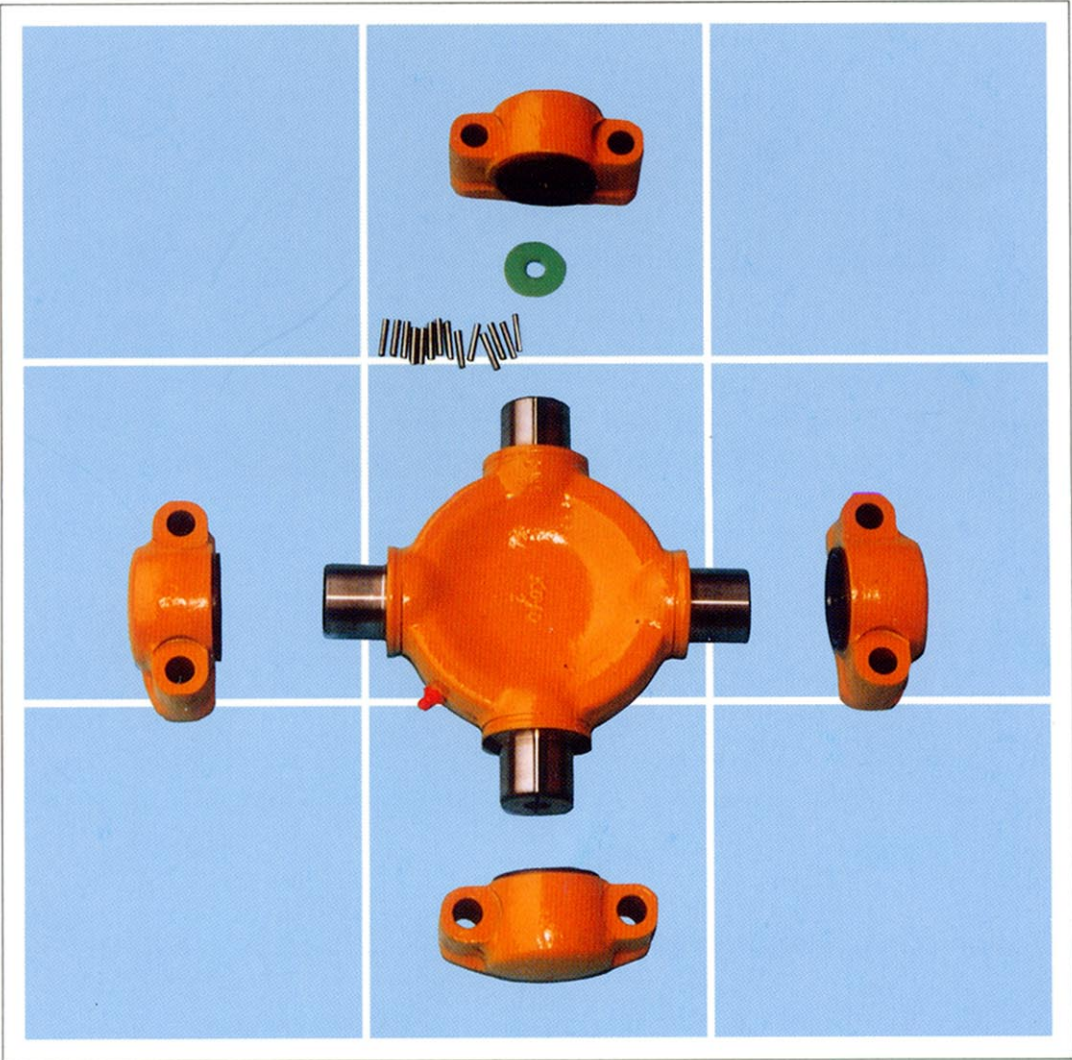


SHOP MANUAL



GUIDANCE FOR REUSABLE PARTS

UNIVERSAL JOINT SPIDERS



GUIDANCE FOR REUSABLE PARTS
KOMATSU

INDEX

INTRODUCTION	1
CAUSES AND JUDGEMENT OF FAILURE.....	2
• Check points for judgement of parts	
JUDGEMENT STANDARD	4
EXAMPLES OF FAILURES	5
PREVENTIVE MAINTENANCE	13

INTRODUCTION

This Guide for Reusable Parts describes the causes of damage to universal joint spiders which may be discovered when construction equipment is overhauled and provides photographs to help judge whether damaged spiders can be reused.

Damage to the universal joint spiders most often occurs because of severe operating conditions or poor lubrication.

We at Komatsu will be extremely pleased if this Guide can be actively used by people involved in diagnosis and repair, if it can help reduce repair costs by giving appropriate technical judgements about whether the spiders can be reused or must be replaced, and if appropriate measures can be taken to prevent recurrence of failures through an accurate grasp of the causes of damage.

Note: This publication is intended for guidance only and KOMATSU LTD. hereby expressly denies and excludes any representation, warranty or implied warranty for the reuse of universal Joint spiders.

CAUSES AND JUDGEMENT OF FAILURE

The judgement of whether or not a part can be reused of course depends on the size of the damage, but consideration must also be given to the degree of possibility that the location and kind of damage will lead to further damage of the drive shaft and universal joint.

When determining whether or not a part can be reused, try to determine why the damage occurred by considering the history of daily maintenance and the operating conditions, and use your accumulated experience together with the photographs in this Guide to decide whether the part should be ranked in Category A, B, or C.

