

# Effect of Spindle Parameters of Woodworking Band Saw on the AE Value of Crack Band Saw Blade in Compound Material Processing (1)

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**Abstract.** Taking the MJ3210A motion band saw as the research object, the AE value of the band saw blade vibration was obtained by analyzing the VIBSYS vibration signal acquisition and analysis software system in Beijing, and the change of the AE value of the band saw and the crack was found out. The experimental results show that in the MJ3210A sports car sawing machine, the band saw blade with width of 130 mm is used, and the AE value of the cracked band saw blade is well in the high band saw blade AE value. Under the best working condition of the band saw, the band saw blade AE If the value exceeds 104.7 dB (A) above, it means that the band saw blade has at least one crack length greater than 1.38 mm for the crack defect and the need to replace the band saw blade in time. Different species with saw blade of the AE value is different, white pine wood minimum, the largest oak wood; according to a variety of wood processing AE instrument value to determine the band saw blade crack to the situation; so as to fully rational use of band saw blade, The failure and the degree of development to find a new method.

## 1. Introduction

Due to the saw blade used for cutting, it is the closed cutting in the cutting, the saw blade cutting edge can not observe the change of the state at any time with the eyes, and can not determine the correct replacement time of the saw blade [1-5]. According to the actual survey, wood processing enterprises online inspection usually use two kinds of band saw cutting edge and band saw the overall situation: one is the use of band saw blade cutting time, that is, using time constraints. That is, according to the experience of band saw blade, with a period of time with chalk smear blade root position, and then determine the light development to determine the degree of crack generation, and the second is based on the situation when the sound cutting to determine the work of the band saw and the degree of crack. The With reference to the first method of light, check the applied lighting value determination method to check whether the band saw blade crack. In this paper, the focus of the band saw the formation of cracks before and after the expansion of the law. In order to improve the quality of wood surface treatment, the correct judgment of the band saw a reasonable time to provide a scientific basis..

## 2. The experiment main instruments and equipment

### 2.1 The experiment main instruments

The apparatus and equipment used in this test are shown in Table 1.



**Table 1.** Test apparatus and equipment.

Name	Model	Manufacturer
woodworking band saw	MJ3210A	Shenyang Shen He woodworking machinery factory
The large capacity data acquisition instrument quickly	WS – 5942-2-5	Spectrum of Beijing century technology development co., LTD.
Precision multi-function digital AE meter meter	GSM1020A	Shenzhen shigeru source technology co., LTD.

### 2.2 MJ3210A specific parameters of the woodworking band saw machine

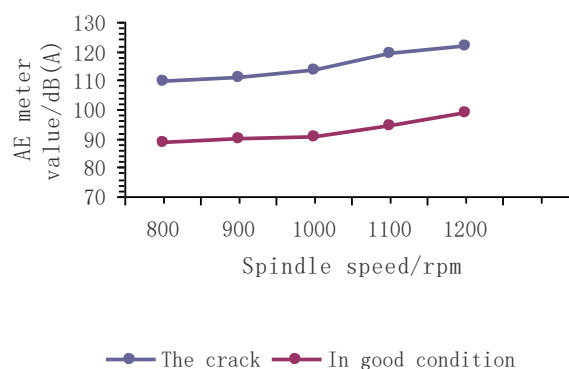
The test and application of Tianjin forestry cutting tool factory production of No. 18 B.W.G band saw blade. Show.

### 2.3 Cutting wood

The parameters of the test wood are shown in Table 2.

**Table 2.** Test apparatus and equipment.

Tree species	Manchurian Ash
Moisture content	10%
Cutting thickness	100mm



**Figure 1.** Saw wheel spindle speed under different load crack defects on the intact band saw blade and the band saw blade cutting AE count value

## 3. Test data processing and result analysis

### 3.1 Saw wheel spindle speed on the intact and crack defects of band saw blade AE count value

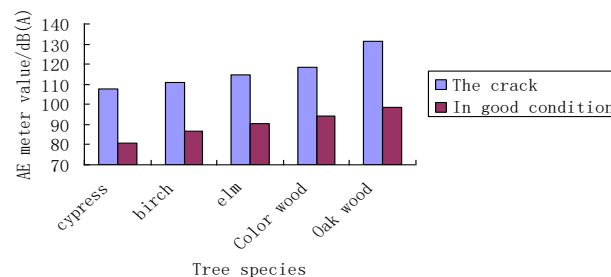
In band sawing machine pressed two weight is 93 N, up and down saw card a distance of 600 mm, under the premise of the feed speed of 15 m/min, under the five kinds of saw wheel speed, respectively, the crack is 1.38 mm of defective band saw blade and complete (sound) band saw blade for data collection and analysis, get the band saw blade when cutting AE meter value curve as shown in Fig. 1.

