BIESSE

Nesting 4.0:

The Evolution of Nested Based Mfg.

BIESSE

Cesare Magnani

Biesse Brand Sales Manager

Technological Evolution

PRODUCTIVITY

FLEXIBILITY

Stand Alone Nesting Machine

Auto Load/Unload
Nested Based Cell

Automatic Storage and
feeding system

Integrated Factory

Stand Alone Solution

Stand Alone Solution

Up to 60 Sheets/Shift

- Small to medium size companies and/or Protoype, Specialties, remakes dept.
- Custom jobs just-in-time
- Reduced floorspace and great accessibility
- Cut, Groove, Bore in a single operation
- User-friendly
- A huge advantage for a machine at this level is having On-board programming software for quick programming at the machine especially for remake parts or small production jobs without the need for a separate CAD/CAM.
- Production of complete jobs can be totally managed by feeding the machine on-board software with simple cut lists, without external CAD/Cam packages.

Stand Alone Solution

Up to 60 Sheets/Shift

Components identification possible through manual label application.

Label application by the operator can be guided to speed up the process and minimize possible mistakes

Manual label application COULD impact productivity as could be sequential to all other operations

Stand Alone Solution

Typical Perfomances

- Sheet Process Time: 3 - 7 minutes
- Load – Unload Time*: 4 - 7 minutes
- Consequently about 30-60 sheets per shift (8hr)

* Load/Unload time is function of the number of components nested but it is quite unpredictable as it is especially dependent upon operator speed and performances.

Stand Alone Solution

Productivity Context

- Loss of Efficiency as machine and operator work alternatively and not in continuous mode
- High Downtime due to operator handling, loading and unloading operations. Reduced productivity
- Loss of Quality due to multiple manual handling of panels, raising the risk of scratching and damaging
- Higher Probability of mistakes
- High Labor impact and cost for operating machines tooling-up and for material handling
- Increased lead-time to process production batch
- Labor dependency for material handling. Higher potential for mistakes

Automatic Offloading Solution

Automatic Offloading Solution

60 to 90 sheets/shift (8hrs)

CNC Automatically offloads nested components from the machine work table, allowing for quick loading and machine restart.

OPERATOR SORTS COMPONENTS ON THE OFFLOADING TABLE WHILE MACHINE IS PROCESSING NEXT SHEET

For small and medium shops and factories with increased efficiency requirements.

- First level of automation in material handling. Machine sets the pace !!!
- Operator and machine work simultaneously increasing efficiency and productivity.
- Productivty boost >50% compared to stand alone solution
- Reduction of load/unload time to about 1 min
- Cleaner operation: sweeping arm performs a double function by vacuuming saw dust off the spoilboard while offloading the previously processed panel

Automatic Offloading Solution

Components identification possible through manual label application.

Label application by the operator can be guided to speed up the process and minimize possible mistakes

Manual labelling does NOT impact overall productivity as simultaneous to the machine machining.

Automatic Offloading Solution

Typical Perfomances

- Sheet Process Time: 3 - 7 minutes
- Load – Unload Time*: about 1 min
- Consequently about 60-90 sheets per shift (8hr)

* Load time is still function of the operator being ready immediately after the machine has finished pushing off the material. So operator performnaces are still important

Automatic Offloading Solution

Productivity Context

- Better Efficiency as machine and operator work simultaneously in most situations. Machine in stand by while operator is loading
- Less Downtime machine in standby for a much shorter period of time
- Loss of Quality due to multiple manual handling of panels remains unchanged compared to the stand alone solution
- Higher Probability of mistakes
- Reduced Labor impact and cost for operating machines and for material handling
- Labor dependency for material handling and potential mistakes reduced.

