In cold climates or whenever freezing temperatures are expected between work shifts, it is recommended to run the machine forward and reverse before shutting it down to reduce moisture build-up and help prevent freeze-ups.

Evaluation of Worn Components

Part Replacement

The replacement of worn components has a direct impact on the owning and operating costs of all equipment. Cat MTL undercarriage components are all designed to provide optimum performance and service life. When they have reached the end of their service life, components should immediately be replaced. Failure to replace worn components can lead to accelerated wear or failure of other related components, leading to higher owning and operating costs. Conversely, replacing worn components before the end of their service life, even though they may appear rough and worn, can unnecessarily increase owning and operating costs. It's important to be able to evaluate worn components as either useable or non-useable.

Your Cat Dealer personnel are your best resource for evaluating worn components on all Cat equipment. Whenever possible, have a trained technician advise you when components need replacement.

The following section is provided as a guideline to help you understand the service limits of some undercarriage components. The Operation and Maintenance Manual contains similar but more detailed information.

Rubber Tracks

Because of the wide range of applications, materials and operating techniques possible with a Cat MTL, the service life of tracks may vary. Working in harsh materials can accelerate wear of the tracks, as does working continuously on slopes. In virtually all applications and materials, a set of tracks will develop scuffs, cracks, cuts and missing rubber chunks. This is normal and does not necessarily degrade the performance of the machine. Track lugs also experience wear as the tracks accumulate service hours.

The key criteria to evaluating the serviceability of a track are:

1. A track must be able to maintain proper tension to be useable. A track that is torn or damaged to the extent that it can no longer maintain tension should be replaced.
2. Track lugs should not continually skip over sprocket rollers or ratchet when the track is properly tensioned. If track lugs continually ratchet because they are worn or damaged, the track should be replaced.

In some cases, track lugs wear only on one side as the result of operating continuously on a side slope. In this situation, the life of the track can normally be extended by rotating it with the other track or simply turning it 180 degrees and reinstalling it on the same side.* If lugs are worn completely across the width of the lug, rotating the track will not help.

**180-degree track rotation is not possible on 247B2 and 257B2 models.*

Roller Wheels

As mentioned earlier, the three key functions of undercarriage roller wheels are:

1. Distribute weight of machine from the frame to the track.
2. Guide the track.
3. Provide a cushion between the track, the weight of the machine and any foreign debris that is ingested.

Roller wheels are a wear item and will need to be replaced periodically. However, as long as roller wheels continue to function as described, there is no reason to replace them. Like a rubber track, as wheels accumulate service hours they develop nicks, lose chunks, and can also develop pits and grooves. Keeping the undercarriage free of rocks and debris helps reduce wheel wear, but some wear is inevitable and normal. Most of the time, worn wheels can continue to function as long as they have a minimal amount of rubber surface.

Consult the Operation and Maintenance Manual for proper roller wheel replacement guidelines.

Drive Sprocket Sleeves and Rings

Cat MTL drive sprockets transfer horsepower and torque from the drive train to the track. The sprocket rollers have free rotating roller sleeves to minimize friction as the rollers engage track lugs. The roller sleeves rotate over a stationary inner roller pin. With use, both the outer sleeve and the inner pin will wear. The inner pin will normally wear only on one side since it is stationary. The free-rotating outer sleeve will uniformly lose thickness around its circumference as it wears.

When outer sleeves wear to their minimum thickness (specified in the Operation and Maintenance Manual) they should be replaced. As the outer sleeves are replaced, the inner pins can be rotated 180 degrees to "double" their service life. The next time the outer sleeves require replacement, the inner pins should be replaced, too.

