1. Introduction

One of the most important requirements imposed on cold strip mills is getting rolled in without surface defects (prints on the tape surface, the thickness differences in length of the strip, waves of the strip rolled) and a corresponding quality band material.

For better productivity and continuous operation is required without disruption of the rolling mill. Most failures occur because of vibrations rolled strip mill stands or drive system of the rolling mill. Vibration mill stand occurs due to eccentricity of backup and work rolls. Another issue of the mill vibration is represented by dimensional and surface defects of rolled strip.

To detect early functional defects of the mill and the defects of rolled strip will be installed accelerometers on the mill stands and on the gearbox or coupling.

2. The equipment, parameters and conditions of measuring-registration.

Experiments were made into, two phases, with performance equipment and up-to-date acquisition equipment - namely data analysis:
- Line of data acquisition: transducers, Preamplifiers, filters, analog-digital converter (National Texas USA);
- Modal analyzer, with data acquisition in Lab VIEW programming (USA);

Have been made 115 different charts by this equipment, which 20 is representative. To make the measurements of: movement, throttling, frequency, transducers were fixed on the upper and lower cylinders support of considered rolling mill’s frames by the vertical and horizontal direction (Figure 1).

Experiments were performed on 3, 4, 5 frame of the rolling mill because on them there are the highest values of displacements, acceleration and frequency vibrations and that in fact, represents the latest stage in the achievement of the finished product.

The magnitude and frequency of vibrations are influenced by:
- the speed of rotation of the cylinders, rolling force, the tension between frames, emulsion used - the characteristics of vibrations and they were recorded during mentioned periods of time.

It has been also measured and recorded of functionary parameters for the five stand of tandem

<table>
<thead>
<tr>
<th>Frame</th>
<th>Rolling force x10^4 [N]</th>
<th>Rotation speed of the working cylinders [Rot/min]</th>
<th>Tension between the frames x10^4 [N]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1250</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1150</td>
<td>470</td>
<td>1 - 2 40</td>
</tr>
<tr>
<td>3</td>
<td>1100</td>
<td>580</td>
<td>2 - 3 32</td>
</tr>
<tr>
<td>4</td>
<td>1050</td>
<td>690</td>
<td>3 - 4 19</td>
</tr>
<tr>
<td>5</td>
<td>1000</td>
<td>880</td>
<td>4 - 5 11</td>
</tr>
</tbody>
</table>

Fig. 1: Schedule for rolling mill parameters recorded
3. The type, location and recording of variables

The measurements were made with transducers placed upright, horizontal and axial position-on cylinders bearings support for shareholders and operator at all tandem frame of cold band.

From the analysis made it can be concluded that the greatest value for movements, speed, acceleration were recorded at 3, 4, 5 stands of rolling mill. For the frame number four the value of measurement recorded as follows:

Maximum displacement - measured on the cylinder upper support (operator-action) was 355 \times 10^{-6} m, 370 \times 10^{-6} m; Maximum displacement - measured on lower support of the cylinder (operator-action) emphasized lower values, meaning 36x10^{-6} m and 178 \times 10^{-6} m.

Maximum recorded acceleration was about 2.5m/s² so it is situated between maximum values from stand number three (1.6m/s²) and stand number four (4m/s²).

4. Results Interpretation

Of records and measurements made is resulted that:

The highest amplitude of vibrations has been emphasized in 4 frame (action side), compared with frames 3 and 5. The vibrations caused the appearance of some wavy parts on the surface band (rolls 14 and 16; thickness output 0.37; width 1660mm) – (in the form of cross stripes) with up to about 20-40 mm.

On the surface of the last 5 rolls strip - before the change of working cylinders- are observed traces and printings belonging to these cylinders

Analyzing the spectra frequency related to 3, 4, and 5 stand of mill, two maxima were noticed, respectively (figure 2).

At speeds between 600-1250m/min. rolling and the vibration frequencies measured not exceeding 450Hz, we have not registered print and sudden wave variations in the thickness of rolling strip.

At the vibration frequencies between 450-1150Hz noticed wave surface bands with step between 2-40mm, wear pronounced decks of the cylinders work-support and in their camp.

Of all the research results made the current problem is to analyze the conditions for scientific running of rolling mills, the identification and quantification disturbing factors and finally, modern design, for increasing resistance, reliability, reduce consumption, ensure continuity processes and product quality finished.

5. Conclusions

As a major conclusion of the investigation on the basis of which have some researches contracts concluded with ARCELOR MITTAL S.A. and completed - is a pressing need reduction and possible elimination vibrations in order to increase reliability of all the rolling and the production of endless bands in accordance with international standards.

In the researcher made was the following:

- Under the action tasks variables (interior and exterior system), the chain of cinematic equipment to distort, charging the forces and resistance of the materials from which they are made the components, by installing the phenomenon of fatigue. This is the most frequent cause of the deterioration of equipment subassemblies.
- Main sources demands are dynamic forces of inertia period starting and braking; games in components from inside the spaces of the cinematic chain entrapment -working; wear subassemblies; faulty execution and assembly.

6. References