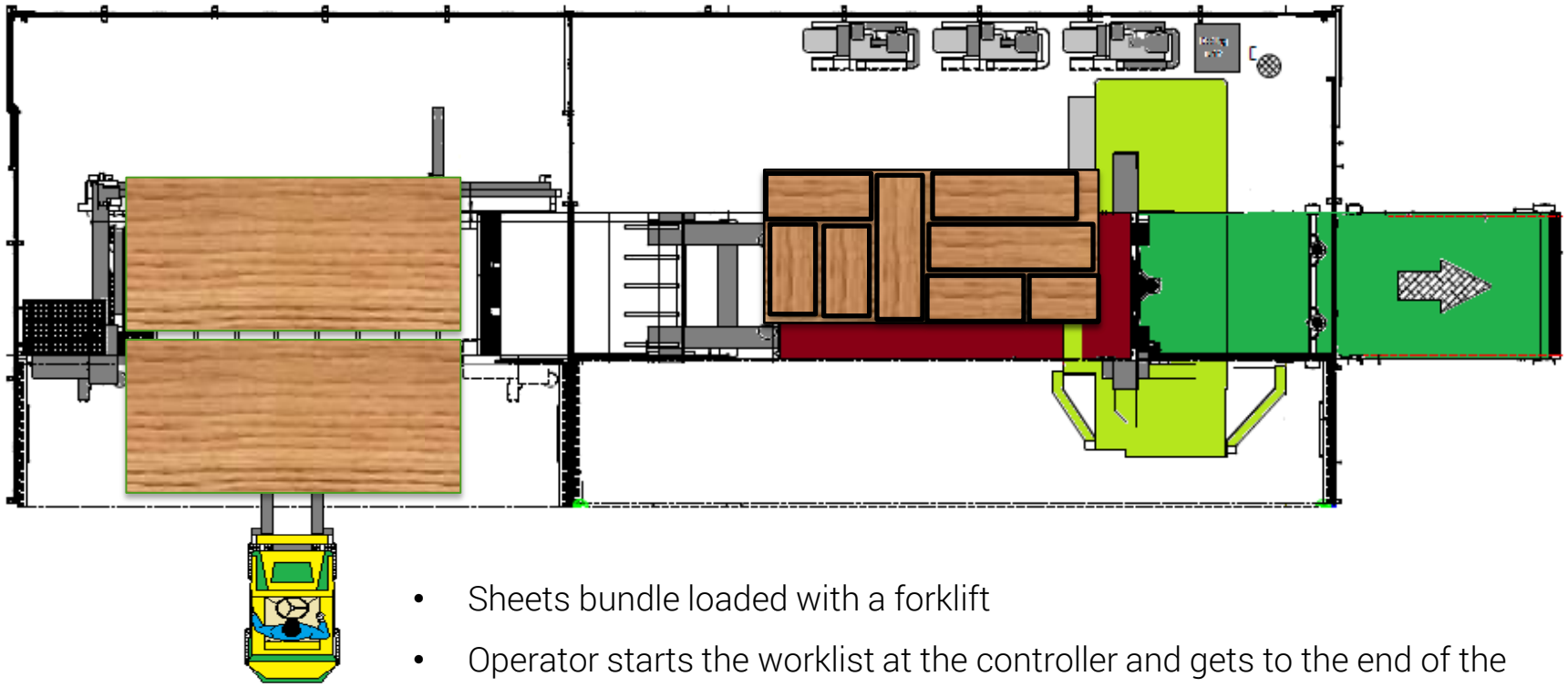
Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

The automated nesting based cell



- Sheets bundle loaded with a forklift
- Operator starts the worklist at the controller and gets to the end of the conveyor for sorting
- Machine cycles continuously until the bundle is completed.
- Full automated load/unload cycle
- Operator sorting not always busy could attend additional machines

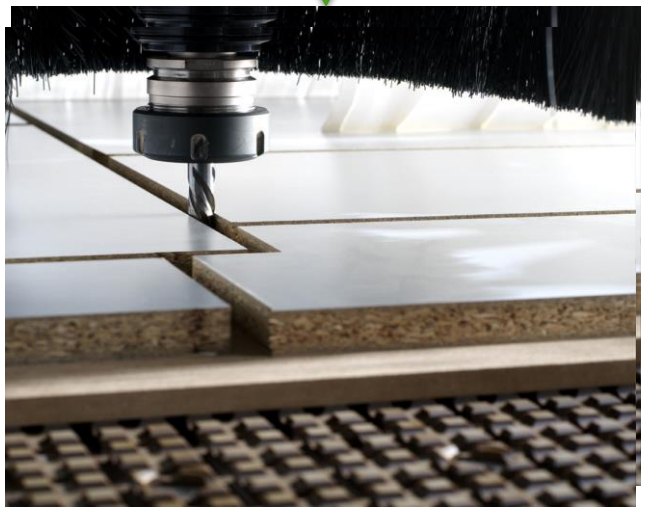
Automatic Load and Unload

Automatic Nested Based Cell (NBC)