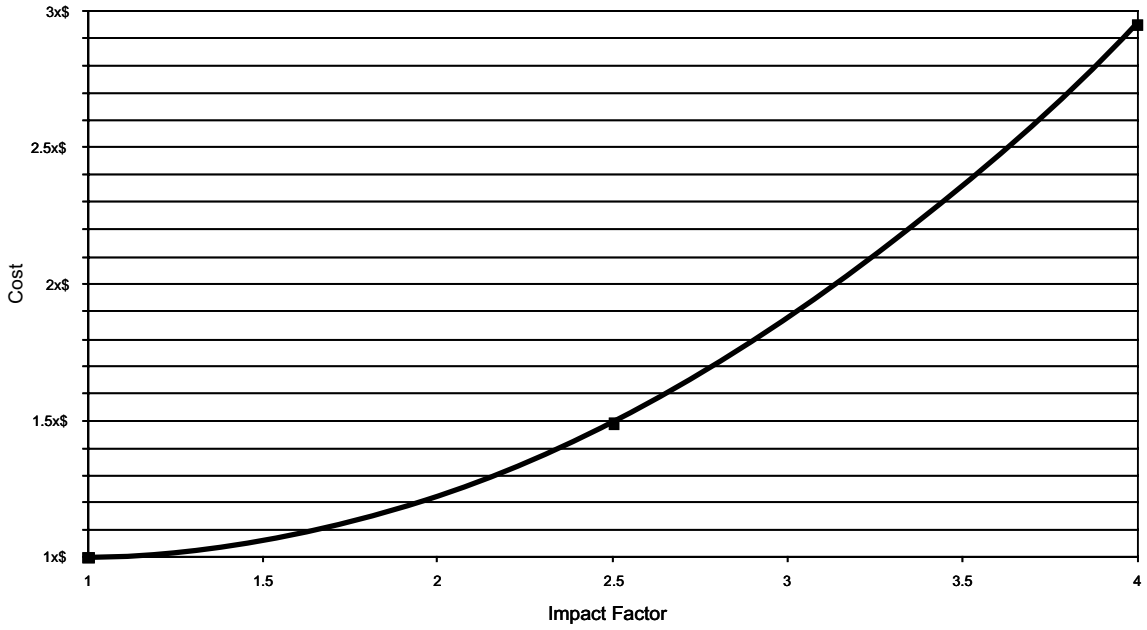
Sprocket rings are also wear items and will wear as the roller sleeves rotate. Consult the Operation and Maintenance Manual for replacement guidelines for the sprocket rings.

Working Conditions – Key Owning & Operating (O&O) Cost Factors

	Application	Operating Techniques	Underfoot Conditions	Maintenance Practices
1 – Excellent	Snow Material Handling Turf/Sod	Trained Operators One Operator 3 Point Turns	Snow Turf Concrete	**Daily** Cleaning, Track Tension Check, Inspection
2 – Good	Digging Grading Trenching	Stop track turns Pivot Turns Up & Down slopes	Dirt Mud Clay	**Weekly** Cleaning, Track Tension Check, Inspection
3 – Poor	Dozing Cold Planning Forestry (Mulching)	Counter-rotating Loaded Turning Spinning Tracks	Milled asphalt Rock 2 " Dirt with 10-20% rock	**Monthly** Cleaning, Track Tension Check, Inspection Loosely follow OMM
4 – Bad	Recycling Demolition	Transition Turning Travel over curbs at speed	Stone _" Dirt with 20-50% rock	**Rare** Cleaning, Track Tension Check, Inspection Do not know OMM

Increasing Impact on O&O

Increasing Impact on O&O



Please select the value that most often represents your practices for each of the categories below (1-4):

Application (1-4) x 0.05 weighting factor ____ Total ____

Operating Techniques (1-4) x 0.25 weighting factor ____ Average (Total/4) ____

Underfoot Conditions (1-4) x 0.35 weighting factor ____

Maintenance Practices (1-4) x 0.35 weighting factor ____

Summary

To help minimize wear of undercarriage components on multi terrain loaders, you should:

- Understand the fundamentals of how an undercarriage works (p. 4)
- Be aware of the factors that affect undercarriage wear (p. 8), such as:
  - Application
  - Underfoot Conditions
  - Operating Techniques
  - Maintenance Practices
- Learn the operating techniques that minimize wear and give best results (p. 10)
- Keep tracks tensioned properly–not overly loose and not overly tight (p. 12)
- Keep the undercarriage free of mud, gravel and other debris that can accelerate component wear (p. 13)
- Avoid replacing undercarriage components before the end of their service life (p. 14)

For advice on machine operation, maintenance or service, contact your local Cat Dealer.

CAT® DEALERS DEFINE WORLD-CLASS PRODUCT SUPPORT.

We offer you the right parts and service solutions, when and where you need them. The Cat Dealer network of highly trained experts can help you maximize your equipment investment.

PEGJ0016-02

CATERPILLAR®
TODAY'S WORK. TOMORROW'S WORLD.™