

Damage Analysis on Tooth Gear Ring of a Bucket-Wheel Excavator

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Abstract. This paper deals with damage analysis of gear ring after manufacturing process, just before *in-service* period. Tooth gear ring segments were made of 40MnCrSi3V low-alloyed cast steel, which chemical composition and mechanical properties were given in table 1 and 2, respectively.

Table 1. Chemical composition of low-alloyed cast steel 40 MnCrSi3V.

	C	P _{max}	S _{max}	Si	Cr	Mn	Cu _{max}
[%]	0.35-0.45	0.04	0.04	0.5 -0.75	0.5-0.8	0.6 -0.9	0.3

Table 2. Mechanical properties of low-alloyed cast steel 40 MnCrSi3V at room temperature.

Re	Rm	A ₅	Z	KCU 3
[MPa]	[MPa]	[%]	[%]	[J/cm ²]
340	640	10	20	17

Concerning parent material characteristics, in this case low-alloyed cast steel 40 MnCrSi3V, inspection and control of gear segments were necessary to be performed after manufacturing. Non-destructive testing method with magnet particles (MT) of fluorescent suspension of particle size 3 μm was performed for potential defects detection. Surface indications were observed on 8 out of 12 gear segments on these new parts, where the lengths of the cracks goes up to 110 mm. Some of the observed defects were shown in Fig. 1. Defects were located in segments main body the gear teeth, its main body etc. Taking into account aforementioned, observed defects on new gear ring segments were caused in manufacturing process i.e. by casting process and inadequate cooling rate.



Figure 1. Examples of observed defects on gear ring of a bucket-wheel excavator.

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