RESEARCH ON THE STUDY OF MATERIAL DEFECTS AND SOME COAL MILLS SUBASSEMBLIES LIFE TIME

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Abstract: The defects from the structure of metallic materials of which are manufactured the pieces, can be put out by NDT. One of NDT methods, commonly used in practice is ultrasonic method. In this paper are rendered the results of the determinations by the effects of coal mills bars by type DGS 100, obtained with ultrasound devices by type PHASOR XS.

Keywords: coal mill, the bar, NDT, ultrasonic method.

1. INTRODUCTION[2]

The main machine of drying and preparation system of coal dust necessary for burn in the power plant is the die-fan, with hammer, type DGS100, which has the role to dry and to grind the coal, and also to transport the coal dust mixture and flue gas to the toboiler firebox burners. DGS100 mill was designed for grinding the lignite from the Oltenia Basin.

Some of the highlights that need to find the defects to ensure the safety work are the bars (Fig.1) of coal grinding mills type DGS100 of the Thermo Rovinari.

Figure 1. Overall drawing of the bar for DGS100 coal mill.
The elaboration of metallic materials is a complex technological process in whose progress intervene a number of factors, which favor more or less the presence of discontinuities. In some cases, discontinuities fall under the category of admitted defects and in others, is constituted in impermissible defects for the parts that will be part of an installation or equipment.

It is known that the presence of discontinuities in metallic materials affects their mechanical properties and is due to:

- the drafting process of the material (molding);
- the manufacturing process of the parts (forging, rolled metal, welding, heat treatment);
- the operation, following the requests, which is subject to the material (corrosion, cracking).

The discontinuities from the structure of metallic materials of which are manufactured parts can be put out by NDT. One of NDT methods currently used in practice is ultrasonic method. The successful use of ultrasonic methods in identifying discontinuities in metal structure parts is conditioned by the knowledge of source, the shape or probable orientation of the discontinuities, so finally it can accurately determines the presence or their absence.

Once identified, the discontinuities, must be reconciled with the stipulations of standards, of rules, or of the contractual technical conditions that determine whether they are admissible or inadmissible remedies.

For rolled products or drawn from steel, defects are included in the STAS 6656-66.

From the defects group provided in the above-mentioned standard we mentioned the compactness categories of defects namely:

a) the voids are discontinuities of compactness, formed in the casting or the steel making, in proportions not admitted and not removed in processing of ingots;

b) compactness deterioration that appears as discontinuities in laminates and paths compactness in the form of gaps, relatively narrow and prolonged (regular or irregular line of continue lengths, interrupted or shifted).

Concretely can be illustrated some of the defects that appear frequency, namely:

- producing shrinkholes, contraction gap with oxidized edges, or with others impurities formed at the ingot solidification;
- indoor porosity or microretasura in the form of small and numerous gaps, usually coming from shrinkage and formed at edges crystals;
- flaws in the form of not weldedor partially welded discontinuities, which appear in the rolled section being caused by the solidification of the liquid steel from ingot and rolled during the lamination and pulling; its surface is generally smooth and non-oxidizing which allows it welding more or less completely, depending on the temperature and pressure conditions in the case of hot lamination.
- The cracks that are damages of the compactness, can be derived from the original material, or from the processing and heating, or from the formation, respectively, inadequate cooling.
At ultrasonic control of laminated parts can highlight internal discontinuities place, having regard about their origin (either insufficient ingot cutting either due to cooling and thermal treatment of the material).

In this paper are rendered the results of defects bars DGS coal mill type 100 determinations.

2. RESEARCHES REGARDING ULTRASONIC DETERMINATION OF MATERIAL DEFECTS OF BARSCOAL MILLSTYETE 100DGS. [1]

DGS100 mills bars (from Thermo Rovinari) are made of laminated steel (P460NH). The ultrasonic appliance used to determine a bar defects (Fig. 1) is of type PHASOR XS.

