INFRASOUND NOISE RADIATED FROM VIBRATING SCREENS AT AN ORE REFINERY: PART 2 – NOISE REDUCTION TREATMENTS AND NOISE MAPPING TECHNIQUE

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1. INTRODUCTION

An infrasound problem has been identified at an ore refining factory and large vibrating screens were identified as the dominant source.

In order to evaluate potential solutions allowing to reduce the screens' acoustical emission, a 1:15 scale model was built to be tested in laboratory.

Noise mapping techniques were used to highlight the radiating patterns and measure the performance of tested solutions.

Read part 1 of the current article for exhaustive noise source description and methodology.

2. NOISE MAPS

Noise maps were performed on the side and the top of the small scale model (Figure 1 and 2).

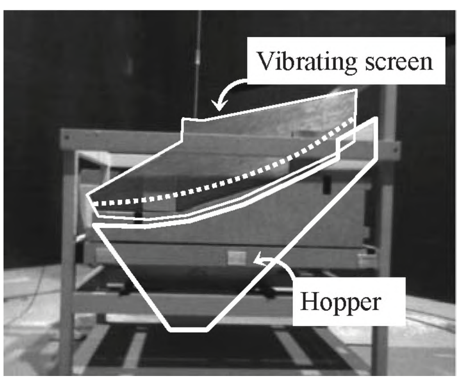

Figure 1. Small scale model – side noise maps' background picture

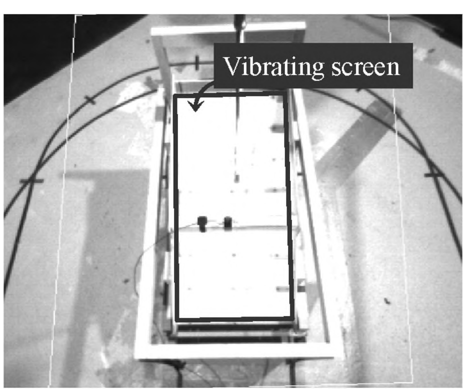

Figure 2. Small scale model – top noise maps' background picture

The displayed value is the sound intensity global level ranging from 205 to 235 Hz which represents the 13.5 to 15.5 Hz operating range for the full scale vibrating screen and the color scale ranges from 65 to 85 dB. The noise maps were performed at a 15 cm distance from the sound source.

3. RESULTS

The noise maps were performed for the key configurations:

1. Complete screen plate and current hopper (reference case)
2. Slotted screen plate and current hopper (first implementation stage)
3. Slotted screen plate and reduced volume hopper (second implementation stage)

These configurations are explained in part 1 of the current article

Figure 4 and 7 show the current configuration (prior to treatments implementation). The strongest sound source is identified at the gap between the screen plate and the hopper. The lack of acoustical short-circuit generates a high pressure level in the hopper and the leak at the hopper's perimeter radiates the energy to the outside. When seen from the top (Figure 7) the energy is evenly distributed on the screen plate with a slight increase at the center region.

Figure 5 and 8 show the first stage of implementation with the slotted screen plate. The acoustical short-circuit generated by this opening in the screen plate reduces the radiated energy by 8 to 9 dB. It also reduces the sound pressure in the hopper subsequently reducing energy radiated from the leaks located at the hopper's perimeter.

Figure 6 and 9 show the second stage of implementation with a reduced volume hopper and the slotted screen plate. This proposed hopper gives an additional 5 to 8 dB. The hopper replacement reduces globally the radiated energy but doe not modify significantly the radiating pattern.

4. CONCLUSION

The noise mapping technique proved to be useful in the process of acoustical phenomena identification on the small scale model. It also helped to improve the treatments performance by providing a visual representation of the radiated energy.

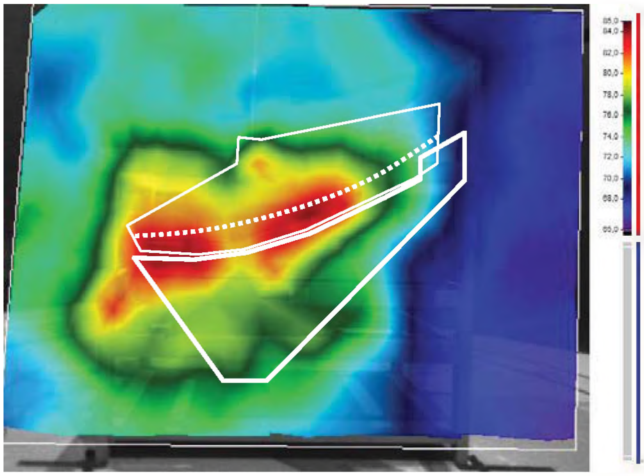

Figure 3. Complete screen plate and current hopper – side
205 to 235 Hz global level
$L_I = 81$ dB

