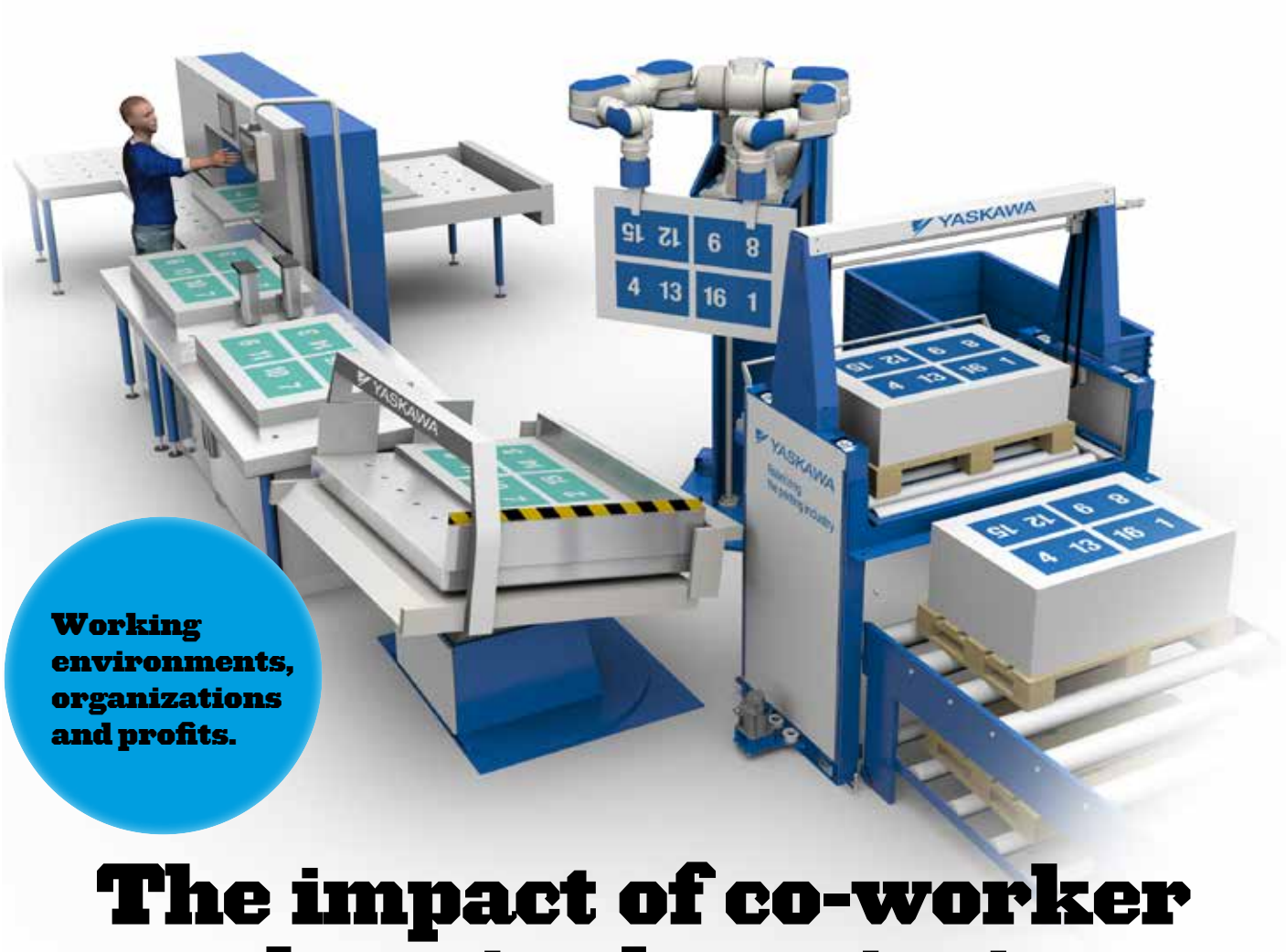


Working environments, organizations and profits.

