MITSUI E&S

Mitsui E&S Machinery Co., Ltd.

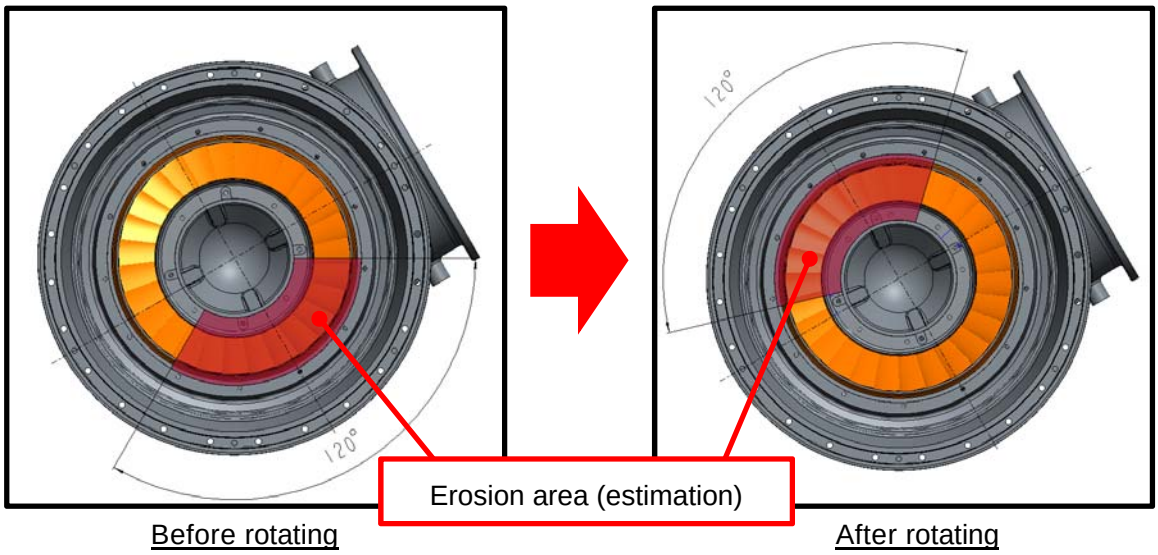
SERVICE NOTE

for MITSUI－MAN B&W engines,		No. 199	
Countermeasure for erosion of nozzle ring on TCA turbocharger		APPROVED	N. Osako
		CHECKED	
		PREPARED	T. Matsubara
ENGINE TYPE	**TCA turbocharger**	**DATE**	**2019.1.15**

1. Background

MAN TCA turbocharger has accumulated long service hours with good results in general over the 15 years. However, some our recent service experiences revealed the erosion of turbocharger parts by exhaust gas flow, especially the report of nozzle ring is increasing. Those experiences also revealed that the affected area of erosion on nozzle ring is limited in the range of approx. 120° as shown in below figure, because the small hard particles in exhaust gas, which is the cause of this erosion, are flowing to the outside in the inner 90° bended gas admission casing by centrifugal effect. Also, we found the progress of erosion is relatively slow.

Based on above findings, our licensor, MAN Energy Solutions (Augsburg), announces the recommendation that usage of nozzle ring can be extended by rotating nozzle ring at approx. 180°, if the erosion condition is within the acceptable range.



Before rotating

After rotating

PRIORITY							
IMMEDIATELY	☐	AT FIRST OPPORTUNITY	■	WHEN CONVENIENT	☐	OTHERS	☐

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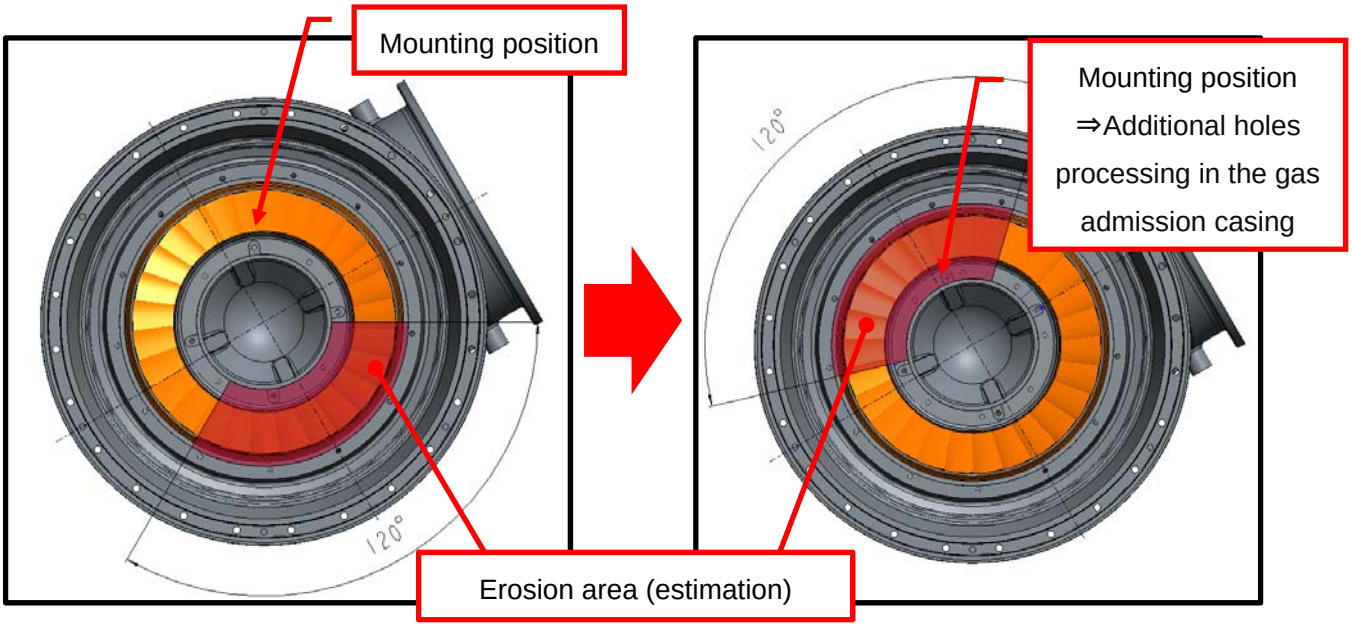
1. Procedure for rotating nozzle ring