The automated nesting based cell

Stack loading

Panel infeeding



Unloading

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Larger Shops 70-120 sheets/shift (8 hrs)

- Automatic Load/unload cycle with load/unload cycle sumultaneous.
- Load/unload cycle 40 - 50 sec
- Machine setting and keeping the pace, pushing operator.
- Higher consistency of complete cycle time
- Reduced Labor Impact
- Great Solution for one bundle at a time operation

Automatic Load and Unload

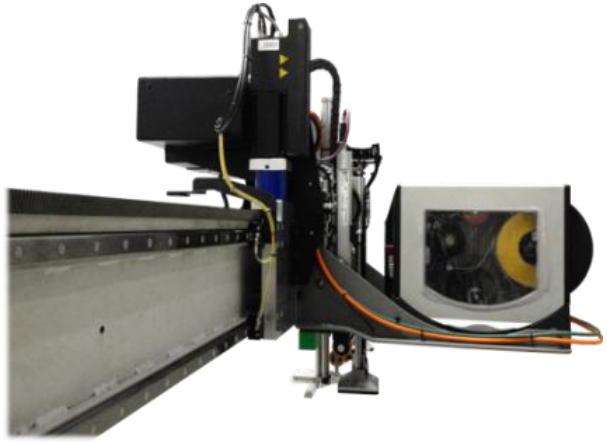
Automatic Nested Based Cell (NBC)

Components identification possible through MANUAL or AUTOMATIC label application.

Label application by the operator can be guided to speed up the process and minimize possible mistakes

Manual labelling does NOT impact overall productivity as simultaneous to the machine machining.

Automatic labell application makes it very rialable and LABOR-FREE



Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Productivity Context

CHALLENGING TO MANAGE MULTICOLOR / MULTIFORMAT BUNDLES

Two (2) possible approaches to this requirement:

1. Replacement of homogeneous bundles as needed at the machine forklift
2. Creation of “rainbow bundles” in the warehouse

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Replacement of Bundles as needed

- Machine downtime to offload the unused portion of the material stack
- Multiple handling of the unused portion of the material stack, to bring it back to its warehouse
- Machine downtime to load the next material stack to be processed. This material stack could also be partially unused.
- Multiplied for every change of bundle in a day.

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Replacement of Bundles as needed – RESULTS?

- Greatly reduced productivity and great impact of machine downtime
- Very labor intensive operation for the continuous handling of material bundles
- Loss of quality due to continuous handling

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Example:

An average of 9 stack replacement per shift @ 10min downtime for stack replacement

↓

Loss of 90 minutes of production time

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Productivity reduction of 20%

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Productivity Context

CREATION OF RAINBOW

- Rainbow bundle created manually. Manual picking from material racks;
  - LABOR INTENSIVE
  - LOSS OF QUALITY: due to additional manual handling
  - POSSIBLE MISTAKES
  - Potentially NO reduction in productivity

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Productivity Context: generalities

Market increasingly demands flexibility and quick order fulfillment

Producing just-in-time small batches involves frequent material changes challenging efficiency in the production process

- Loss of performance of the operating machines, caused by the machines downtime due to changes in the sheet sizes
- Loss of quality due to the continuous handling of the same panel stack, raising the risk of scratching and damaging the sheets
- Increased Labor for material handling and machine setup
- Reduced Efficiency and Productivity

- Margins reduction
- Dramatic reduction of competitiveness

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

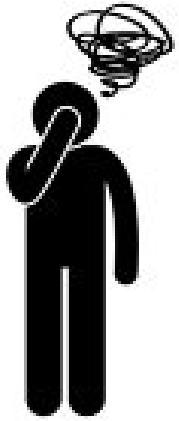
Critical parameter: Type of production

A large product range means more stacks replacement on the scissor lift!