The impact of co-worker robots in the printing industry 2017

During my years in printing I have seen a lot of sheet fed printing plants around the world. Common for them all are that after printing, a lot of pallets with printed products are moved from one finishing machine to another, where the operators then lift the material in and out of the machines. A heavy, unhealthy and undesired job, which simply, by all normal human standards, should be eliminated.

BY HENRIK CHRISTIANSEN, PRESIDENT & CEO OF GRAPHIC ROBOTICS

Robots take jobs away"? Whoever invented this statement ignored that any development has done exactly this since the beginning of life. Experience also shows that all good developments (and robots) constantly have generated new jobs and expanded our economies.

The statement also neglects that there exist two kinds of jobs: the ones, we want, and the ones, we don´t want!

Within the printing industry the heavy manual lifts are jobs we don't want, and there exists absolutely no good reason, why we should not automate or robotize such jobs. The conventional printing equipment manufacturers are trying their best to eliminate them with mechanical solutions – but with questionable degrees of success, mostly because many heavy manual lifts need to include separation, airing and registration processes. The liftng processes are far more complex than they appear to be at first sight.

Yaskawa Levanto's basic movement pattern is pre-programmed, but the skilled and experienced operator decides parameters like ream and stack thicknesses, twisting angle, airing intensity etc from the Yaskawa Cockpit touch-screen PC.

”The co-worker robot is new to the robotic industry

To perform the heavy manual lifts efficiently require, apart from muzzles, extensive operator skills, experiences and perceptions of the processes, which makes it impossible to develop mechanical solutions which substitute the heavy manual lifts without various sacrifices.

When we let a modern co-worker robot perform the heavy lift by copying the operator's movement pattern down to the tiniest details, we secure that the required complex movement pattern with airing, separation and registration is maintained while the heavy lift at the same time is automated.

