How SOPHIE simplifies your production

With SOPHIE, Bäumer offers the first ever manufacturing execution system which has been specially developed for the foam processing industry.

With the modular MES (Manufacturing Execution System) SOPHIE, foam processing becomes tangible and usable with full transparency. SOPHIE interconnects the entire foam production, thus increasing the potential of digital technologies for the whole value chain.

Let us show you what this could mean for your production with an example:

Foam Cutting with processing, upholstery and mattress industry, foils for automotive and sale of short blocks

Company size:	240 employees
No. of cutting machines:	25
No. of branches:	1
Automation level:	medium

Tom G. is the production manager.
His goals are clearly defined to improve the quality and efficiency of production.

01 Reduce waste

02 Guarantee traceability of the finished cut products in case of recalls or complaints

03 Production with consistent, reproducible quality, for example through consistent cell structure and block dimensions, quality and efficiency improvement

To achieve his goals, he would like to have a complete overview of his production, but he can hardly collect all the data by himself. He spends a lot of time collecting and evaluating the individual evaluations from the various production areas.

At a previous trade fair, he heard about SOPHIE and asked for advice on what it can achieve in the individual production areas.

1. Order entry

Tom gets himself an overview of the orders that are pending in the near future. The plan is to produce mattresses of various sizes, qualities and materials. The orders were selected according to their quality and size. Tom checked this request against his inventory. Up until now, the daily production had to be planned manually, from order entry to manufacturing. However, manual nesting is not accurate to the piece: The machine operator only nests one type of mattress in the block until the whole block is filled. Until now, this has inevitably led to overproduction and stockpiling.

With SOPHIE Tom G. has direct access to the stocks in the long and short block storage. SOPHIE automatically displays the optimal blocks for the current production. The data on the available blocks are recorded in the system, including dimensions, weight and exact position in the warehouse. The blocks were precisely scanned so that deviations from the norm, such as foam defects such as bubbles, sagging, unevenness or craters were detected by SOPHIE. This is already taken into account when assigning the optimal block.

SOPHIE nests accurately to the piece and fully automatically by scheduling the complete daily production in one go. Fewer employees are required for the planning of the production and the operation of the machines. Manual interventions are not necessary, but still possible. The entire production becomes faster and more cost-efficient.

2. Tank storage and foaming

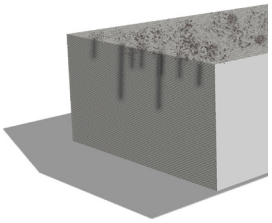
In tank storage, Tom talks to his colleague Frank, who is responsible for foaming. Frank complains that there are not enough foam blocks of the desired qualities in stock. Frank monitors the fill levels and raw materials and has to check manually whether sufficient chemicals are in stock. These may then have to be reordered.

- **With SOPHIE** the data are linked together and orders are triggered automatically.

Again and again the problem occurs that, despite having been made to the same recipe, the foam quality of the fresh block is not constant.

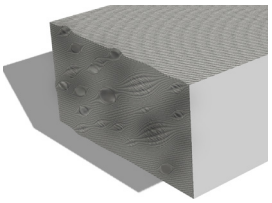
- **With SOPHIE** all data from the tank storage and all production data from the foaming plant are retrieved in real time. In addition, temperature, air pressure and humidity can be measured. These data show under which conditions a certain foam quality was achieved.

OVERVIEW FOAMING ERRORS WITH LONG BLOCK



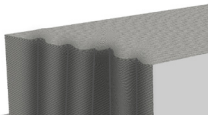
Indentations on the upper side

The foam has a very uneven surface with indentations on the upper side. These can be so-called craters or tears, which can occur when the block leaves the foaming tunnel.



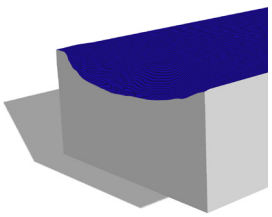
Cut side showing bubbles

Air pockets have formed during the foaming process. The so-called pin holes cannot be detected from outside. They only become visible when the block is cut open.