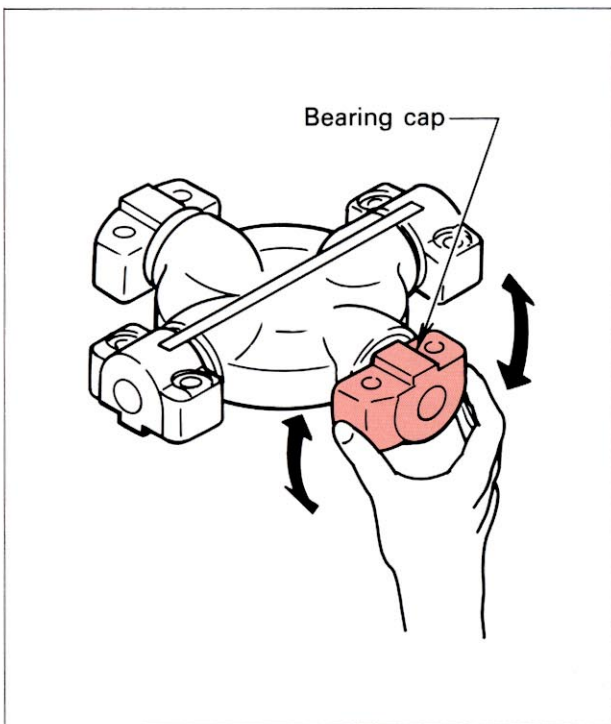
Check Points for Judgement of Parts

To make an accurate judgement about the damaged part, pay special attention to the following check points.

Stage	Check points
Before disassembly	<ol style="list-style-type: none">1. Is an abnormal amount of grease oozing out ?2. Is the part short of grease ?3. Does the bearing cap move smoothly when turned by hand ?4. Measure the clearance between the bearing cap and spider.
After disassembly	<ol style="list-style-type: none">1. Seal damage<ul style="list-style-type: none">● Is there wear on the seal lips ?● Is the seal cage deformed ?2. Is the thrust washer excessively worn ?3. Is the lubrication proper ?<ul style="list-style-type: none">● To what extent is there peeling ?● In what direction is the peeling ?4. Are there peeling fragments in the bearing cap ?5. Mating between bearing and spider<ul style="list-style-type: none">● At tip● At base● Overall

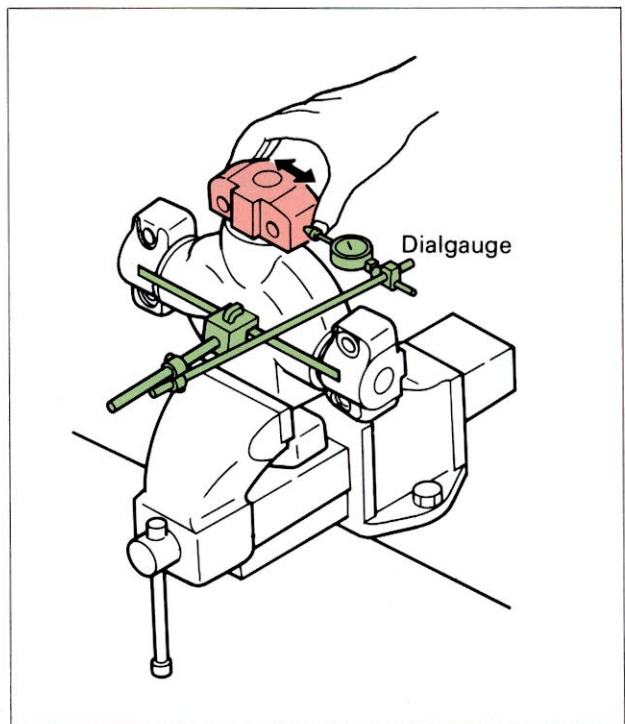
- **Check the movement of the bearing cap.**

Turn the bearing cap by hand as shown in the drawing and see if it moves smoothly.



- **Measure the clearance between the bearing cap and spider.**

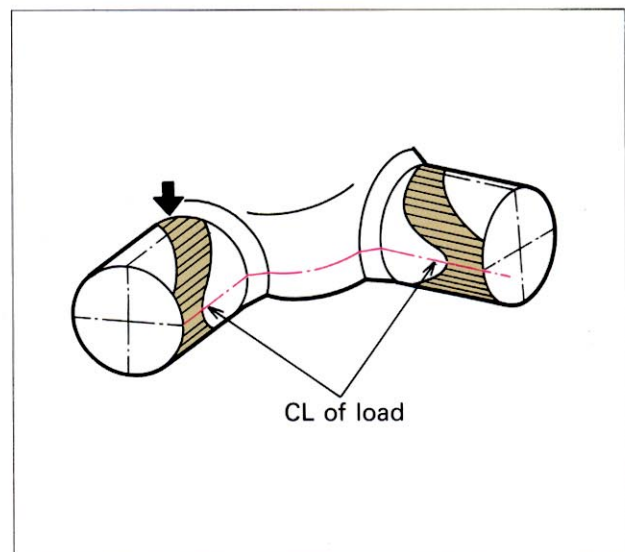
If the bearing cap does not turn smoothly, cut the wire attached to the cap, connect a dial gauge to the cap as shown in the drawing, move the cap in the direction of the arrow, and measure the clearance between the spider and bearing.