Automatic Load and Unload

Automatic Nested Based Cell (NBC)

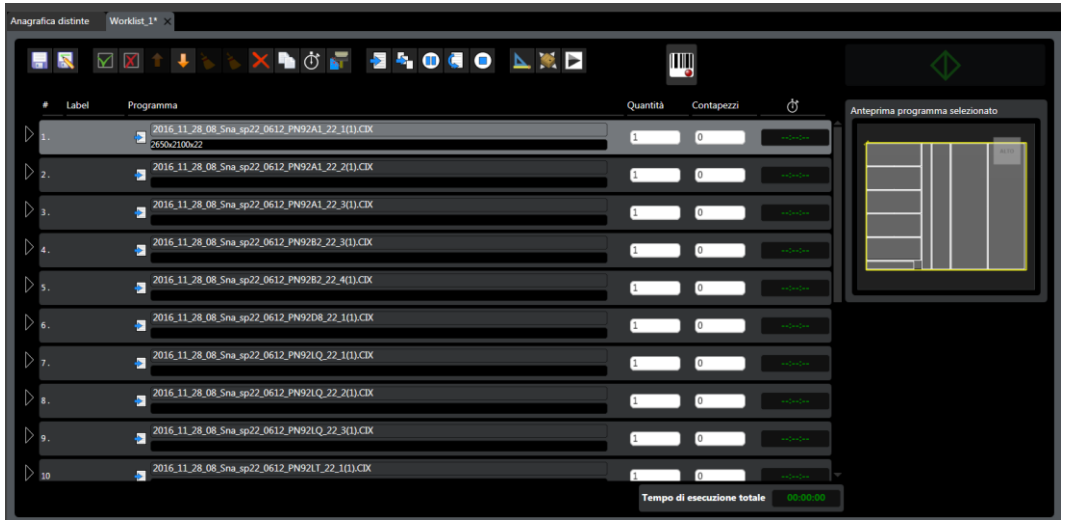
Already prepared stack



mistake probability

Possible decrease of productivity and waste of material

Less production flexibility



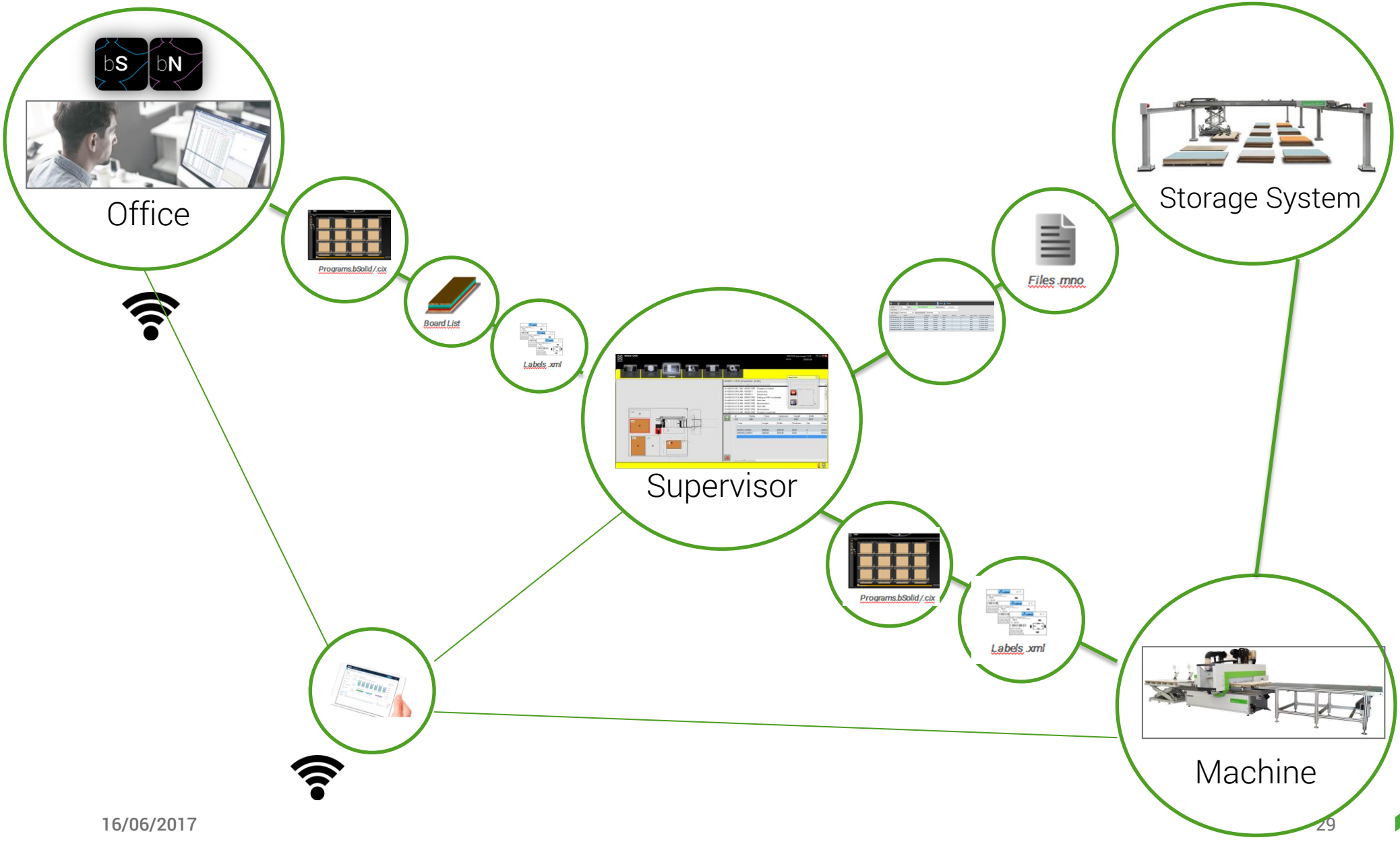
Automatic Load and Unload

Automatic Nested Based Cell (NBC)

Productivity extimation chart

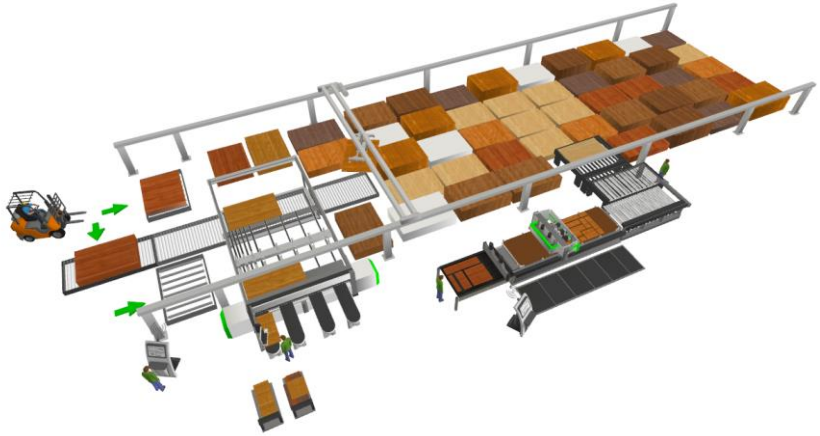
Automatic Storage and NBC Cell

Automatic Storage and NBC Cell



Automatic Storage and NBC Cell

Nesting and siziing cells integrated with a WINSTORE 3D storage system



ADVANTAGES:

- True **Just-In-Time**. Any sheet color, type or shape quickly available, and automatically loaded: **NO** machines downtime
- Automatic handling
- Reduction of Labor
- Overall Floor Space reduction
- Monitoring the rotation index of each sheet typology, helping purchasing decisions
- Stack preparation done while machine running and/or during night shifts.

