

## Speed Measurements at the Headbox

### Paper Pete makes things clear



Dear Paper makers,

*Change is the order of the day in Heimbach's TASK department: Whether we are investigating one or in some cases all sections of a paper machine, offering advice on machine technology or performing analyses – no two jobs are alike. What we do know for sure, however, is that on many occasions a customer needs facts first of all in order to pursue a line of enquiry and we can help with specific measurement technology. In today's case study we were in action during the start-up phase of a machine producing folding boxboard and carried out measurements on three headboxes in order to assess the jet-wire ratio.*

Together with my colleagues Janek, Ralf, and Jelke, we began with a preparatory meeting. Janek explained that the customer had ordered the complete clothing package from Heimbach and that they were asking us to check the **jet-wire speed**. Ralf and Jelke talked us through a diagram of the forming section so that we were able to prepare ourselves in a targeted way.

#### Measurements are complex

During our flight my colleagues reported on some interesting projects in which they had performed speed measurements and as a result had been able to determine the cause of increased fabric wear and/or disproportionately increased sheet breaks. Other jobs consist of **precision-tuning drive systems** or synchronising transfer positions. In addition to this we frequently check **machine settings, such as speed indicators**, for accuracy – and this was also relevant for this particular assignment.

#### Facts for forming

Once on site, we exchanged views with the production manager who suspected that the three fabrics were not running at exactly the same speed, which could lead to displacement or movement of the sheet layers during couching. It wasn't at all clear, furthermore, whether jet speeds were displayed correctly in the control room, which for machine operators in the forming section is **the control instrument per se** – after all, you need correct information that you can rely on. As we know, perfectly calibrated and correctly displayed jet speeds – also called "jet-wire ratio" – are the **basis for being able to manipulate the formation and some of the stability characteristics of the end product**.

#### First results

We began our measurements and identified the jet speeds as well as those of the forming fabrics of the filler, back, and surface

layers. The first significant result was: **All three fabrics were running at exactly the same speed** (see pg. 14, Fig.1), so that we were able to quickly reassure the production manager with regard to his first concern. The speed displayed in the control room also corresponded to the result of the measurements. However, in the back layer a major difference of jet speed was discovered: The measured speed was around 35 m/min below the value that was shown in the control room. For the first time we suspected that the problem might be down to a calculation error and/or incorrect programming of the speed indicator.

#### Ratio – the decisive factor

Next, together with the paper makers on site, we dealt with the speed differentials between jet and fabric, i.e. the "ratio". You can appreciate how fundamentally important the provision of the correct value is in this context, after all, **fibre orientation**

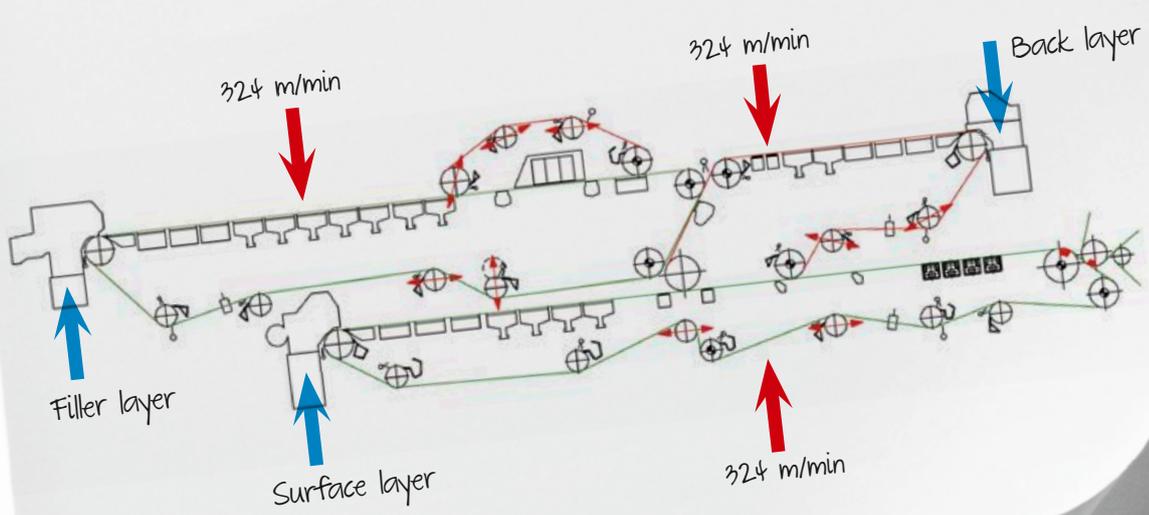


Fig. 1: Fabric speed in the filler as well as surface and back layers.

and formation are set according to this. Even though the back layer appeared to have a ratio of 10 m/min, the measurement that we took showed -25 m/min (Fig. 2). In this circumstance, the paper makers quite logically assumed that the jet was 10 m/min faster than the fabric and therefore more fibres were aligned in a cross direction. In fact, the jet was actually 25 m/min slower than the fabric and therefore the fibre

orientation followed tended **more to the machine direction**. We therefore increased the jet speed until a real ratio of 0/min was achieved.

