

# *Disrupting sheet cutting with robotization and new cutting software*

## *Yaskawa Levanto*

For most printers/bookbinders a sheet cutter line is necessary but quite anonymous and ignored. It is not a profit center, and there is no profound focus on its productivity. A careful study of the sheet cutting process shows that a lot can be done to improve production capacity, productivity and the operator environment with automation and robotization.



*Robotizing  
the printing  
industry*



# Sheet cutting jobs

**A variety of jobs has to be processed at a sheet cutter. This can be anything from trimming unprinted paper or finishing a poster to cut flyers, business cards, labels and magazine covers out of sheets.**

The time for cutting a stack is more or less proportional to the number of cuts across the sheet. So it takes the operator a lot of time to cut a sheet with a lot of small elements like business cards, while a job with few cuts like a poster is done very fast.



*The robot is God's gift to sheet cutter operators!*

Most sheet cutter operators will state that it is more complicated to cut a high stack, because the knife draws in the sheets, but generally speaking it takes the same time to cut a high as a low stack.

A good stipulation is that it takes around 15 seconds to perform a cut. On top on this the stacks must be moved in and out of the sheet cutter as well as turned. Cutting 4 magazine covers out of a 40" sheet (8 cuts) takes around 150 seconds and with 120 mm stacks under the knife this corresponds to marginally more than 3 x 40" pallets with 90 cm piles per hour – excluding make-ready time.

## Sheet cutter make-ready time

A 90 cm pile holds, depending on sheet thickness, 4-10,000 sheets. The majority of today's jobs are short run jobs, so full pallets are rarely processed, which indicates many pallet- and job changes per hour. This makes the make-ready time highly fundamental. With 1 make-ready per hour it is not so important if it takes 1 or 5 minutes, but with 4, the difference is dramatic.

The sheet cutter manufacturers offer a wide range of software and options, which significantly shortens the make-ready time and automate the cutting process. In combination with a robotization these options are highly productive.

## Filling the vibration table

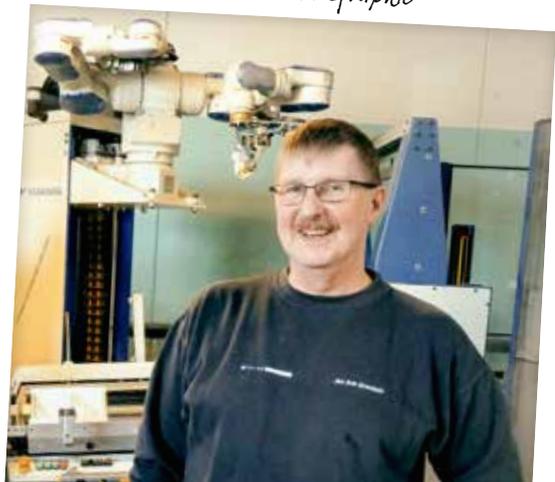
The time for filling the vibration table depends on 3 topics:

1. Ream weight (thickness)
2. Ream cycle time
3. Stack height on the vibration table

Generally speaking, separating, airing and moving thicker and heavier reams fills the vibration table faster with a given ream cycle time. In practice this is a truth with limitations, because thicker reams make the operator tired faster. Lifting very thin and light reams is easier, but as the cycle time hardly is faster with very thin and light reams, the optimal productivity is reached with a decent ream thickness. Experience shows that most operators prefer to lift reams of around 8 kilos with a cycle time of around 10 seconds. If the vibration table operator works intensively he can, for a short period, handle around 3 x 40" pallets with 90 cm piles per hour, but he can hardly perform this way over a full day. And this figure does not take pallet changes and eventually pile turnings into consideration, so the realistic operator capacity is probably closer to 2-2½ pallets per hour at a 2-man operated sheet cutter line, and significantly less at a 1-man operated line.

A robot never gets tired, so robotizing the ream separation, airing and moving implies that rather thick and heavy reams can be processed constantly over the full day. Subject to the material, job quality and pile resting time, Yaskawa Levanto can process around 4 x 40" pallets with 90 cm piles per hour.

*The robot is central at Stibo Graphic*



The height of the stack on the vibration table is also important. Lower stacks makes the table filling cycle time longer, because this cycle includes an emptying of the table, but this does not have a dramatic impact on productivity. The real stack height productivity impact occurs at the sheet cutter, because running ½-height stacks reduces the production capacity with around 50%.