↓

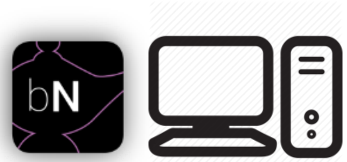
Higher margins and competitiveness

Automatic Storage and NBC Cell

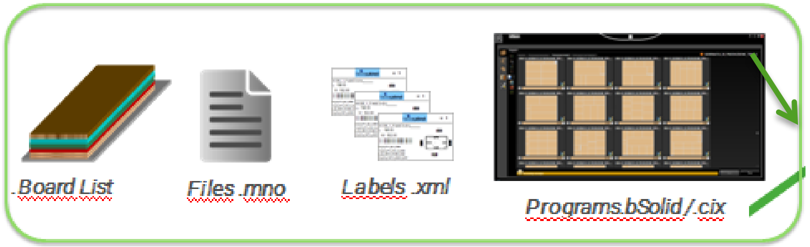
Nesting cell + Automatic Storage System: boards sequence

THE BOARD YOU NEED WHEN YOU NEED IT!

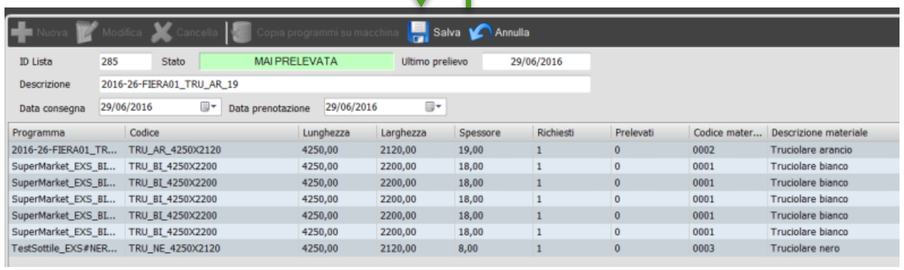
A FEW MOUSE CLICKS HANDLE THE WHOLE PRODUCTION!!



JOB / PROJECT



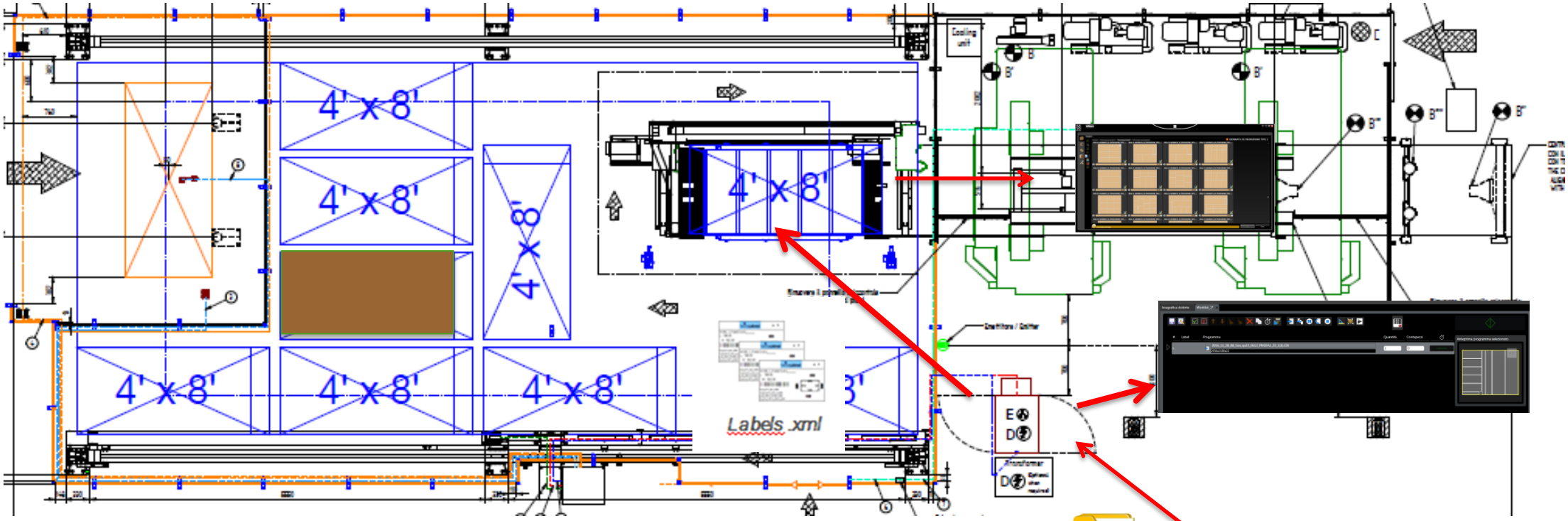
Nesting Projects sent to the nesting cell control