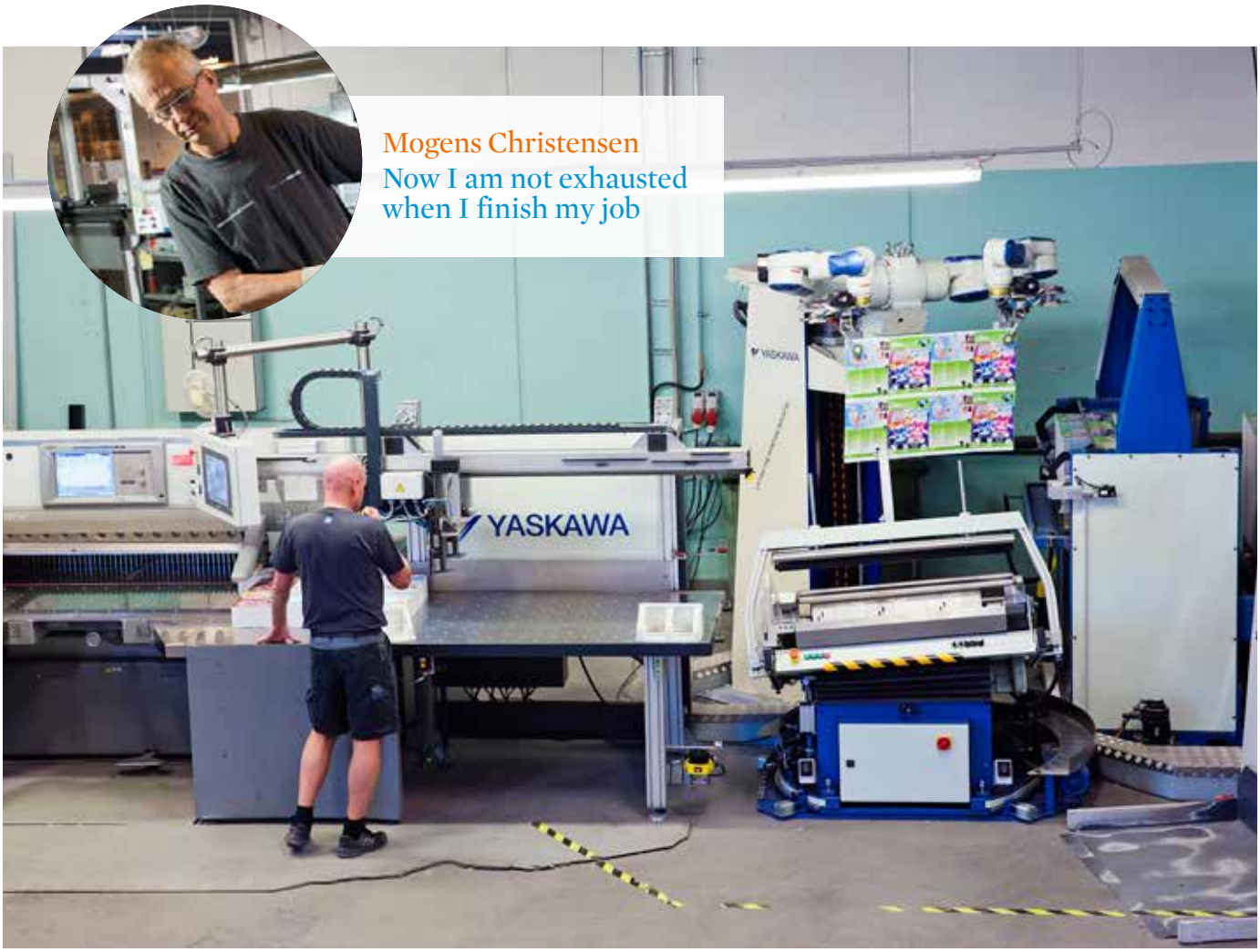
ROBOTS & CO-WORKER ROBOTS

The conventional definition of a robot is: "A manipulator, which is moveable in 3 or more directions and which can be programmed to perform a specific task". This means that the robot only can do what it is pre-programmed to do.

The co-worker is different, because it is a conventional robot integrated into an operator controlled production line, where a lot of different - and unpredictable - things can happen during the production process.

The big advantage is that the co-worker

The grippers twist, airs and separates the ream of sheets decided by the operator.



Mogens Christensen
Now I am not exhausted when I finish my job

robot enters into a close cooperation with the operator, who can change the settings about, say, the ream thickness or airing intensity in the robot program in realtime any time during the working process.

This is something which really disrupts the printing industry, because everybody familiar with printing knows that it is impossible to pre-program the complex manual handling processes in printing and finishing.

Even a reprint of a known product is a new and unknown job, because if the humidity or temperature in the paper or something else fluctuates, the product changes its behavior.

All experienced operators know and feel that even invisible changes require that the specific product is handled in a special way – something which a robot consequently also must do, but something which a conventional robot never will be able to do.

With co-worker robots it is suddenly possible to transfer the skilled operators' experiences and knowledge to the robot in realtime. So the operator profits from the robots ability to eliminate the heavy manual lifts, while the robot profits from the operator's skills, and a good co-worker robot does not function without a good operator. This is the future of print manufacturing available here and now in 2017 and a pure win-win situation for both the operator and the production process.

If somebody tells you that the new, modern co-worker robots are very easy to program, be careful, because even though this statement is correct, it is not the robot, but the process to be robotized, which holds the challenges. Simple processes are easy to program, but complex processes are – and will for a long time be – extremely challenging to program, and many lifting processes in printing are extremely complex.

Yaskawa Levanto eliminates many heavy lifts and demonstrates that it is not only human beings who can air and separate printed sheets perfect at a sheet-cutter line. Yaskawa Levanto has a careful human touch and lifts much more – without ever being tired.

There are two kinds of jobs: the ones, we want, and the ones, we don´t want!