### Operator knowhow

The operators accumulate a lot of knowhow over time. This does not only relate to how to handle various types of jobs, but also how to manage the operation. How to optimize the balance between pile heights, ream thicknesses and stack heights without other data than eye-evaluations? This requires a nearly artistic skill and makes the skilled operators far more productive than the unskilled ones.

What is wearing the majority of sheet cutter operators out rather fast is the heavy and unhealthy lifts at the vibration table, so robotizing these lifts not only relief the operator from this unhealthy job, but also improves the working environment dramatically and prevents the operator from being worn out. Robotization is a pure win-win situation, because it protects the health of the operators while it at the same time maintains the knowhow and the high operator productivity at the production line.

### 3 separate activities

Sheet cutting contains of the 3 separate activities:

1. Filling the vibration table
2. Cutting the sheets
3. Processing the cut products

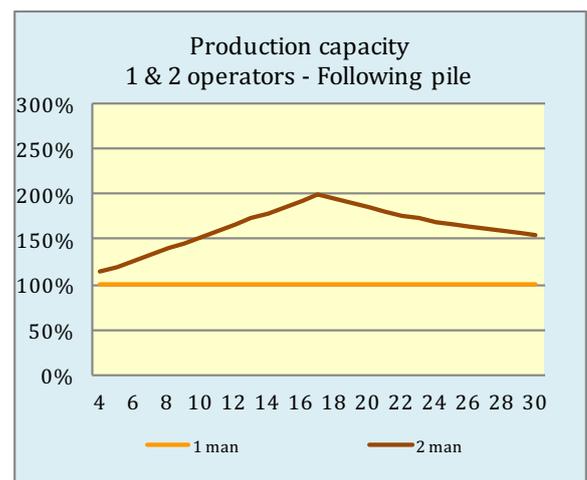
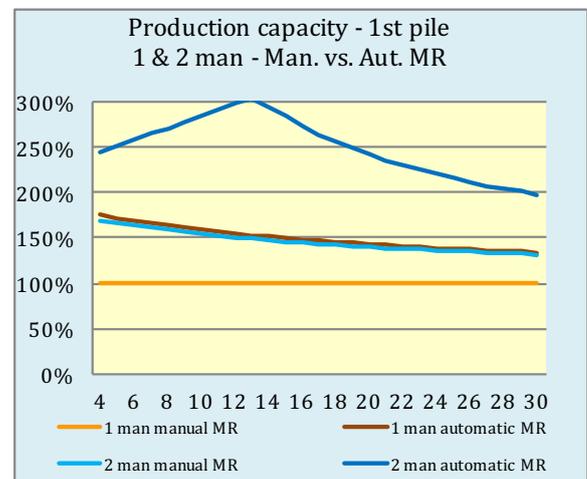
The 3 activities can be performed in sequence by 1 operator or parallel by more operators. The central topic is that if the times for filling the vibration table and cutting the sheets do not match one of the production processes stand idling. If it is a 2 man operated line, one of the operators stands idling, so while adding a 2nd operator increases the production capacity it will in most cases both decrease productivity and profitability. (But as the sheet cutter line normally not is a profit center one does not really know anything about its profitability!)

### 1 vs. 2 operators

All sheet cutter lines can be 1 man operated. The advantage of adding a 2nd operator depends on the balance between sheet cutting and vibration table filling (i.e. number of cuts across the sheet) and if make-ready is considered or not.



*The robot relieves the operators from heavy work*



For old sheet cutter lines without make-ready and cutting software the advantage of the 2nd operator is questionable, while a sheet cutter line with all modern automation profits a lot of the 2nd operator.

For following piles, where the sheet cutter automation has less impact, the advantage is also questionable. The biggest advantage of the 2nd operator is obtained in the rare cases where the times for sheet cutting and vibration table filling match.

# Yaskawa Levanto is fast and

Yaskawa Levanto handles around 4x40" pallets with 90 cm piles per hour. So it can nearly follow the fastest jobs like cutting posters. With more cuts across the sheet Yaskawa Levanto starts to stand idling – and could consequently supply 2 sheet cutter lines parallel. The most obvious economic advantage of Yaskawa is that it increases the production capacity.