The ordinary trend for mating of the spiders is shown in the figure at right.

The damage on bearings often occurs because of a combination of raceway fatigue and fretting wear, but sometimes fretting is especially severe and sometimes fatigue of the raceways leads to flaking.

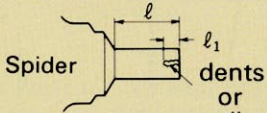
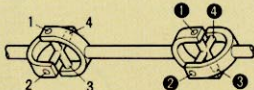
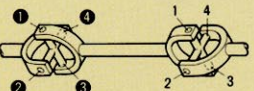
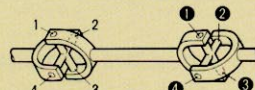
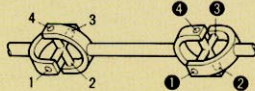
Generally, when the damage is caused mainly by a deterioration in lubrication, fretting occurs; when the lubrication is good and heavy loads are applied, flaking is likely to occur.



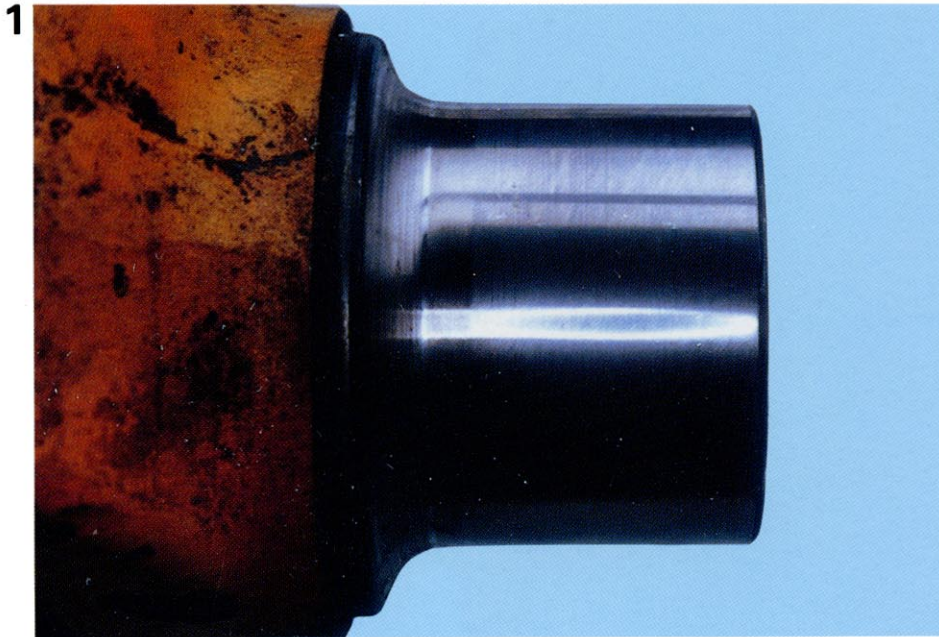
JUDGEMENT STANDARDS

Judgement category	Judgement standard	Remedy
A	Same standard as new part, no problem with machine functions, no worry that the damage will cause secondary failures.	Can be reused as is
B	If reused as is, the damage will progress or may lead to secondary failures, if repaired, the functions of the machine can be maintained.	Can be reused after repair
C	If repair is not possible, if it is clear that functions of the machine will deteriorate, or if continued use of the part will lead to major damage.	Can not be reused

Judgement Standards for Spiders

Category of Damage	A	B	C
Clearance between spider and bearing	<ul style="list-style-type: none"> Contact at spider surface is normal 	<ul style="list-style-type: none"> Clearance is less than 0.5 mm For the next time of inspection, use the following guideline: $SMR X (0.5 - \text{clearance} / \text{clearance})$ 	<ul style="list-style-type: none"> Clearance is 0.5 mm or more
Flaking (dents)	<ul style="list-style-type: none"> Contact at spider surface is normal Minor flaking 	 <ul style="list-style-type: none"> $l_1 \leq \frac{1}{4} l$ If the part has been used 3,000 hrs or more, it can be reused $l_1 \leq \frac{1}{2} l$ 	<ul style="list-style-type: none"> If the part has been used less than 3,000 hours, it can not be reused $l_1 \leq \frac{1}{2} l$
Fretting (peeling)	<ul style="list-style-type: none"> Contact at spider surface is normal Minor fretting 	<p style="text-align: center;"><Category-B></p>	
Peeling occurs only on the side of the spider subject to loads and is less than 1/6 the bearing load area	<ul style="list-style-type: none"> Interchange the positions of the yoke and spider  <p>① When two joints are used, interchange the front and rear joint (change the position)</p> 	<p>② For the same position, reverse the front and back surface of the spider</p>  <p>③ With the same surface and same position, shift the installation position with regard to the yoke by 90°</p> 	