It is recommended that nozzle ring can be rotated once as shown in Figure 1 providing that the erosion condition is within acceptable range. In order to fit the nozzle ring in new rotated position, it is necessary to drill the additional screw holes in the gas admission casing, because those holes pitch is not equal interval. For more information about additional machining, please contact to our Techno service.



Before rotating nozzle ring　　After rotating nozzle ring

Figure 1. Procedure of twisting nozzle Ring (In case of 27 blades [TCA55])

2. Criteria for continuously using of nozzle ring

2-1.Erosion at the base of the blade

In case of the erosion is detected as shown in Figure 2, the nozzle ring can be re-used, if the longest length “L” of all relevant blades is within the following table.

Type	Length “L”
TCA55	27mm
TCA66	36mm
TCA77	42mm
TCA88	48mm

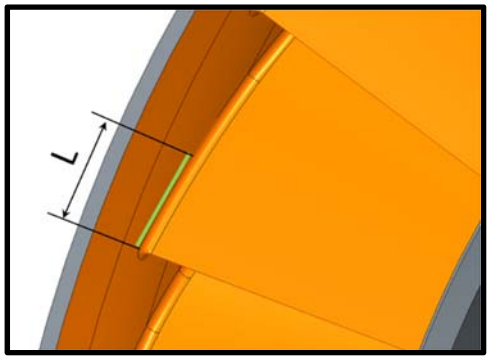


Figure 2. Criteria of Erosion at the base of the blade

2-2. Erosion on the trailing edges of the blade

In case of the erosion is detected on the trailing edges of the blade as shown in Figure 3, the nozzle ring can be re-used by rotating nozzle ring, if the widest width “B” of all relevant blades is within the following table.

Type	Width “B”
TCA55	14mm
TCA66	18mm
TCA77	21mm
TCA88	24mm

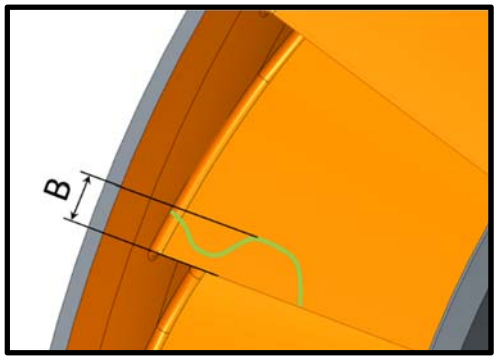


Figure 3. Criteria of Erosion on the trailing edges of the blade

2-3.Erosion on the outer ring

In case of the erosion is detected on the outer ring as shown in Figure 4, the nozzle ring can be re-used by rotating nozzle ring, if the thinnest dimension “T” of all relevant blades is within the following table.

Type	Dimension “T”
TCA55	3mm
TCA66	3.5mm
TCA77	4mm
TCA88	4.5mm

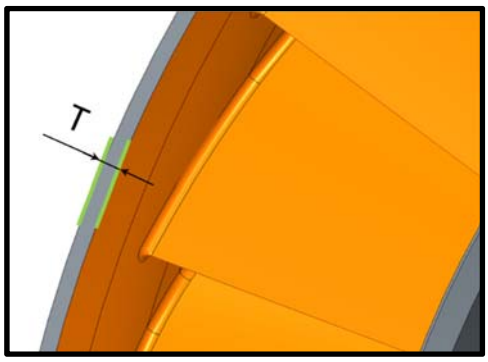


Figure 4. Criteria of Erosion on the outer ring

If you have any questions and concerns, please contact Mitsui E&S Machinery Co., Ltd. Technoservice Div. (Refer to MITSUI Service Note No. 111)