The capacity increase depends on:

1. The run length
2. Number of cuts across the sheet
3. Sheet cutter automation level

The run length determines if the job contains of one or more full pallets or if the pile is less than a full pile.

A stack of 15 cm corresponds to the maximal sheet cutter height and a run length of around 1,000 ex, so this is a typical short run job. Compared to a conventional 2-man operated sheet cutter line without sheet-cutter automation Yaskawa Levanto nearly triples the production capacity while the manning at the same time is reduced from 2 to 1.

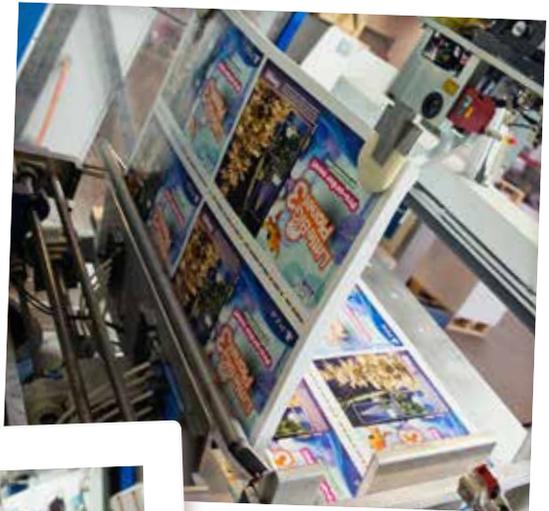
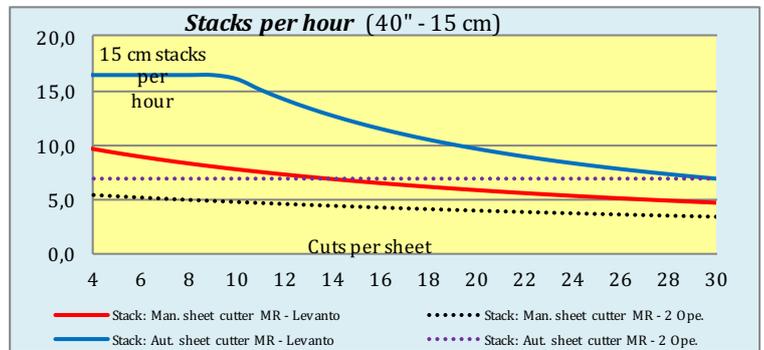
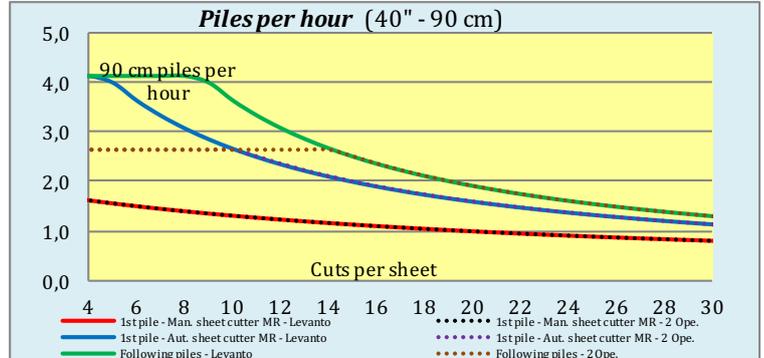
Looking at full piles the capacity and productivity increase is less dramatic, but still significant.

Only in relation to the first full pile produced at a sheet cutter line without any kind of automation the only advantage of adding Yaskawa Levanto is a reduction in manning from 2 to 1. This is because the make-ready time at the sheet cutter is so long that a speed gain at the vibration table is without impact.

## Feeding via the side- or back table

The majority of modern sheet cutters accept feeding of the stack directly to the back table. This configuration has 2 advantages:

1. The operator is relieved for manually pushing the stack from the side table to the cutter table
2. The stack is fed to the back table parallel to the operator removes the cut stacks from the front table. This adds a marginal production capacity to the sheet cutter line.