EXAMPLES OF FAILURES



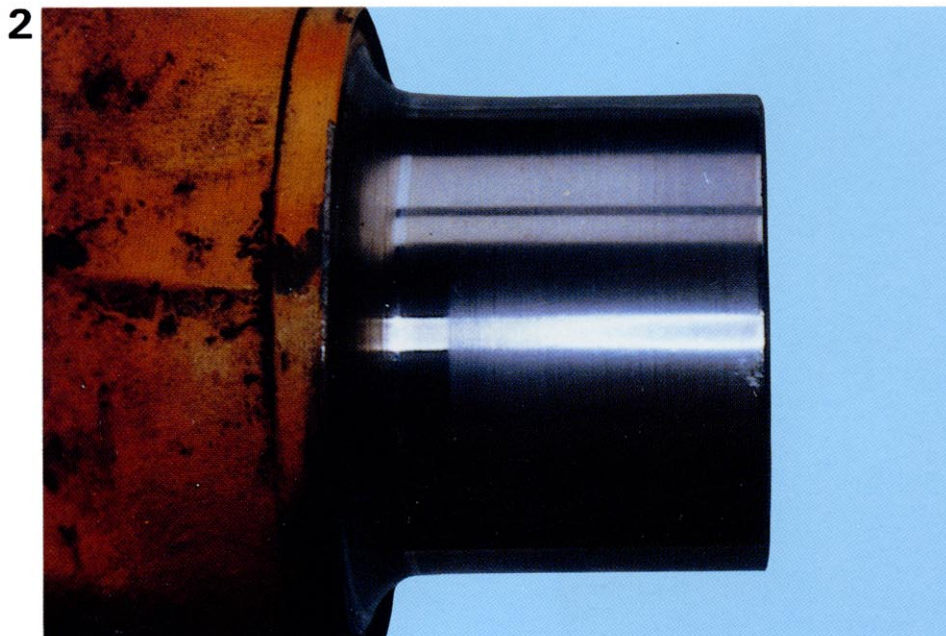
Category: A

Condition

- The wear on the surface causes no trouble with contact.

Cause

- Normal



Category: A

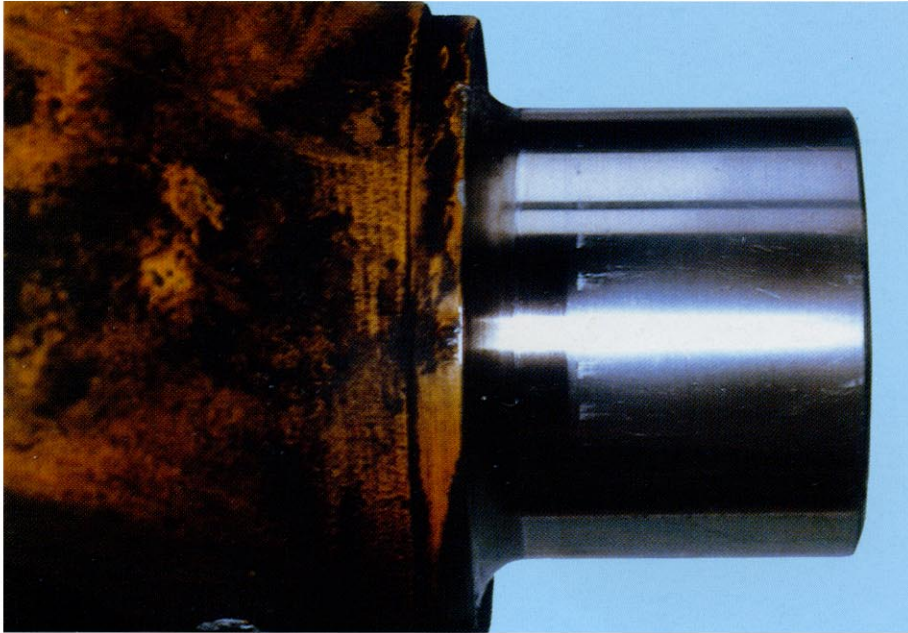
Condition

- The wear on the surface causes no trouble with contact. There are dents from time of disassembly and reassembly, but they can be corrected with an oilstone.

Cause

- Normal

3



Category: A

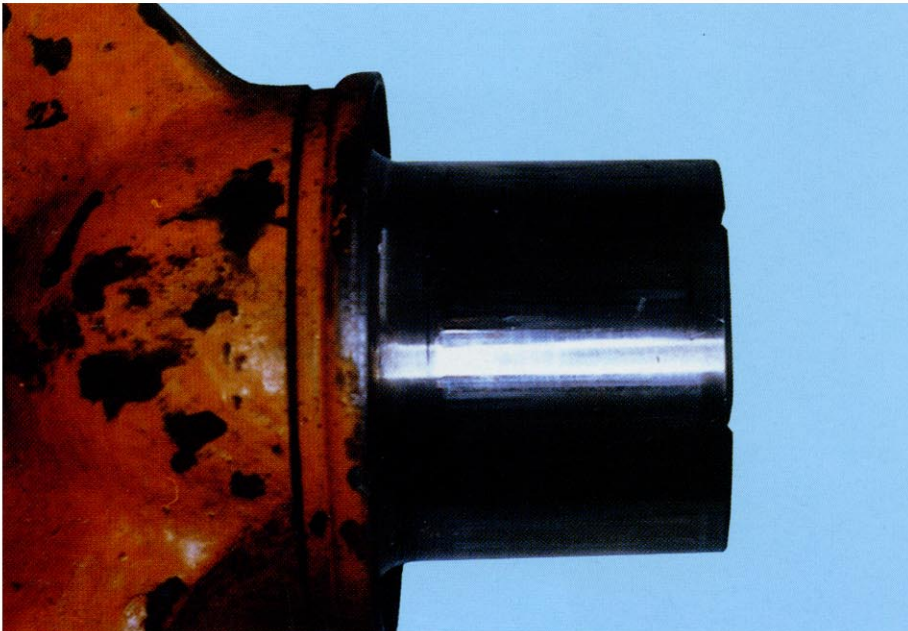
Condition

- Slight degree of fretting, but not enough to cause problems.