The operators get a better job

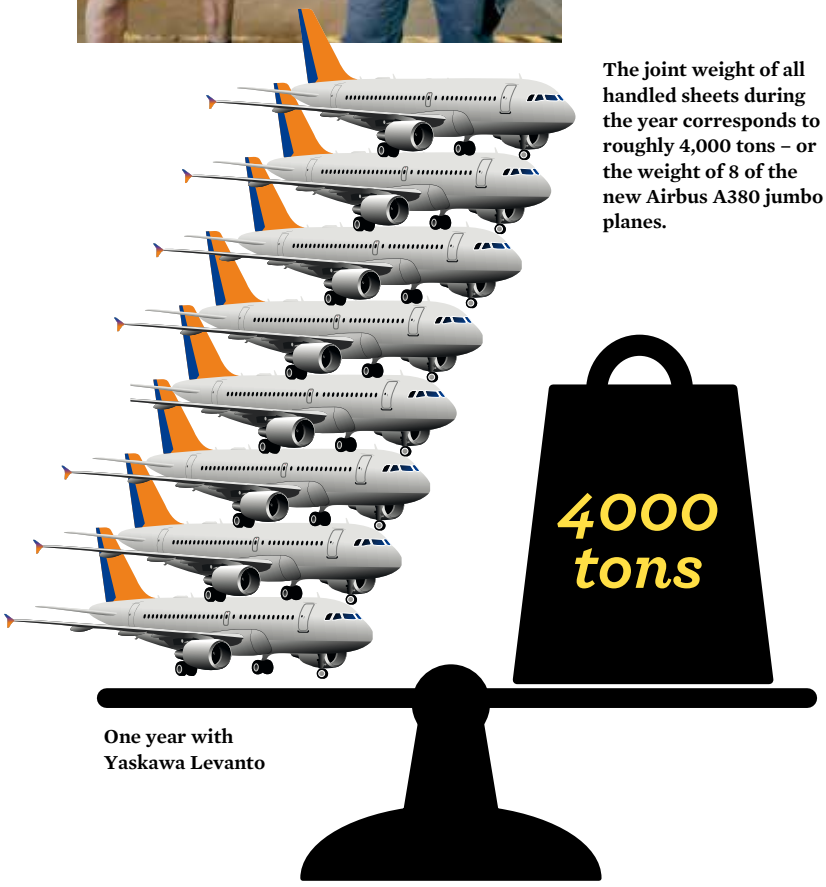
What happens, when the operators are relieved from lifting 5-8 tons per shift?

a. The operators can suddenly focus on the activities where their experiences and knowhow matter, and everybody, women and men, big and small, old and young can work efficiently in finishing as long as they possess the appropriate skills
b. The operators are no longer exhausted, when their shifts end, which opens up for a new, active and more satisfactory leisure life – which again opens up for more efficient, motivated and unstressed employees during the working time
c. The operators are no longer physically "worn out" prematurely, due to problems with backs, shoulders, arms and fingers, and this something both the operators and the companies profit from. Apart from the fact that nobody in today's modern production environment should be asked to perform activities, which have a negative impact on the health, the satisfied, motivated and healthy operator can stay with the job as long as it is appropriate and challenging, and the company has an appreciated, experienced operator, who is productive over time, instead of frequently having to train new inexperienced operators, with the drop in productivity this generates
d. Changing a working position into something, which requires knowledge and supervision instead of muzzles to constantly feed and empty machines, also implies that one operator might be able to control more production lines parallel, which adds even more to the overall productivity

Another spin-off of robotizing the heavy manual lifts is that the jobs in finishing suddenly get more attractive for the demanding millennium generation, which requires jobs with intellectual challenges to be motivated and thus productive.

Changing the job requirements to a higher level simply makes it easier for printing companies to procure skilled and motivated young employees, something which is starting to be a real serious problem in the printing industry in highly developed areas.

Yaskawa Levanto separates, airs and moves a ream of sheets from a pile to a vibration table. This releaves the operators at Stibo Graphic AS in Denmark, Johnny Larsen and Jan Erik Grandahl from this heavy work.



The joint weight of all handled sheets during the year corresponds to roughly 4,000 tons – or the weight of 8 of the new Airbus A380 jumbo planes.