By Fig.1 shows, saw wheel spindle speed impact on the size of the band saw blade transverse vibration displacement is very obvious, saw wheel spindle speed before 1000 RPM with the increase of saw wheel speed saw blade transverse vibration displacement is less, when after saw wheel spindle speed 1000 RPM, with the increase of saw wheel rotation speed of the band saw blade transverse vibration displacement is also growing, and has a crack band saw blade AE meter value Ming is greater than the intact band saw blade AE meter. This is due to the increased with the increase of band sawing machine saw wheel spindle speed band saw blade transverse vibration caused by increased. When saw wheel spindle speed at 1000 RPM sawing machine to achieve the best working state; In

good band saw blade AE meter value in 88.4 dB (A) 98.9 dB (A), and between the defective band saw blade AE meter value in 109.3 dB (A) ~ 121.4 dB (A).

### 3.2 The effect of cutting different tree species on the integrity of the wood and the occurrence of cracked defects with band saws

In the determination of saw wheel spindle speed 1000rpm, pressure lump weight 93N, saw blade up and down distance of 600mm, feed rate of 20m / min, under the premise of cutting five kinds of tree birch, color wood, poplar, elm, oak The parameters of the AE scale are shown in Fig. 2 for the data acquisition of the complete saw blade and the defect band saw blade with the crack length of 1.68mm, and the saw blade cutting tree is obtained.

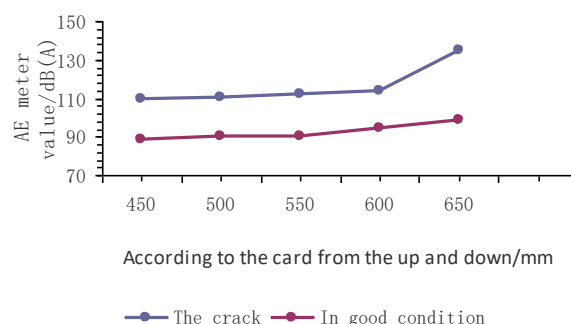


**Figure 2.** The effect of cutting the AE value when cutting the different saws with the saw blade and the crack

It can be seen from Fig. 2 that the vibration displacement of saw blade with saw blade is smaller than that of other wood, and the largest amount of oak is the smallest. Poplar: complete band saw blade 80.8dB (A), defect band saw blade 107.6dB (A), birch: complete band saw blade 86.8dB (A), defect band saw blade 110.8dB (A), elm: complete band saw blade 90.4 (A), defect band saw blade 114.6dB (A), color wood: complete band saw blade 94.5dB (A), defect band saw blade 118.5dB (A), oak: complete band saw blade 98.6dB (A), defect band saw blade 131.5dB (A) ;, Generate cracks with band saws AE values are generally larger than the full band saw blade AE values. Poplar in these five kinds of trees in the hardness of the smallest, the largest hardness of oak, which shows that with the hardness of the wood cutting is increased, AE value also increases.

### 3.3 The influence of the upper and lower saw blade distance on the AE value of the good and cracked band saw blade

Under the premise that the speed of the main shaft of the band saw is 1000rpm and the weight is 93N, the band saw blade crack is 1.68mm, and the distance between the saw blade and the saw blade is changed. Now with the saw blade up and down the distance to get the band saw the AE value of the curve shown in Figure 3..