Cause

- Normal

4



Category: A

Condition

- Slight degree of fretting, but not enough to cause problems.

Cause

- Normal

5



Category: A

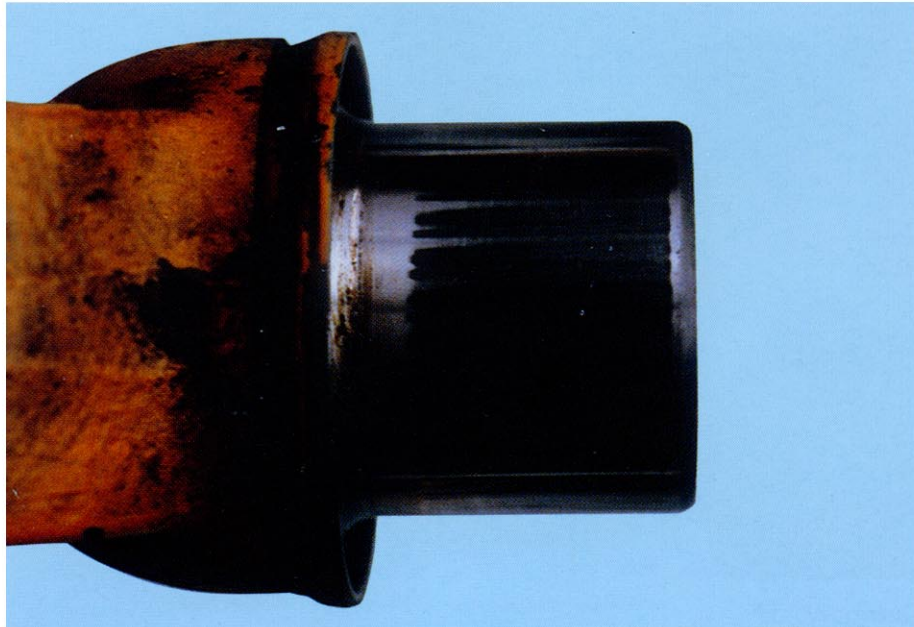
Condition

- Slight degree of fretting, but not enough to cause problems.

Cause

- Normal

6



Category: A

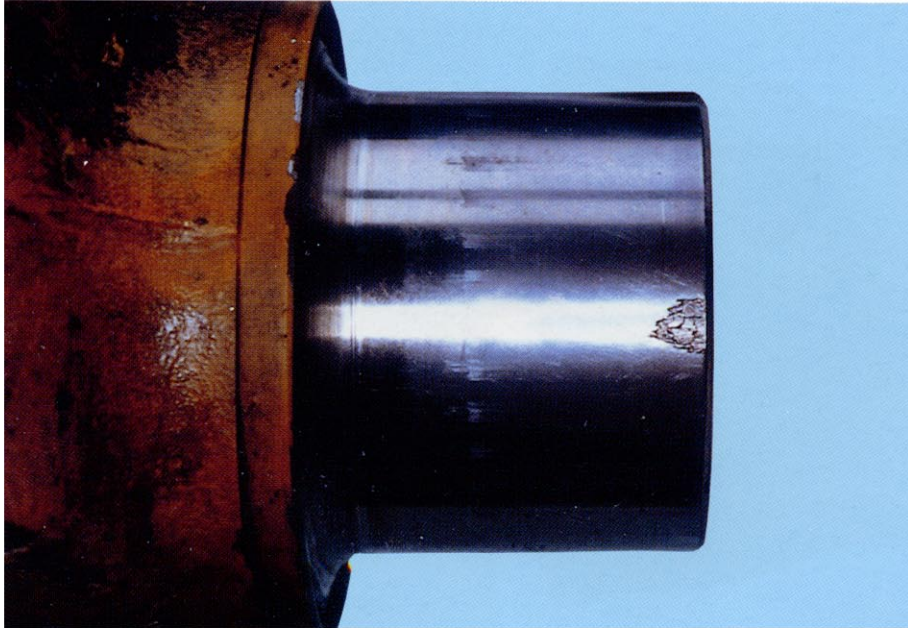
Condition

- Slight degree of fretting, but not enough to cause problems.