One year with Yaskawa Levanto

The financial consequences of robotization

Robotizing a production line means substituting labor costs with capital costs, in order to increase the return on the invested capital, so the incentive to robotize is not linked to the value of the existing production line as such, but to the value generated from the production line with or without robotization. Running robots in shifts reduce the costs per shift, while salary costs increase when running shifts.

The typical monthly financial and running costs of one co-worker robotcell for heavy lifts match, more or less, the monthly salary of one operator in a high salary area.

The typical financial key in high labor cost areas is that roughly 50% of the turnover is used for salaries in modern, automated, but not robotized finishing companies or divisions. Robotizing the finishing lines and running shifts reduce the labor cost ratio to between 15% and 20%.

The robotized costs of producing one unit (brochure, magazine etc.) is lower than the production costs in any low salary area, improving the competitiveness dramatically and eliminating any intensive to outsource the production.

Insourced production improves the competitive position by producing close to the market with short delivery times.

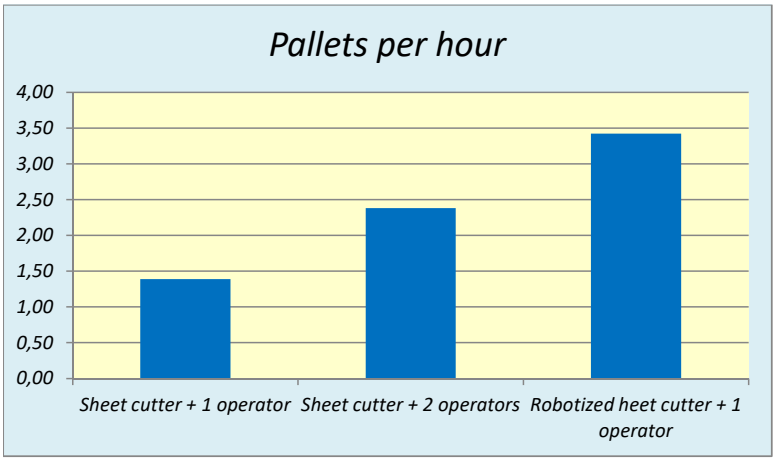
THE MANAGEMENT CONSEQUENCES OF ROBOTIZATION

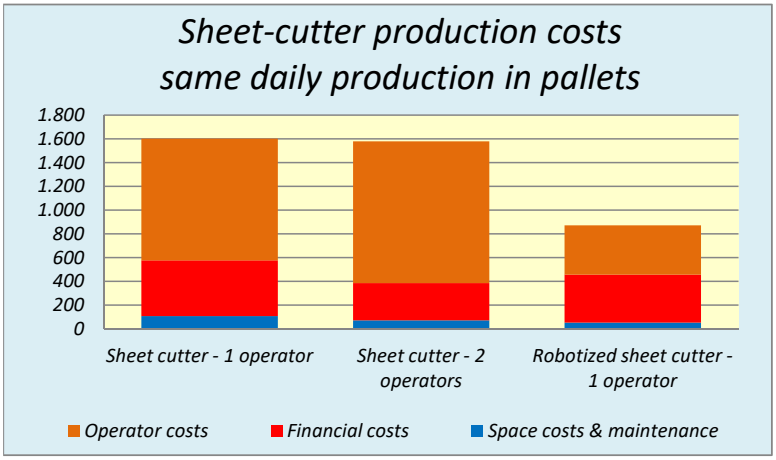
Robots are never sick (but they need service from time to time), and robots have no incentive not to produce at the most optimal speed all the time, so removing the unpredictable human element in the production process makes the planning easier.

Robots register constantly in real time all running parameters and stop reasons so it is easy to check if the planned and realized production conditions match, and perhaps even more important, if something did not come out as planned, what happened? Is a specific job more complicated than estimated, or did something else go wrong in the planning?

It is of course also possible to measure, if some operators are more productive than others, and as the "muzzleparameter" is removed it is easier to spot reasons for the differences and implement programs to increase operator productivity.