Uneven cut side

The foam has a cut side with an uneven surface.
Cause: Dull blade

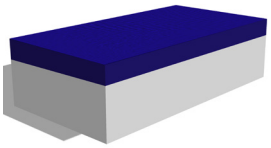


Unstable material

The block is “bulging” directly after leaving the foaming channel and/or has collapsed in places. This can also occur during the maturation process, or when the foam is stacked in a long block storage.

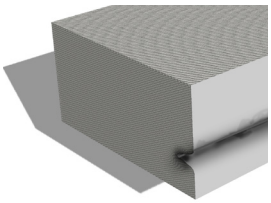
Fissures on the cut side

The block is torn on the edge of a cut side.



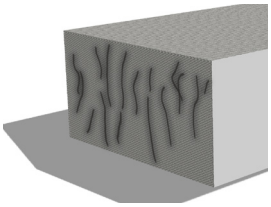
Wrong size

The planned block height was not reached during foaming.
Cause: Incorrect foaming (incorrect recipe) or the foaming channel was set incorrectly (incorrect width).



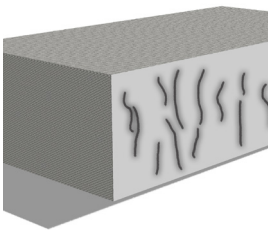
Surface too sensitive

The material is brittle on the longitudinal side in the lower part of the block.
Cause: Strong reaction occurred during the final curing of the block due to incorrect foaming.



Torn cut side

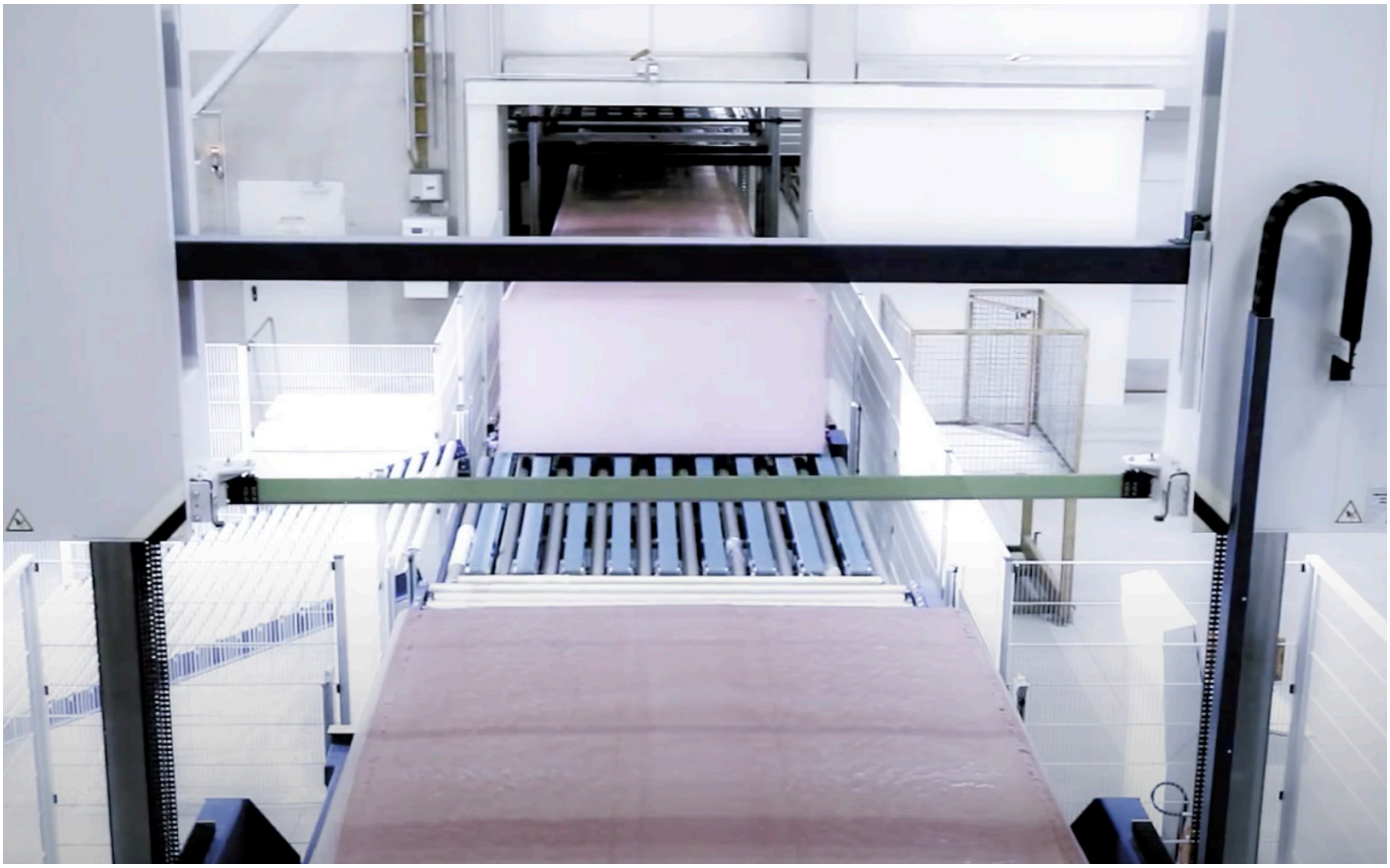
The foam is broken or torn on one cut side. These damages occur when the block leaves the foaming tunnel.