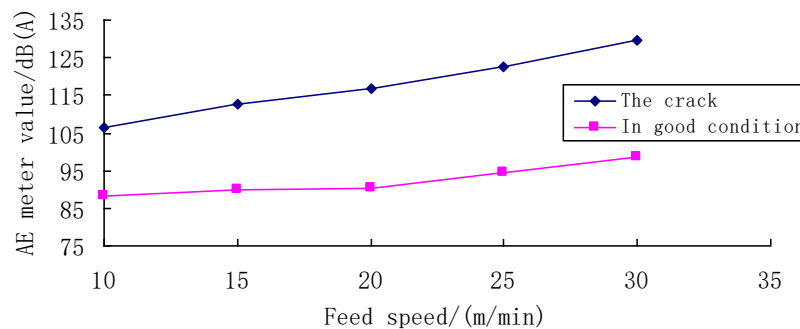
**Figure 3.** Load under different saw card from up and down on the whole band saw blade and crack defects of band saw blade AE count value

It can be seen from Figure 3, in the upper and lower saw the card before the distance of 600mm, with the increase in the distance from the saw blade saw blade transverse vibration displacement also increased, but the magnitude is smaller, after 600mm with the increase in the distance from the saw

blade Saw blades AE increase in the rate of increase; this is due to the increase in the length of the band saw blade. And there is a cracked band saw blade with an AE value greater than the intact band saw blade AE value. (A) -98.3dB (A), the defect band saw blade AE is between 108.6dB (A) and 120.5dB (A).

### 3.4 Feed speed in good condition and the influence of crack defect band saw blade AE count value

In order to grasp the lateral vibration of the saw blade when cutting, in the case of a good band saw blade and band saw blade crack is 1.68mm, the use of load under the acquisition of data. In the determination of the saw wheel spindle speed 1000rpm, pressing the weight of 93N, up and down the saw blade distance of 600dB (A) under the premise of cutting oak were selected five kinds of feed speed for data acquisition, the analysis results shown in Figure 4.

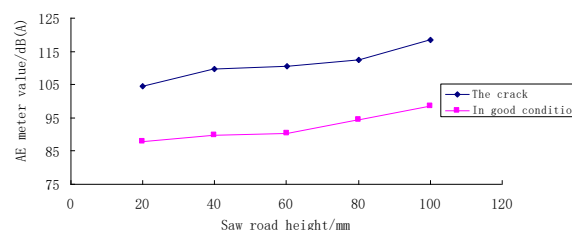


**Figure 4.** Effect of Different Feeding Speed on AE Value of Cutting Saw Blade and Crack Defect Band Saw Blade

The Fig.4 shows that sports car before the feed speed of 20 m/min, with the increase of car feed speed of transverse vibration displacement distance was generally higher, but the increase amplitude is small, in the car after the feed speed of 20 m/min band saw blade vibration displacement increases gradually, increase rate is higher. And has a crack band saw blade AE meter value Ming is greater than the intact band saw blade AE meter. Good band saw blade AE meter value in 88.3 dB (A)~ 98.6 dB (A) defective blade transverse vibration displacement in 106.6 dB (A)~129.5 dB (A).

### 3.5 Effect of Different Saw Height on Integrity and Crack Band Saw Blade AE

Select the saw blade tension 8330N, saw the number of revolutions of 1000rpm, feeding speed 20m / min, up and down the saw blade distance of 600mm, cutting oak, in different saw height conditions, the acquisition band saw AE signal and analysis The AE curve of the band saw with different crack length is shown in Fig.5.

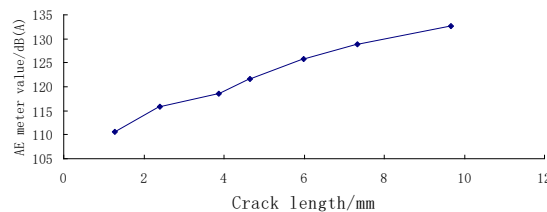


**Figure 5.** Influence of Different Saw Blade Height of Saw Blade on AE of Saw Blade Cutting

As can be seen from Fig. 5, the height of the saw blade with different saws has a significant effect on the band gauge AE. With the increase in the sawing height of the saw blade, the AE value increases, and the increase in the saw height exceeds 60 mm. And there is a cracked band saw blade with an AE value greater than the intact band saw blade AE value. The full band saw blade AE is between 87.9 dB (A) and 98.4 dB (A). The defective band saw has a value of 104.7 dB (A) to 118.8 dB (A).