Reference:

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Attached material:

- Service letter of MAN Energy Solutions (Augsburg)

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Erosion on TCA nozzle rings in two-stroke engines

Dear Sir/Madam,

Where heavy fuel oil is used, the exhaust gas contains small hard particles (e.g. "cat fines") that have an erosive effect, especially where gas velocities and concentrations of these particles are high. The highest flow velocities occur at the outlet of the turbine nozzle ring. The flow is also very strongly deflected in circumferential direction. Moreover, the particles in the exhaust gas are flung outwards due to the centrifugal effect. Erosion can thus be observed at the outlet of the nozzle ring, on the inner diameter of the shroud ring and on the outer area of the turbine blades.
Experience in the field has revealed an upsurge in instances of increased erosion on the axial nozzle rings in the series TCA55, TCA66, TCA77 and TCA88. To date, this phenomenon has been observed in the aforementioned turbocharger sizes, which are used in two-stroke engines.
Since this increased erosion generally only affects a circumferential segment of ≤ 120°, the components do not necessarily need to be replaced. If the requirements set out below are met, the nozzle rings can be twisted by approx. 180°.
Additional bores must be drilled in the associated turbine inflow housings in order to twist the nozzle rings. Instructions on how to do so can be found in TM2700085497.

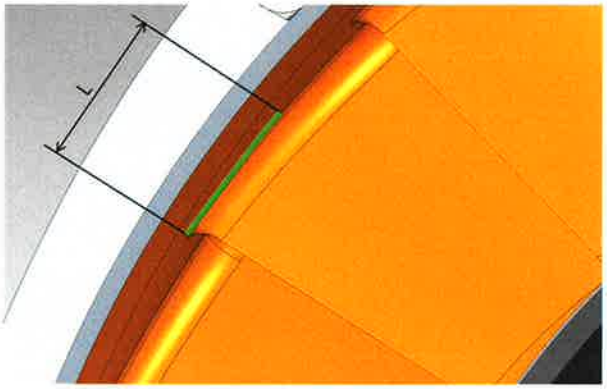
Number of blades with increased erosion

In the case of nozzle rings with a total of 27 blades, no more than 11 consecutive blades may have the increased erosion described below. In the case of nozzle rings with 34 blades, no more than 15 blades may be affected.
There must not be increased erosion present in several different areas.

Erosion at the base of the blade

The following erosion values are permitted between the base of the blade and the outer ring:

Type	Length "L"
TCA55	27mm
TCA66	36mm
TCA77	42mm
TCA88	48mm

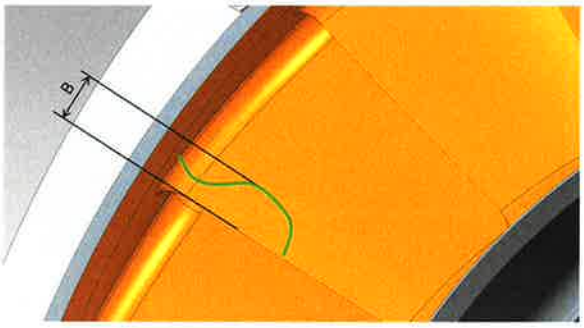


The specified length "L" relates to the most severely affected blade. If at least one blade exceeds the specified value, twisting of the nozzle ring is not permitted.

Erosion on the trailing edges of the blades

The following maximum values are permitted for the dimension "B" on the trailing edge of the blade:

Type	Width "B"
TCA55	14mm
TCA66	18mm
TCA77	21mm
TCA88	24mm

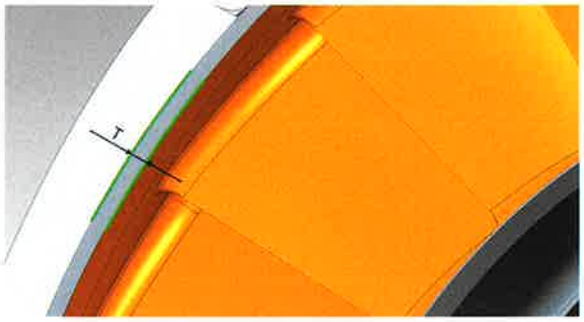


The specified width "B" relates to the most severely affected blade. If at least one blade exceeds the specified value, twisting of the nozzle ring is not permitted.

Erosion on the outer ring

The following minimum values are permitted for the dimension "T" on the outer ring of the nozzle ring:

Type	Dimension "T"
TCA55	3mm
TCA66	3,5mm
TCA77	4mm
TCA88	4,5mm



The specified dimension "T" relates to the most severely affected location on the outer ring. If the value for dimension "T" falls below the specified value in at least one location on the circumference, twisting of the nozzle ring is not permitted.

i. A.

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Head of Turbocharger Operational & Engineering Quality