Torn sides

The foam cracked or ripped when the top layer was removed or when it was cut. These cracks can penetrate very deeply into the material.
Cause: Wrong / dull blade or fast movement of material.

3. Cutting to length



The continuously produced foam block is cut into long blocks. Usually, these blocks almost always have the same length of 30 meters. Tom would prefer that the blocks could be cut to length individually, depending on the orders. This would significantly improve the waste rate.

- **With SOPHIE** the long block can be cut to length individually, including long block nesting. For example, the first cut is made after 28.5 meters, the next after 31 meters. This significantly reduces waste. With SOPHIE, the long block production can be optimally adjusted to future orders.

Tom also has the problem that the block dimensions change over time. The exact reason for this is unclear to him. Most of the time, large deviations are only noticed when the block arrives at the cutting machine.

- **With SOPHIE** the long block is 3D scanned and weighed directly after foaming. These data can be retrieved at any time during the entire process the long block passes through.

Tom usually foams the long blocks a little bit higher and wider as ordered, because the degree of shrinkage cannot be calculated precisely. In this way, he ensures that the block always keeps its required minimum height and width.

- **With SOPHIE** and based on its data, more precise foaming without any “safety surplus” becomes possible. This leads to waste reduction. It is possible to save up to 1.5% of the raw material. With an annual production of 10,000 tonnes, this corresponds to around € 420,000.

4. Long block curing racks and crane storage

Tom notices time and again that blocks of the same quality do not mature the same way in the curing racks. Especially in countries with heavily fluctuating climatic conditions in terms of temperature, humidity and air pressure, the dimensions of the long blocks can change quite drastically. A block lying on the edge of the storage area cools down faster than one lying in the middle. The blocks lose weight to varying degrees and the dimensions change, which leads to unpleasant surprises for the further production process.

- **With SOPHIE** the temperature of the long block can be measured during the curing process. Lancets are inserted in the block to record the different temperatures during the maturing process. This creates a temperature curve that allows conclusions to be drawn. It is possible to control when the block needs to be moved to a new position so that its dimensions change as little as possible. The data collection permits to react to factors and influences. After curing, the long block can be 3D measured and weighed again before it is sent to the crane storage or directly to the short block line. Now you can see how the long block has changed its weight and dimensions. The shrinkage or loss of weight is an important indicator to assess to what extent the block still meets the specifications and where the deviations are. These block data can be used for automated nesting within the block. Subsequent shrinkage is detected early and correlations can be analyzed thanks to SOPHIE.
  In addition, it is possible to re-measure blocks completely after storage or crushing. In this way, possible influences on the dimensions of the long block during stacking in the crane hall are detected. These findings can be used to determine which block qualities should not be subjected to high pressure during stacking.
  Visco-blocks, which usually remain in the curing storage, are scanned and weighed in advance after the curing process. This means that they too are ready to make optimal use of resources with the help of the nesting programs.

Tom is struggling with storage capacity, depending on the order situation. The curing storage is simply too small at times. As a result, he sometimes has to move blocks that are not fully cured to the crane store at a higher temperature. There, a not fully cured block then finds itself at the bottom of the block stack, resulting in its cell structure still being influenced in an uncontrolled way.