Cause

- Normal

7

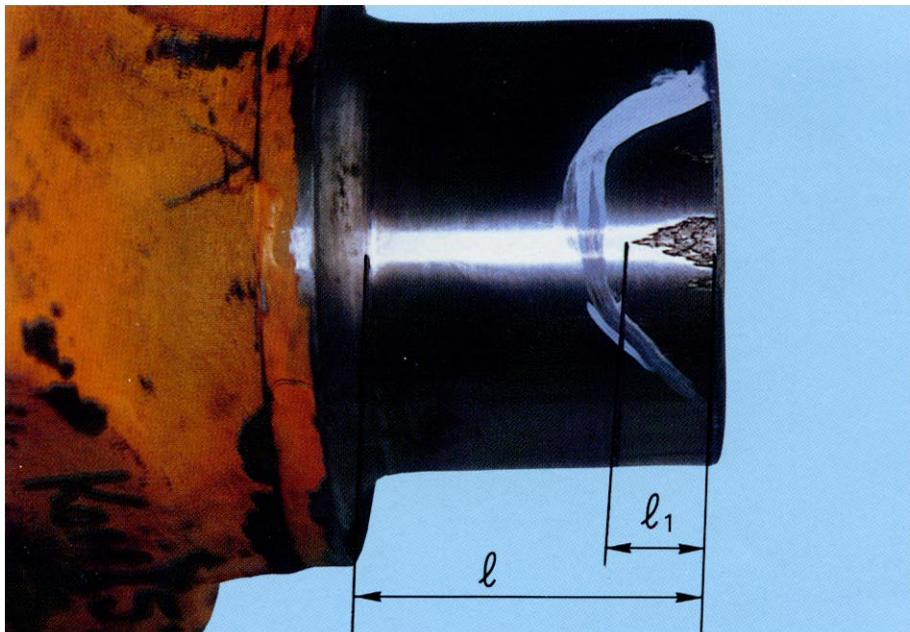


Category: B

Condition

- Slight peeling can be seen at tip, but not enough to cause problems. When reassembling, clean the spider and bearing cap and remove the peeled fragments. If the seal lips, core bar, or thrust washer is broken, deformed or excessively worn, Category is C.

8



Category: B

Condition

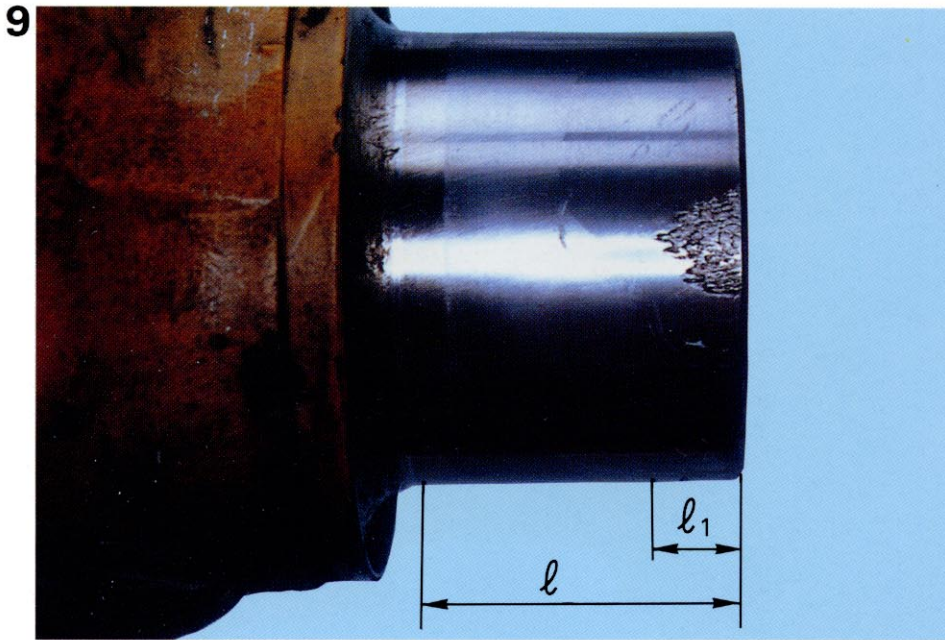
- Slight peeling can be seen at tip, but there is no interference. However, if there is damage to the oil seal or thrust washer, Category is C.

When reassembling, clean the spider and bearing cap and remove the peeled fragments.

$$l_1 \leq \frac{1}{4} l$$

l : length of rolling contact
 l_1 : length of peeling

Estimated remaining life \geq Hours used



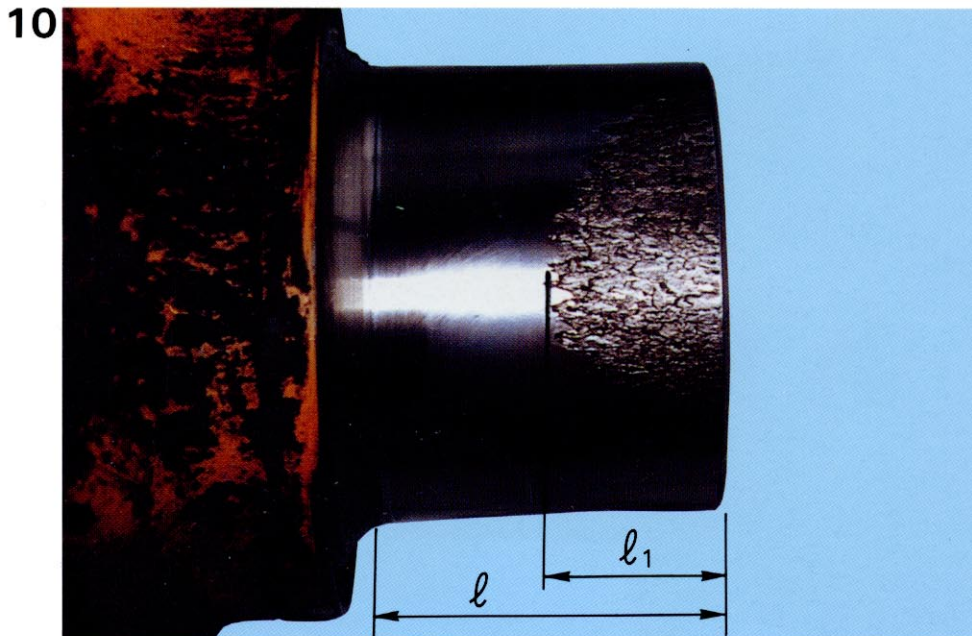
Category: B
Condition

- Slight peeling can be seen at tip, but not enough to interfere with use. However, if there is damage to the oil seal or thrust washer, category is C.