*Capacity increase!*

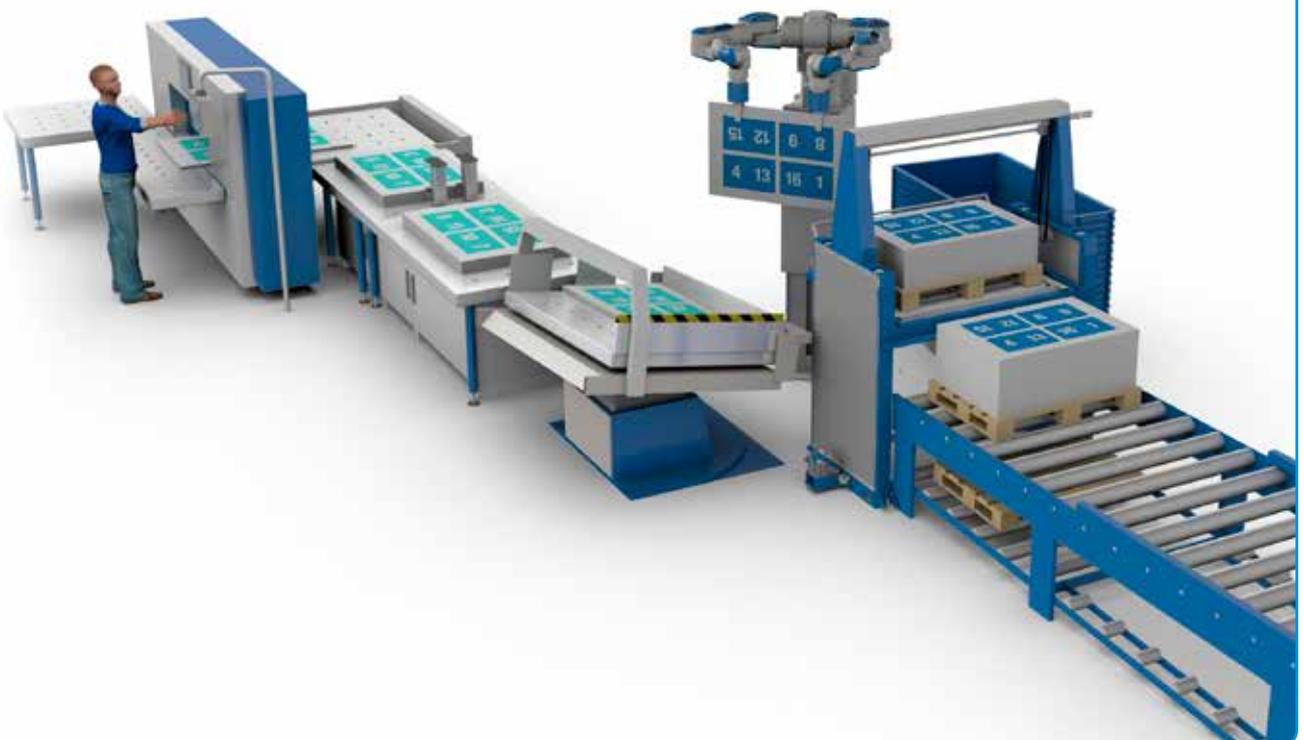


# *increases the capacity*

Yaskawa Levanto for 1 sheet cutter and 1 operator front feeding



Yaskawa Levanto for 1 sheet cutter and 1 operator back feeding

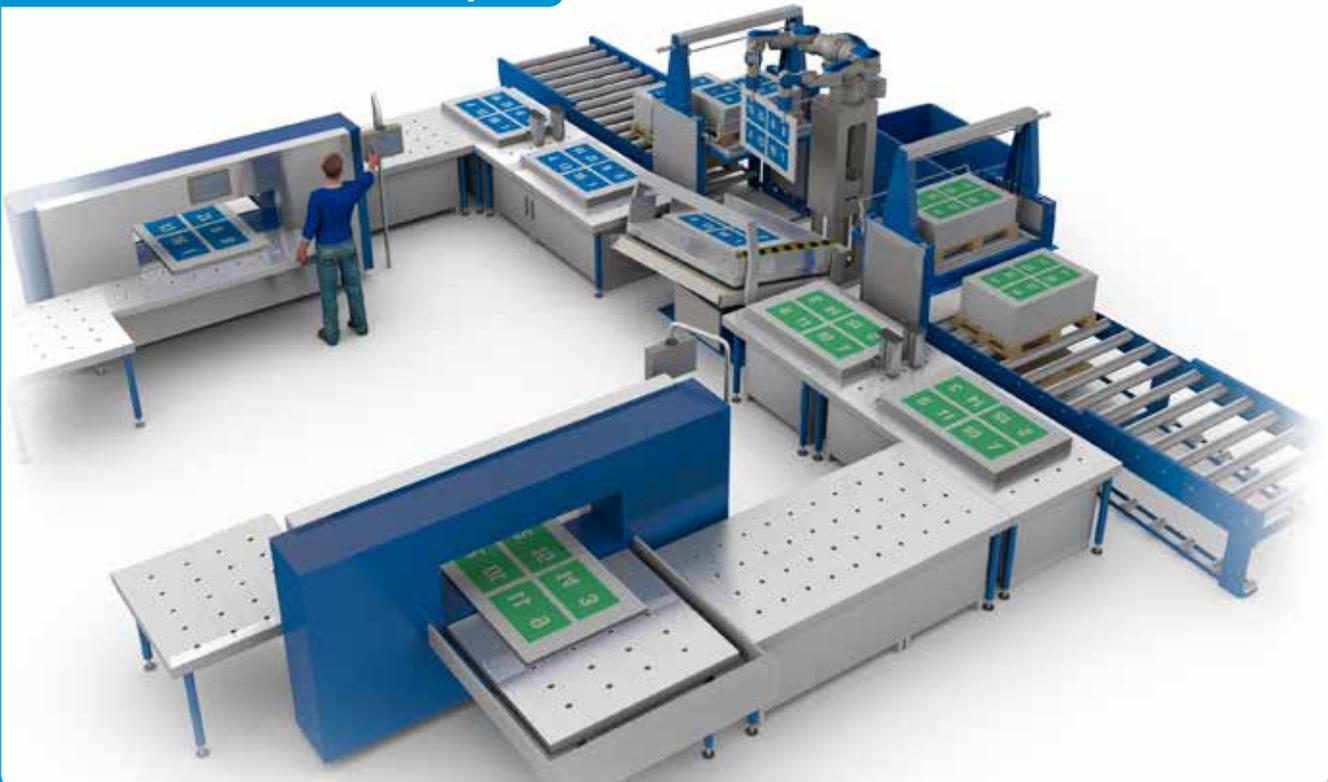