- **With SOPHIE** this allows conclusions to be drawn about stacking behavior. In the future, these blocks will be stored at the top. This ensures that there are no surprises at the cutting lines.

5. Cutting

It worries Tom that he can only increase his efficiency slowly and that the workflow on the cutting lines, i.e. the foam cutting machines combined into production lines, is not running smoothly. Deformations as well as holes in the short blocks cause problems that only become apparent when the cutting result is examined.

- **With SOPHIE** the block is scanned by means of a 3D procedure and possible internal and external deformations of the block are visualized and detected early on, even before the first cut has been made.
  In connection with the modules Bäumer Nest and Mattress / Rail Nest, Sophie can plan the parts to be cut (daily or partial production) with exact timing.

Short block line

Since the data on the actual block (foaming date, quality, density, exact dimensions) are available, the long block is now cut into predefined short blocks according to the specifications of the nesting program using cut-to-length machines such as the BZM-A or ABLG-2 from Bäumer. When nesting the cutting programs, individual time specifications for the availability of parts during the production process can also be taken into account. The corresponding cutting program and the machine type on which they are to be processed is automatically assigned to the short blocks. If there are several machines of the same type, SOPHIE assigns the block to the machine that is most quickly available.

Tom G. often finds that a long block cannot be completely filled with cutting programs. However, these end pieces must be cut into short blocks. Up until now, the short blocks were manually transported to an intermediate storage area by forklifts and stacked there. Tom, like other companies, has his own system for visualizing the inventory. These blocks must then be filled with cutting programs by the production department, retrieved and transported to the machines.

- **With SOPHIE** the long block leftovers are cut into predefined standard short blocks. Like all short blocks, these are marked either with an RFID chip or barcode label. In addition to manufacturing date, quality, weight, real dimensions, cutting program (if available), it contains all data required for the complete run through the production process.

THERE ARE TWO POSSIBILITIES:

01 **Manual transport:**
With the help of forklifts, the short block is moved to the storage location, scanned via barcode or RFID and deposited in the appropriate place. This means that the position of a block in the storage area can be located at any time in order for the block to be transported to the machines.

02 **Automatic transport:**
After the cutting process, the short block is automatically transported to the short block storage. Here the blocks are stacked and stored. The blocks are moved out upon request from SOPHIE, including the assignment of the cutting machine and the corresponding cutting program. The transport to the individual cutting machines is performed by high-speed shuttles (100 m/min). This eliminates the need for manual processing of the blocks. The blocks can no longer be damaged or soiled (or similar) and forklifts, including drivers, are no longer necessary.

If the blocks are processed manually / fully automatically on the different cutting machines according to the information, the operator can compare target and actual quantities cut and send a confirmation and feedback to SOPHIE. When doing this, any scrap can be sorted out and reported back to SOPHIE so that it is taken into account in the next nesting.

6. THE KEY BENEFITS AT A GLANCE

01 **Intelligent networking:**
Individual machines no longer have to be controlled manually since the entire value chain is networked, resulting in automated production control.

02 **Quality guarantee:**
Data-based production control guarantees consistent quality - independent of the operator.

03 **Efficiency:**
Production is constantly optimized on the basis of continuously collected data: Costs are reduced, quality is increased – sustainably.

04 **Optimization of material costs:**
Resources are conserved and the material is optimally utilized.

05 **Transparency:**
The entire production becomes completely transparent from A to Z.

06 **Fault analysis:**
Defects and faults in manufactured products are detected at an early stage, and complete product tracking in the event of a complaint is also possible.

07 **Flexibility:**
Customer orders are processed faster and in a coordinated manner thanks to the central control: The machines automatically receive the necessary data and execute the work steps.

08 **Synchronization:**
Logistics processes are perfectly integrated into the production.

09 **Always up-to-date:**
Real-time retrieval of the production status.

10 **Security:**
State-of-the-art information technology ensures the security of data and systems.

11 **Future-proof:**
The potentials of future developments remain assured.

12 **Material allocation:**
Since foam blocks are clearly marked as reserved, there are no accidental multiple allocations of one and the same block.

13 **Smart search:**
The search function lets you find blocks based on different data areas, e.g. quality, storage location, etc.

Talk to us and tell us about your issues.
Together, we will find the optimal solution for you.

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