**Slice opening and jet speed**

After this had been accomplished, we changed the slice opening of the headbox in order to find out whether the **jet speed remained constant**. For this test it is

essential that all control parameters – including the adjusted ratio – are maintained. If then you change only the slice opening of the headbox (flow rate higher or lower), the jet speed has to remain constant. Any changes, however, are an indication that in principle the entire system has to be checked. In the back layer we found quite conclusively:

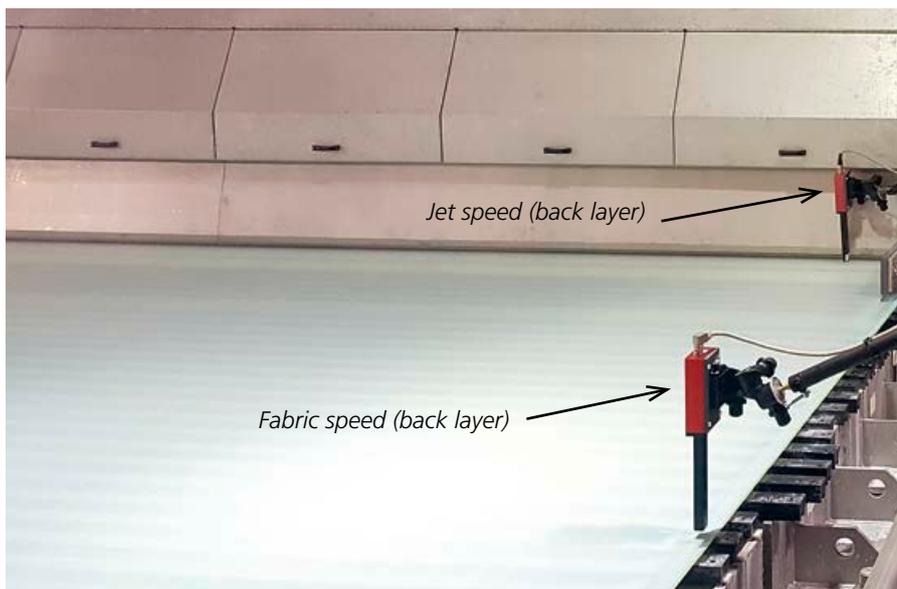


Fig. 2: Both fixed measuring points in the filler position.



When the slice opening was changed from 20.6 to 21.2 mm the jet speed was perfectly constant – however, measuring values and display consistently indicated a difference of just under 35 m/min. We therefore came to the conclusion that there was really **only one single factor responsible** for the different readings.

### Clarity achieved

The next series of measurements was performed in the filler position. This is a crucial factor for achieving overall sheet strength and comprises **more than 80% of the total sheet mass**. The jet was permanently 28 m/min slower than displayed. From experience the customer's paper

makers had suspected from the beginning that the display was incorrect. Together we aligned the speeds (jet and fabric). After completion of the adjustments the measured speeds matched. Finally we performed the **measurements in the surface layer** (Fig. 3). The results of both the filler and the surface layer confirmed what we had already found in the back layer: Only one single source of error made sense!

### Job done – paper makers happy

Now we were able to tell the customer with absolute certainty: Fabric and jet were perfectly adjusted in all three layers, which meant that trouble shooting could be focused on the area of data processing.

**Either the software itself or its specific programming was the source of the problem.** From this point onwards our measurement results can provide the customer's software experts with the basis for **correcting the calculation of the jet speed**. Once this has been done we will make another visit to the customer to test the jet speeds once more. Then everything will be resolved and we can say with confidence: Once more we have been able to use experience and our skills to provide practical help to a customer. **All's well that measures well!**

With best wishes,

Your Paper Pete

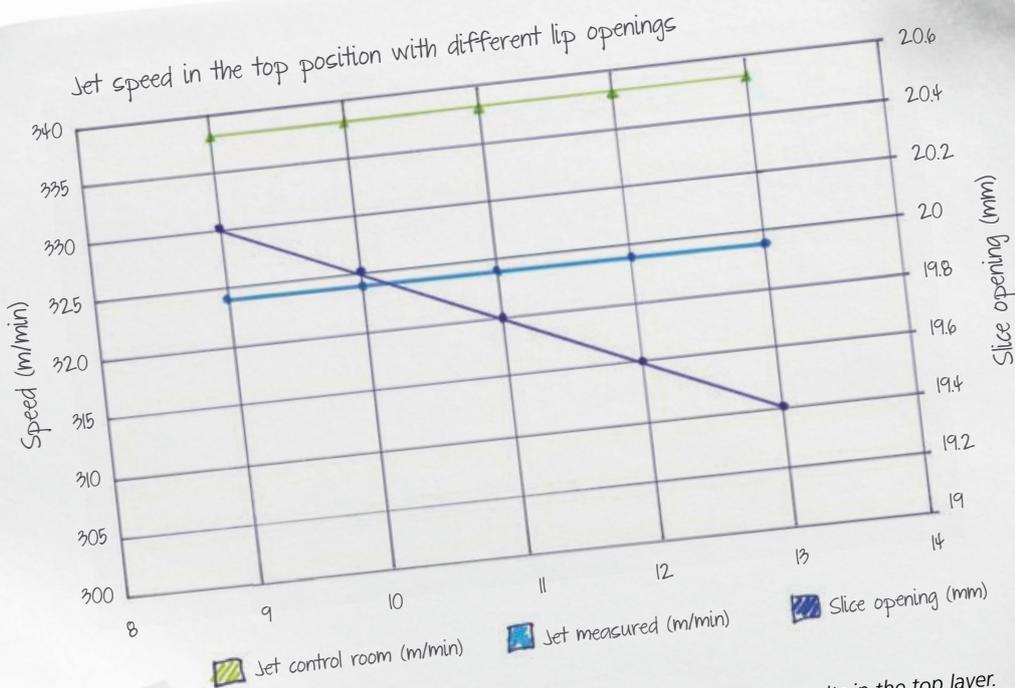


Fig. 3: Measurement results in the top layer.