$$l_1 \leq \frac{1}{2} l$$

l : length of rolling contact
 l_1 : length of peeling

Estimated remaining life $\geq \frac{1}{2} \times$ Hours used

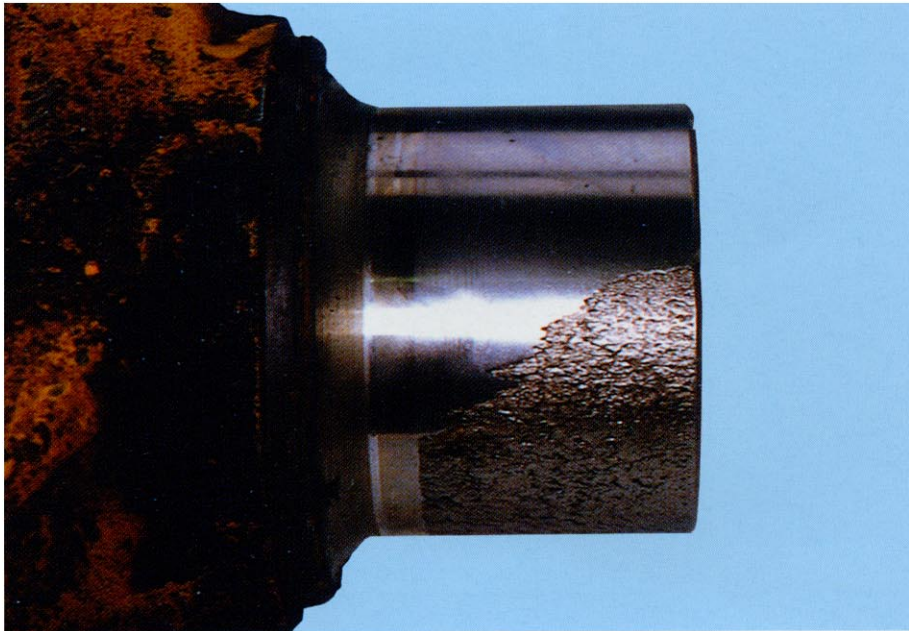


Category: B
Condition

- Moderate degree of peeling on tip, but not enough to interfere with functions. However, if the oil seals or thrust washers are noticed to be damaged, category is C.

When reassembling, clean the spider and bearing cap and remove the peeled fragments, then reverse the front and back of the spider to change the surface receiving loads.

11



Category: B

Condition

- Peeling is only on the surface receiving loads. However, if the oil seals or thrust washers noticed to be damaged, Category is C. When reassembling, clean the spider and bearing cap and remove the peeled fragments, then reverse the front and back of the spider to change the surface receiving loads.

12

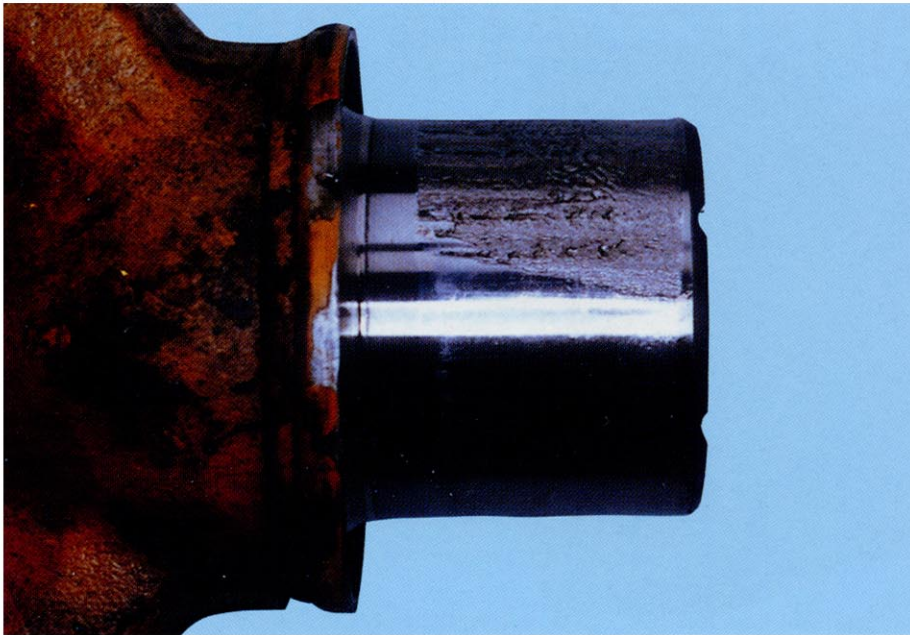


Category: B

Condition

- Peeling is only on the surface receiving loads. However, if the oil seals or thrust washers noticed to be damaged, Category is C. when reassembling, clean the spider and bearing cap and remove the peeled fragments, then reverse the front and back of the spider to change the surface receiving loads.