### 3.6 Effect of Different Crack Band Saw Blade on Transverse Vibration Displacement of Band Saw Blade under Load

In the saw blade tension 8330N, the number of revolutions of the saw wheel is 1000rpm, the feeding speed is 20m / min, the distance between the upper and lower saws is 600mm, and the transverse vibration of the band saw blade is taken under the condition of cutting the oak. Value of the signal, the analysis of the crack length and band saw the AE value of the relationship between the curve shown in Figure 6.

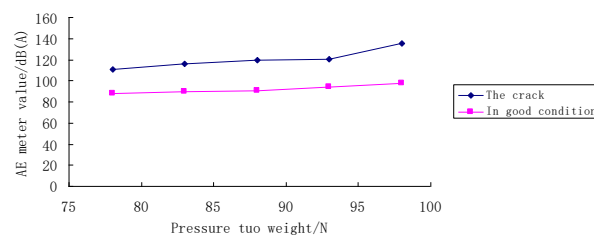


**Figure 6.** Effect of different crack lengths of band saw blade and AE value of band saw blade cutting

It can be seen from Fig. 6 that the AE value of the saw blade increases with the increase of the crack length of the band saw blade, which is due to the increase of the saw blade. In the best working condition of the saw machine, the lateral vibration displacement of the defective saw blade is between 110.6dB (A) and 132.7dB (A).

### 3.7 The effect of the weight of the pressure on the AE value of the cracked band saw blade

The speed of the main shaft saw blade is 1000rpm, the distance from the upper and lower sides of the saw blade is 650mm, and the feed speed is 25m / min. Under the premise of changing the weight of the double blade, the complete saw blade and the crack length are 1.68mm Saw blade for data acquisition, will now increase with the weight of the weight of the band saw blade cutting AE value of the curve shown in Fig.7.



**Figure 7.** Effect of Different Loads on Load Scales of Saw Blade with Full Band Saw Blade and Crack Defects under Load

As can be seen from Figure 7, before the weight of the pressure mound is 93N, the load increases with the weight of the weight under the load. The band saw is generally raised, but the increase is very small, and the cracked band saw blade has a weight of 93N with the weight of the weight after the increase with the band saw the AE value also increases, the impact is very obvious. And there is a cracked band saw blade with an AE value greater than the intact band saw blade AE value. When the weight of the mound is 93N, the band saw machine works to achieve the best working condition. The AE of the band saw is between 88.3dB (A) and 98.1dB (A). The defect of the saw blade is 110.6dB (A) ~ 135.3dB (A) between.

From the test analysis shows that, for the MJ3210A small sports car wood saws, the use of 120mm width of the saw blade, band saw the crack after its lateral vibration significantly increased, then you can determine the saw blade is the replacement time. When the saw wheel spindle speed, pressure lump weight, feed speed, the upper and lower saw the card distance are adjusted to the most appropriate circumstances, the measured AE value if more than 104.7dB (A) above, then the blade has produced at least one crack The length of more than 1.68mm crack defects, the need for timely

replacement of the band saw blade; In addition, the use of band saw blade AE value changes can determine whether the band saw blade crack defects.

#### **4. Summary**

After the above MJ3310A sports car woodworking band saw machine testing and analysis, the following conclusions:

(1) Cracked defect band saw blade AE value is significantly higher than the good band saw blade AE value;

(2) The AE value of the birch saw blade is less than the AE value of the other wood, and the AE value of the birch is the smallest, and the AE value of the oak is the largest. Five kinds of tree species in the maximum hardness of oak, with the increase in wood hardness, AE value increases, according to the tree cutting AE value is different to determine the length of the band saw blade crack.

(3) For the MJ3210A sports car saw blade, a 120mm dB width band saw blade is used. The test results show that the AE value of the band saw with crack is significantly higher than that of the complete band saw blade. The change from the AE value of the band saw blade It is necessary to check whether the saw blade is cracked and whether it needs to be replaced in time. If the saw blade spindle speed, the pressure lump weight and the saw blade are adjusted up and down to the most suitable case, the lateral vibration displacement is more than 104.7 dB (A) , It means that the saw blade has produced at least one crack length of more than 1.64mm crack defects, the need for timely replacement band saw blade. The AE scale for the complete band saw blade is between 87.9 dB (A) and 98.9 dB (A). And then determine the range of dB (A) for judging the defect condition of band saw blade, which provides the technical basis for the full and reasonable utilization of band saw blade in actual production.

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