

ACOUSTIC DESIGN OF A NEW PAPER BOARD MACHINE KM8 AT STORA BILLERUD SKOGHALLSVERKEN

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INTRODUCTION

A Paper Board Machine with connected new CTMP factory and new bleach plant is under construction at STORA Billerud Mill in Skoghall, Sweden. It covers a total investment of 350 million British Pounds.

STRINGENT NOISE AND VIBRATION REQUIREMENTS

The paper industry is manufacturing ecological products, which today are to a large extent recycled. However, it is necessary for companies - in order to create creditability in the long run for the environmental image of their products - also to reflect this thinking internally in the production process and work environment. In this respect low noise and vibration levels are important factors which, moreover, are positively influencing the recruitment of qualified personnel and the reduction of personnel turn-over.

The background for this low level is the qualified product, liquid packaging board used in the food industry, and the desired high environmental image. The company policy for the machine hall is: Bright, Clean and Silent.

The project management have set the following targets for equivalent sound levels L_{Aeq} :

Board machine, operator side
Other production areas
Limited areas for noisy equipment

$L_{Aeq} = 75$ dBA
 $L_{Aeq} = 80$ dBA
 $L_{Aeq} = 85$ dBA

External environment $L_{WA} = 83 \text{ dBA}$
(total allowable sound power level from the plant).

For the external environment the value is applicable as a guarantee value. For the internal environment the values are target values which the suppliers are requested to fulfil. This form of "purchase negotiation" has been proposed by the acoustic consultant DNV Ingemansson AB.

The reason that it is difficult to demand noise guarantees from suppliers is that the customer and others involved in the project influence the supplier's choice of components so that he is not solely responsible for the final result.

E. g. the customer himself buys important components for the machine which can influence the total noise level. Steam systems, valves and electric motors can be mentioned as examples. Moreover, the customer decides to a large extent the machine design.

ACTIVE PRELIMINARY PLANNING - A NECESSITY

Negotiations instead of guarantee

Since noise guarantee specifications are not written into the contract it must be quite clear "which measures are to be taken" by suppliers.

During a two month period of negotiations prior to the signing of contract, DNV Ingemansson listed necessary noise control measures together with the three biggest potential suppliers, Sulzer-Voith, Beloit Walmsley and Valmet.

The lists of measures were based on Ingemansson's 30 years experience in paper industry, reference measurements and also supplier experience. No supplier has a reference machine which comes close to the requirements in question. Closest is Beloit/Valmet who supplied KM7, which was the first paper board machine in the Skoghall Mill, built 1977.

EXAMPLE OF MEASURES

Wire section

Normally, the dominating noise source is the vacuum system used to remove water from the paper web. Silencers have been installed in this case on the control valves. Steam leakage points where noise is generated have been removed.

The hole pattern in the suction rolls which are perforated and under vacuum has been optimised so that audible tones have been extinguished.

A better solids content in the paper has proved to be possible if "bleeding of the air" is carried out as per the principle in Fig. 1.

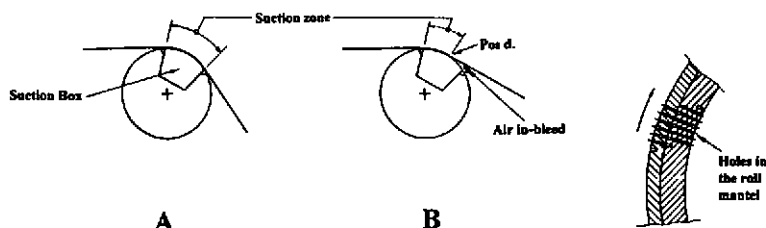


Fig. 1. Sections through a suction roll. "A" normal condition, "B" recommended.

The noise generation during this operating condition has been studied. The variation in the pressure drop in a hole and therefore the noise generation is indicated in the diagram, Fig. 2.

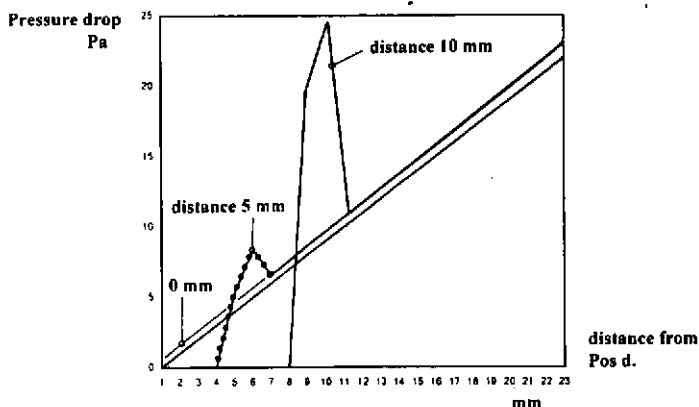


Fig. 2. Pressure change in a hole.

In practice the suction box is made somewhat wider than the width of the suction zone. An attempt has been made to compensate for this with an adjustable sealing strip.

The press section

The heart of the press section is a so-called shoe press. This is driven by built-in gears.

By means of extra high manufacturing precision on the gear and adaptation of the tooth shape design to the actual drive load the gear noise level has been reduced by 4 dBA. This measure has been supplemented with the visco-elastic damping in sections of the steel frame. Damping cassettes are welded to the sections, see Fig. 3.

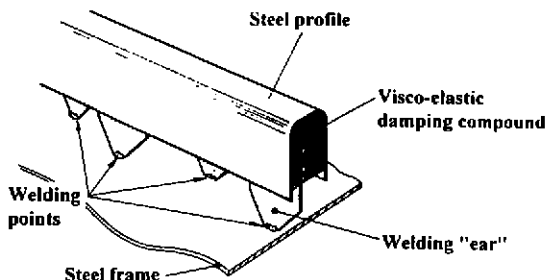


Fig. 3. Damping cassettes.

The dryer hood which is delivered by ABB Fläkt is designed with extra high sound reduction.

Board coating is accomplished with blow boxes of the "single type" i.e. paper drying is attained with air blown from one side. DNV Ingemansson has developed blow nozzles together with Valmet Pansio. By installing a flow resistance in the assembly box preceding the nozzles the turbulent flow has been changed to a more laminar. This, in combination with the extension of the nozzle length so that a greater ejection is achieved, has enabled the noise generation to be reduced 5 to 8 dB in separate one-third octave bands. The blow capacity has also been increased by approx. 5%.

FINAL RESULT

The plant will be taken into operation in December 1996. Only then will we know if the noise project has been completely successful. The noise sources in all plants has been entered in the computer program Noise-Calc and predictions are made.

Even if the target values are not met everywhere round the installations it should already be quite clear that KM8 will be one of the quietest machines ever built.