# *Feeding two sheet cutters*

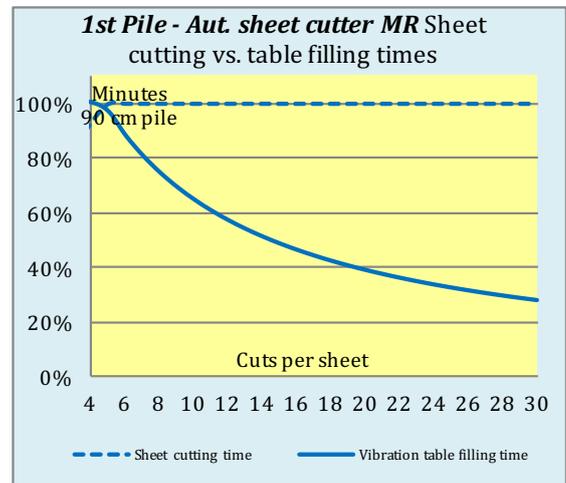
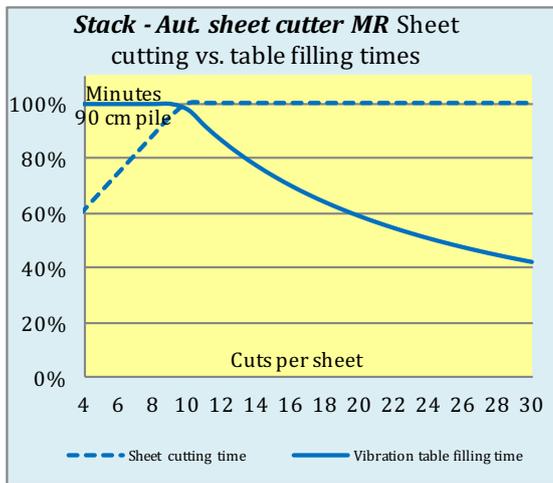
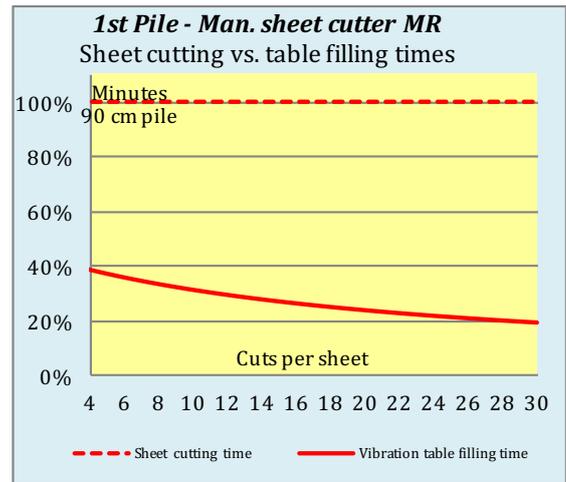
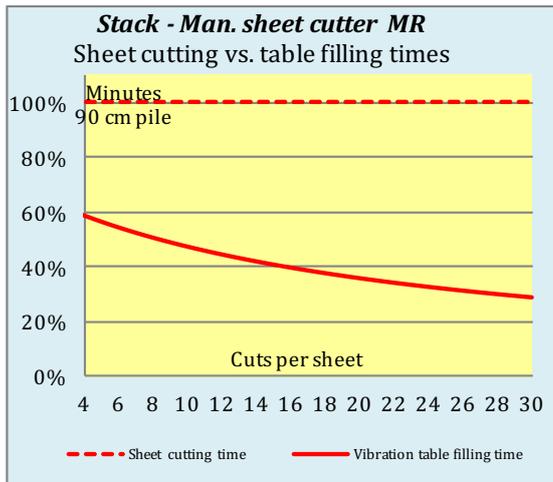
Yaskawa Levanto for 2 sheet cutters and 2 operators