Robotization makes production and storage conditions uniform and easier to manage, price calculations are easier, and data for efficient after calculations are readily at hand, making it possi-





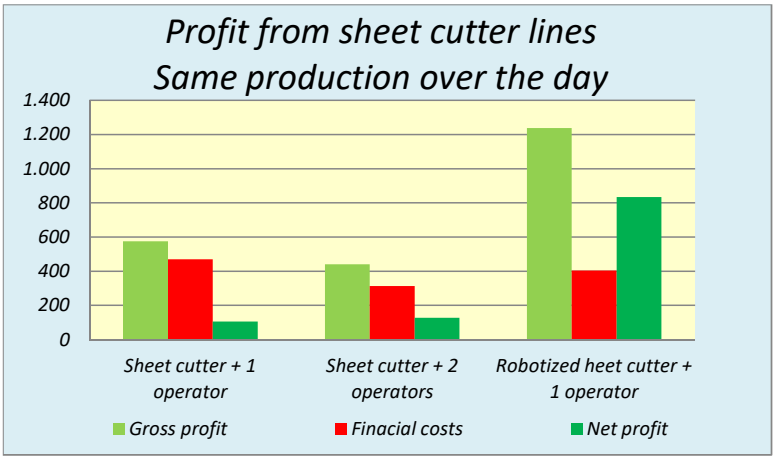
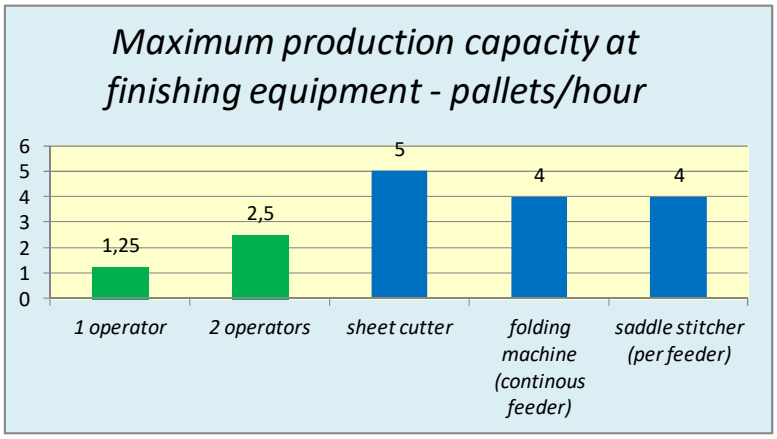


Diagram 1 shows that a sheet-cutter line with 1 operator can produce around 1.5 pallets per hour. This increases to 2.5 with 2 operators, while the sheet-cutter line produces 3.5 pallets per hour when the single operator is assisted by the robot. (Based on 8 cuts across the sheet.)

A fair comparison must be based on letting various production lines perform the same production, so one needs more than 2 sheet-cutter lines with 1 operator to perform the same workload as 1 sheet cutter line with 1 operator assisted by the robot. This increases the labor costs and total costs of the non robotized sheet-cutter lines dramatically (diagram 2), which has a significant impact on both gross and net profit from a job (diagram 3).



The lifting capacity of one strong operator is around 1,500 kg per hour. This corresponds to lifting around 2.5 full 40" pallets per hour. The maximum production capacity of the various finishing machines is, subject to products and production conditions, between 4 and 5 pallets per hour. If he same operator has to both fill and empty the machine his capacity is corresponding to 1.25 pallets per hour through the production machine, which is a significant limitation of the machine's maximum production capacity.

Yaskawa Levanto revolutionizes sheet-cutting

ble to streamline future production conditions. The overall management task simply gets easier and more efficient.

THE ECONOMIC IMPACT OF THE HEAVY MANUAL LIFTS ON THE PRODUCTION

The real economic impact of the heavy manual lifts on the production process and flow are the limitations linked to the manual lifts.