Work technique consists in the survey through reflection of the ultrasonic impulses, ultrasonic waves are reflected by the opposite surface of that probe is applied (bottom echo), or the inclusions area, or other defects which existing in metal (defect echo). The control is realized so that all the explored region points to be probed by continue moving of the probe.

The couplant will be normally the oil, which ensures sufficient contact between the flash and bar area. The bars can be controlled either immediately after hot rolling (before the annealing treatment) or in a later stage of production. In the first case check if the oxide layer is well adherent, continuous and if is possible, palpating a healthy region of the bar, to distinguish at least two echoes bottom succession. In the second case, the bars must undergo, possibly before control, of a preliminary preparation surface (sanding, polarization, etc.), ensuring a good contact between the probes and work piece (in order to obtain minimum two successive bottom echoes).

The used control waves, are of longitudinal type, and their direction is perpendicular to the probe surface. Probes are used with normal diameter between 10 and 24 mm. Depending on the situation that occur, the bars can be controlled using frequencies between 2 and 6 MHz.

Ultrasonic testing of bars is done by moving the probe in the longitudinal direction, on the parallel strips of equal width with that of the probe, until the entire surface exploration. For rectangular section bars this control was performed on one of the surfaces, then a second, perpendicular to the first.

The probe that worked in coal mills bars: of quartz 24 mm.

Examination results are appreciated by the shape, size and discontinuities arrangement, in accordance with the rules of acceptance provided in the technical documentation of the product. The bars which present splits, cracks, crowded inclusions or with the tendency of alignment, are not admitted to the reception.

In Figures 2 and 3 are shown bars having functioned 1500 hours and which must be analyzed to discover arising ultrasonic defects during operation. Transducers were used normal (perpendicular to 90°) and inclined transducers (to an angle of 45°).
Figure 2. Bare of DGS 100 millsthat were in working.

Figure 3. Bare of DGS 100 millsthat were in working.

Figure 4. Assessment curve (1 mm) and the reference curve (2 mm)
The transducer with inclined angle of 45° allows the identifying of defects until the parts edges of controlled that which a normal transducer of 90° is not possible because it does not ‘see’ the last 2 mm of piece.

In order the piece to be declared good all echoes registered (Fig. 4) by the device must not exceed 2 mm.

In Figure 5 there is shown a found defect at a depth of 20 mm from the upper edge of the piece, defect that exceeding the reference curve with 2 mm.

Linear indication declared defect in Figure 5 is in reality a string of excessive elongated granulates at rolling (non-compliant deformation process). Such defect produces a breaking of the bar in the first 100 hours of working.

The examined piece could be used for 20 hours of working but will be considered just a mand will be replaced with a new one.

In Figure 6 are represented the two curves of reference and evaluation for a bar without defects. The bar is also evaluated with a transducer with inclined angle with two bottom echoes.

The life time of DGS 100 coal mills bars from Rovinari Thermo is 80 000 - 100 000 hours of operation without breaking only with the use.
CONCLUSIONS

The results of research regarding on the defectoscopic study with ultrasonic of a landmarks how is the case of the bars from type DGS 100 mills, it shows that the detection of possible defects constitutes an effective way of avoiding some interrupting in the working of this machinery and of the related production losses. Size, orientation and location of faults can be done more accurately using the phasor. This is because the following reasons:
- In phasor technique the transducer is made of several crystals-16 in this case, which makes at the geometrical place of the maximum sonic pressure of points to be a plan and not a right;
- Moving from one-dimensional to two-dimensional determines the increase of the detection probability by substantially reducing of the unfavorable orientation grade of possible reflectors;
- The mobility of the transducer is a three-dimensional; the variation of the incidence angle is achieved through the equipment and requires no manual movement of the transducer as it does when at the using of conventional transducers;
- Respecting the principle of Huyghens, equivalent sonogram being one spatial, the propagation surface being higher and the number of points that becomes spreading centers from where, is noticeably higher.

REFERENCES
[1]. The user manual of the devices with PHASOR XS ultrasound
[2]. STAS 6656-66-Defects of metallic materials

Figure 6: Reference an evaluation curves for a bar without defects