Yaskawa Levanto for 2 sheet cutters and 1 operator



*In many situations Yaskawa Levanto and its vibration table can supply 2 sheet cutters*



### Relative use of capacity

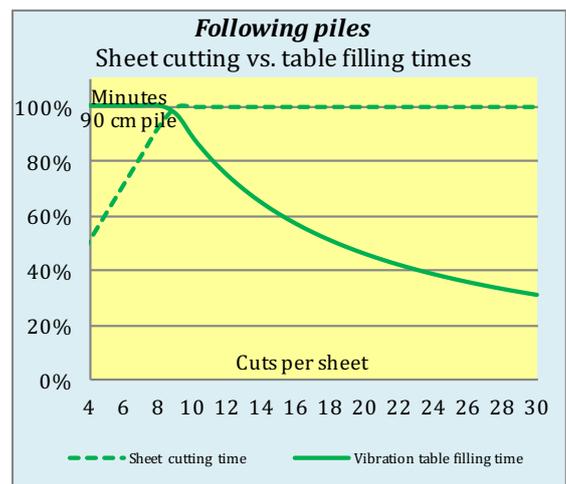
Examining the relative use of capacity of both the sheet cutter and the vibration table shows that Yaskawa Levanto in the majority of situations stands still without working, because it takes much longer to perform the cutting than feeding the vibration table.

The most extreme situations occur when stacks and 1st full piles are produced on sheet cutters without automation software.

But even in connection with sheet cutters with a lot of automation the use of Yaskawa Levanto and the vibration table quickly drops. The balance point with the full capacity use of both the automated sheet cutter and the robotized vibration table occurs at roughly 8 cuts across a 40" sheet, and the majority of today's short run jobs have much more cuts.

The two alternative configurations show Yaskawa Levanto and its vibration table supply 2 sheet cutter lines parallel, where the one line is 2-man operated, while the other is 1-man operated.

The choice between 1 or ½ a man per sheet cutter line depends on the automation level of the sheet cutter. The leading sheet cutter manufacturers offer features and software where the stack is automatically fed to the knife and even turned, so in some situation it might be possible to let 1 operator run 2 sheet cutters, because the automation level is so high.




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If you want to know more about the economics of sheet cutting? Ask for the document: "The economics of sheet cutting".

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**Graphic Robotics** is a company specialized in R&D, production, marketing and support of Yaskawa's industrial robots for the printing industry. Graphic Robotics was established in July 2016 by partners participating in the development of Yaskawa Levanto, which is the first robot system in Graphic Robotics product line.

Yaskawa Levanto is developed by Yaskawa Nordic in in close a cooperation with The Danish Technological Institute, Cool Graphics and specialized companies within robot-system R&D and manufacturing.

Our systems have, through a network of local graphic organizations, qualified service and support around the clock.

**For more information**

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