A strong and motivated operator can lift, perhaps, up to around 1,500 kg per hour, when lifting is the only activity, he performs. This is a huge figure, and it is highly questionable if the operators in fact lift so many kilos over the day, but to have something to compare from, this figure corresponds to 2-2½ 40" pallets with 90 cm piles (5-10,000 sheets, depending on sheet thickness) per hour.

Shorter runs generate more pallets and fewer kilos per hour, but the core of the matter is that manual lifting generates a limit in production capacity.

Reading the specs of sheet cutters (up to 5 pallets/hour – very few cuts across the sheet), folding machines with continuous feeders (up to 4 pallets/hour – short side feeding), saddle stitcher (up to 4 pallets/hour per feeder station) and other finishing equipment indicates that their mechanical production capacity is much higher than the potential lifting capacity of even the strongest and most motivated operator. It is beyond any doubt that the human lifting capacity limits the production capacity of the various finishing lines dramatically

And please observe, we focus on the feeder side. What comes in must come out, so the production line needs an operator at the delivery side too. If the operator shall handle both feeder and delivery sides the production capacity is reduced accordingly.

The key to profitability is operator productivity, and when one adds robots to a production line the operator productivity increases dramatically with the increase in production capacity.

Adding a second operator instead of a robot to a finishing line does not even double the production capacity, so the consequence is a drop in operator productivity and consequently a drop in profitability.

WHAT HAPPENS WHEN WE ROBOTIZE THE HEAVY MANUAL LIFTS?

a. The production capacity increases
b. The number of required machines is reduced
c. The pallet flow gets faster
d. The space requirements for machines and intermediate stocks are reduced
e. The investments in machines and space are reduced
f. The investment in robots and automation increases

Increased production capacity

As the robot's lifting capacity can be designed to match the maximum speed of the various finishing machines, it is these machines' speed and not the operator's lifting capacity, which determines the capacity of the production line.

Depending on the job structure, robotizing the heavy lifts means at least a doubling of the production line capacity, but it can be much more, depending on the handled product, the operator's psychical lifting capacity and motivation to lift as much as possible all the time.

More production capacity combined with

less manning means a better profitability and operator productivity – of course subject to the increased production capacity can be sold.

Faster flow and on demand production
Doubling the production capacity means reducing the flow time through the production line with 50%, and as roughly 60% of the production time for printed matters is allocated to finishing this has a significant impact on the flow time through the total production process.

On demand productions can be faster, and all delivery times can be shortened, increasing the overall competitiveness, and shorter flow times tend to have a very increasing impact on the profitability.

Fewer machines require less space
Doubling the production capacity also implies that the number of machines can be reduced with 50%, which implies a reduction of costs for investments in machinery and space, while one of course also must take the increased investment costs of robotization into consideration.

Fewer waiting pallets
The number of produced pallets is determined by the production capacity of the printing presses. Another and much more important matter is: "How many pallets are floating around in the production plant between the various printing-, finishing machines and storages"?

When the production capacities of the various finishing machines are doubled in relation to a given number of printed pallets, the number of waiting pallets is reduced or eventually eliminated. This implies less space and costs for intermediate storages and a simpler management process.

Product quality
Experiences from the autoindustry show that one of the major arguments for a robotized production is a high and consistent quality.

The robots have of course no impact at all on the important printing quality, but the robots will secure a more consistent production quality at the positions, where they are installed. If the robots, on top of this, are equipped with barcode readers it is possible to ask the robots to perform a rigid production control, which eliminates potential human mistakes such as cutting the wrong cover for a magazine, so robotization can improve both quality and eliminate waste.

Check out the video

See how Yaskawa Levanto functions in a real production environment with a Polar 137 sheet-cutter.

Robotized airing, separation, lifting and ream transportation eliminates all the operator's heavy and unhealthy working activities and directs all focus towards efficient sheet-cutting.

It is undeniable that robots take away working positions in the printing industry, but it is the unhealthy, undesired and low value-adding working positions. Eliminating them increase the operator productivity, improve the competitiveness and give more business. Let a modern co-worker robot perform the heavy lifts and let the profitable future begin today.