Interreg
Euregio Meuse-Rhine
QRM4.0

EUROPEAN UNION
European Regional
Development Fund

POLCA

TECHNOLOGY SHEET

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POLCA is a production control system for high mix/low volume and custom-made product environments. The system is aimed at keeping the lead times at the shop floor short and predictable. POLCA can be implemented as a simple paper-based system with POLCA cards circulating on the shop floor, or as a digital shop floor control system.

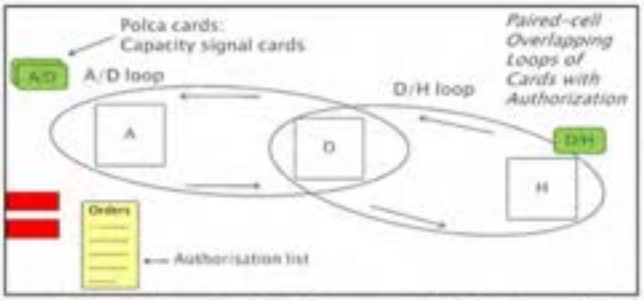
WHICH TECHNOLOGY ?

POLCA stands for Paired cell Overlap Loops of Cards with Authorization. POLCA is a production control system for high mix/low volume and custom-made products environments. The system releases work orders based on the status of the production system, which prevents that the shop floor is overflooded with work and ensures that better decisions are made.

The POLCA control system releases a production order on a workstation based on a combination of two signals:

- An authorisation signal: A schedule authorises the release of a production order at a workstation once a certain defined time (the authorization date) has passed. This prevents that orders are started too early.

- A work in process signal: POLCA achieves this by means of an ingenious card system with overlapping loops. Two consecutive workstations in a routing form a loop (ellipses in Figure 1). A limited number of 'POLCA' cards circulate in each loop. A POLCA-card is basically a capacity signal that indicates that processing capacity is available at the next station or cell. A work order may only enter a loop if a free card of this loop is available. Once an order enters a loop, then a card is attached to the order. Once an order leaves a loop, then the card is returned to the first station of the loop and stored on a visual board. This signals that capacity is available at the downstream station. The last station can always start and doesn't need an additional card. At the intermediate stations, (like D in figure 1), two cards will be attached to the order: an A/D card and a D/H-card. Only one card is attached at the first and last station.



Two overlapping POLCA-loops with POLCA cards

HOW DOES THIS TECHNOLOGY REDUCE LEAD TIME ?

Several effects explain why POLCA reduces the lead time. First of all, POLCA limits the amount of Work In Process (WIP) on the shop floor as the POLCA cards determine the amount of orders that are circulating on the shop floor. The shop floor lead time is directly proportional with the amount of Work In Process. This can easily be understood if you visualize yourself in a long check-in line in a hotel. The more hotel guests in front of you (the WIP of the hotel receptionist), the longer you will have to wait before you get your room key. So, by lowering the amount of POLCA cards in the system, the production manager can effectively reduce the lead time on the floor.

Secondly, the visual nature of POLCA makes it easy to spot downstream bottlenecks (no cards available on the POLCA-board). When no cards are available, operators should work on orders going to other stations. This reduces the chance that these downstream stations will become unnecessarily idle. If no cards at all are available, then there are several options. The first option should be to send the operators to the stations that are the bottleneck. By helping their colleagues, bottlenecks can be resolved, and a smooth flow can be restored. A sufficient level of cross training is needed to accommodate this tactic. Other options are to use the time for training, maintenance work, improvement work, administrative work, team meetings, stock counting,... All these activities help to improve the factory operations.

Thirdly, there are indirect effects of the lower WIP on the overall lead time. Less WIP means less stock on the shop floor, less searching for materials, more space, smaller walking distances,... This can increase your effective capacity on the shopfloor, which further helps to reduce the overall lead time.

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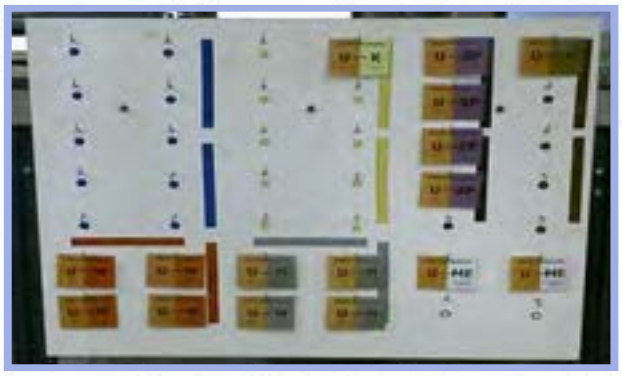
Lastly, the reduction of the shop floor lead time allows companies also to start later and still deliver on time. This increases the flexibility to react to late product changes and gives the suppliers more time to deliver their components on time. This further helps to reduce the chaos on the shop floor caused by late deliveries or unexpected changes.

Companies who have implemented POLCA have further reported a better delivery performance as people are working on the right things, better use of production capacity and lower indirect costs as the planning and steering becomes easier.

FIELD OF APPLICATION

POLCA started as a card-based system made out of paper cards. The first implementation of POLCA in Europe was done by the Dutch company Bosch Scharnieren. Figure 2 shows the POLCA-board of Bosch Scharnieren. Every work cell has a different colour, and the two colours on a card correspond to the routing loop of the card. The picture was taken at the orange work cell and shows all the cards that depart in the orange work cell going to another work cell. There are no cards on the top left side of the board. This indicates that the blue workstation is already saturated with work.



Polca Board at Bosch Scharnieren

Nowadays, several digital POLCA-systems exist that remove the need of physical cards. As a result, cards don't need to be returned and can't be lost. Commercial digital POLCA-systems are currently sold by: PROPOS Software (LINK: https://www.propos-software.nl/) (a spin-out of Bosch Scharnieren), Axxelia with their Timeaxx system LINK https://www.axxelia.com/timeaxx-2/), 3rdWave (LINK https://3rdwave.be/nl/home/) and Scalefactory LINK https://scalefactory.eu/. Figure 3 shows an example of a digital POLCA-system.

The Interreg QRM 4.0 project (link: http://qrm4.eu) supports manufacturing companies by improving their leadtimes through providing practical advice and financial support to companies who want to take steps to implement digital tools on their shop floor.

WANT TO LEARN MORE ?

Contact pascal.pollet@sirris.be

Example of the Timeaxx digital POLCA screen. Availability of cards is displayed by a percentage on the right side of the screen. (Source: axxelia).