13

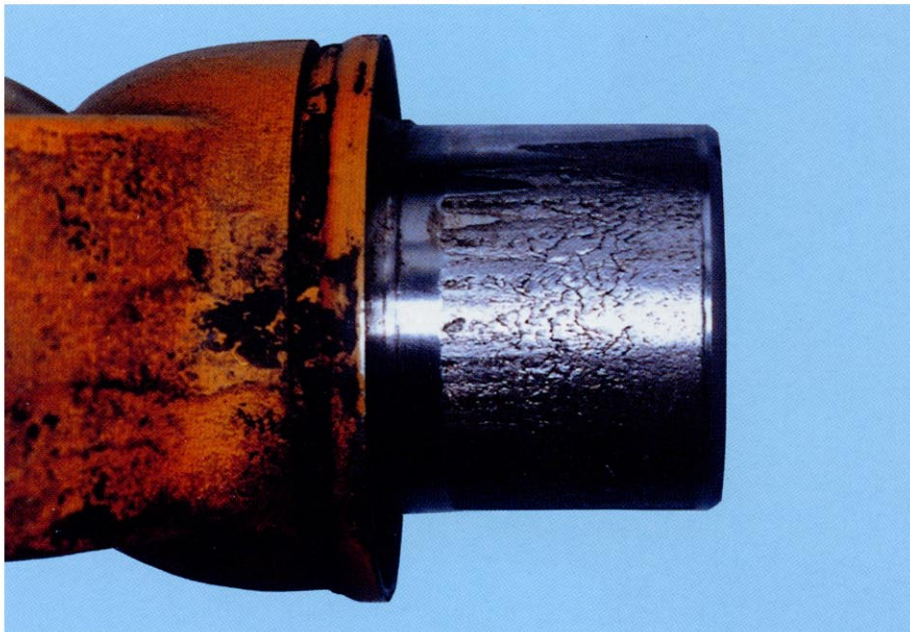


Category: B

Condition

- Peeling is on the surface receiving loads. However, if the oil only seal or thrust washers noticed to be damaged, Category is C. When reassembling, clean the spider and bearing cap and remove the peeled fragments, then reverse the front and back of the spider to change the surface receiving loads.

14

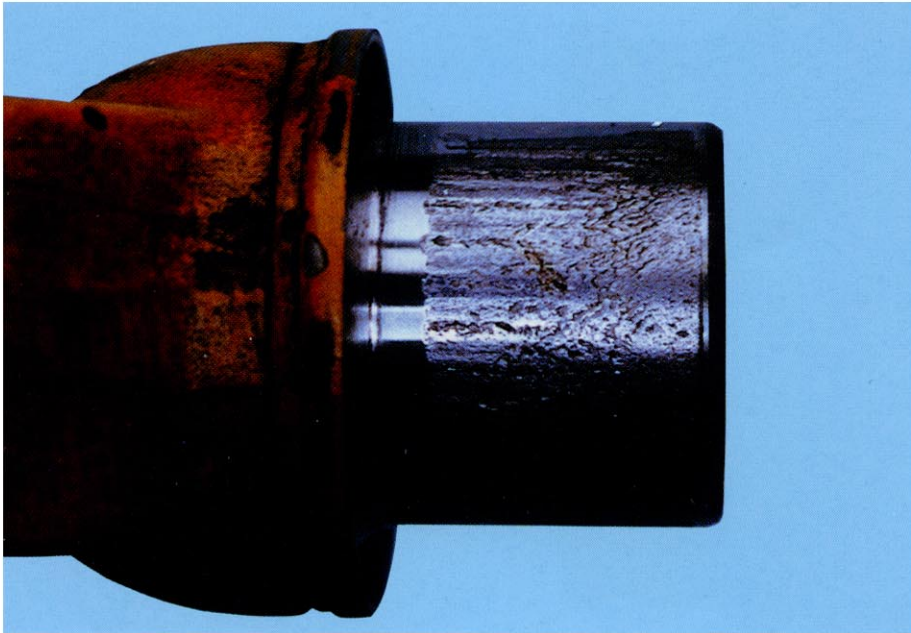


Category: C

Condition

- Peeling has spread to the entire surface, service life is assumed to be over.

15



Category: C

Condition

- Peeling has spread to the entire surface, service life is assumed to be over.

16



Category: C

Condition

- Peeling has spread to the entire surface, service life is assumed to be over.

PREVENTIVE MAINTENANCE

To prevent failures from occurring on the machine and to allow the machine to exhibit 100% of its functions, always keep informed about the machine's condition, and pay special attention to any abnormal vibration or noise.

By carrying out the maintenance described in the Operation and Maintenance Manual, major failures can be prevented. Nevertheless, it is important to encourage the customer to thoroughly carry out the following.

- 1) Use Komatsu genuine grease and observe the specified greasing intervals.
- 2) Avoid as far as possible sudden excessive loads, sudden acceleration, and sudden stopping.

*If some abnormality is noticed, stop operation of the machine and, referring to the DISASSEMBLY AND ASSEMBLY section of the Shop Manual, disassemble and inspect the affected part.