Figure 4. Slotted screen plate and current hopper - side
205 to 235 Hz global level
$L_I = 72$ dB

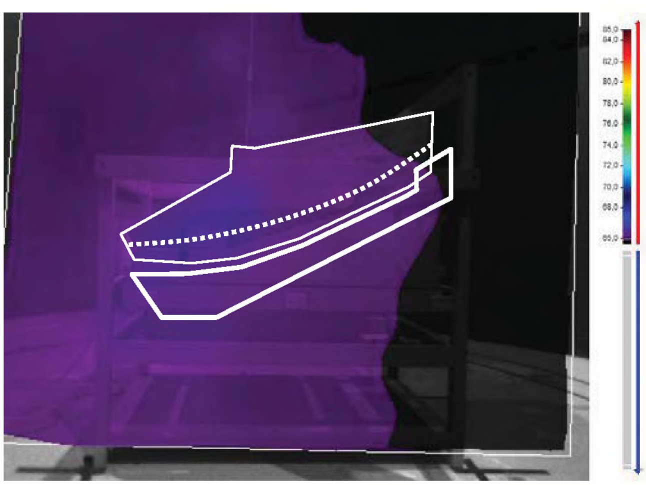

Figure 5. Slotted screen plate and proposed hopper – side
205 to 235 Hz global level
$L_I = 67$ dB

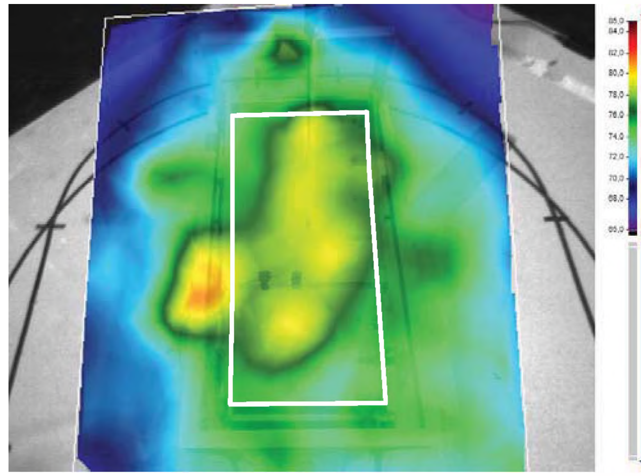

Figure 6. Complete screen plate and current hopper – top
205 to 235 Hz global level
$L_I = 81$ dB

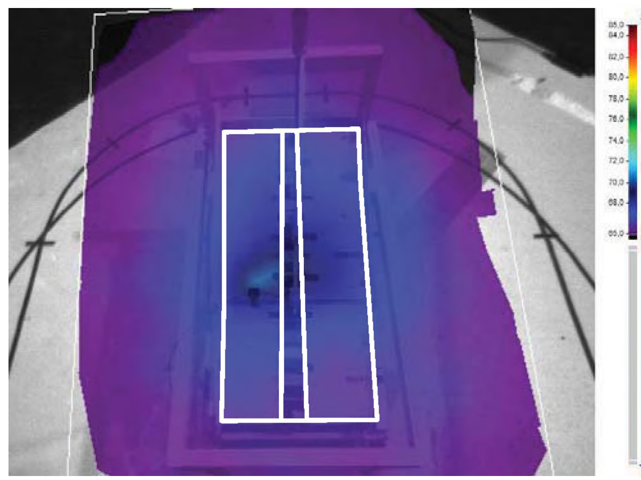

Figure 7. Slotted screen plate and current hopper - top
205 to 235 Hz global level
$L_I = 73$ dB

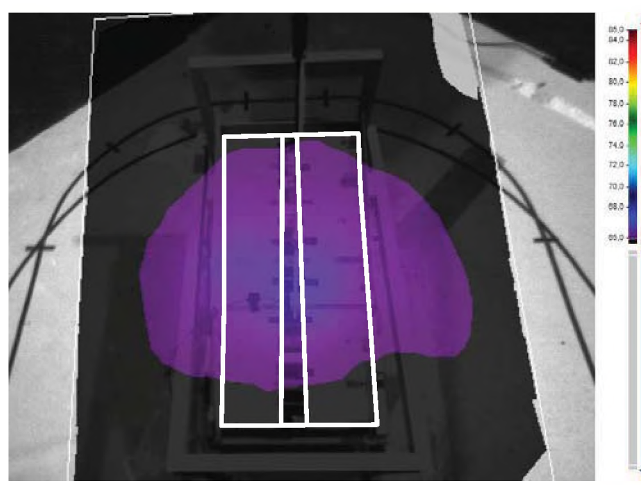

Figure 8. Slotted screen plate and proposed hopper – top
205 to 235 Hz global level
$L_I = 65$ dB