Programma	Codice	Lunghezza	Larghezza	Spessore	Richiesti	Prelevati	Codice mater...	Descrizione materiale
2016-26-FIERA01_TR...	TRU_AR_4250X2120	4250,00	2120,00	19,00	1	0	0002	Truciolare arancio
SuperMarket_EXS_BI...	TRU_BI_4250X2200	4250,00	2200,00	18,00	1	0	0001	Truciolare bianco
SuperMarket_EXS_BI...	TRU_BI_4250X2200	4250,00	2200,00	18,00	1	0	0001	Truciolare bianco
SuperMarket_EXS_BI...	TRU_BI_4250X2200	4250,00	2200,00	18,00	1	0	0001	Truciolare bianco
SuperMarket_EXS_BI...	TRU_BI_4250X2200	4250,00	2200,00	18,00	1	0	0001	Truciolare bianco
SuperMarket_EXS_BI...	TRU_BI_4250X2200	4250,00	2200,00	18,00	1	0	0001	Truciolare bianco
TestSottile_EXS#NER...	TRU_NE_4250X2120	4250,00	2120,00	8,00	1	0	0003	Truciolare nero

Create one picking list or append additional picking lists to current

Automatic Storage and NBC Cell



Nesting Project

.mno file

Picking list

bNest

Automatic Storage and NBC Cell

Productivity extimation chart

Automatic Storage and NBC Cell

Example: increase of productivity

NO DOWNTIME DUE TO STACK REPLACEMENT!

→

Up to 120 Sheets/shift:

+ 25 %

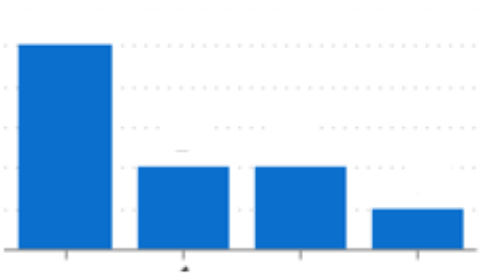
Automatic Storage and NBC Cell

Productivity extimation: small batch, high fexibility production - comparison

PRODUCTIVITY

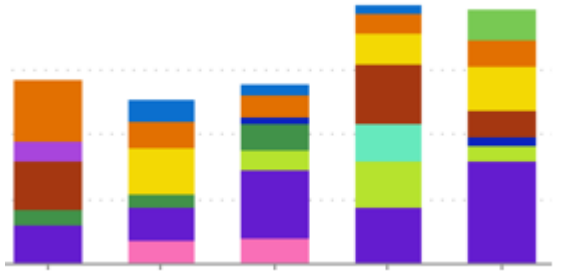
Nesting cell

#2 operators



Nesting cell + Automatic Storage

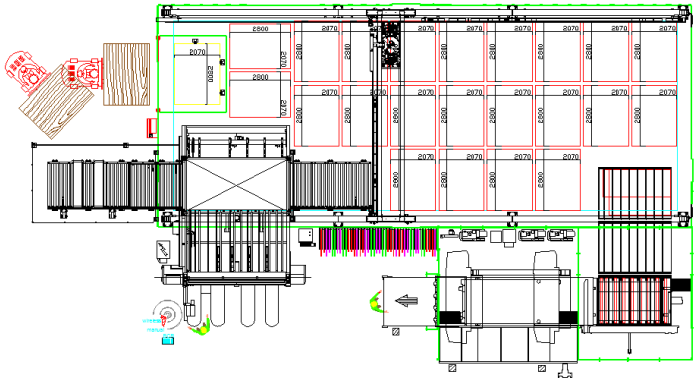
#1 operators

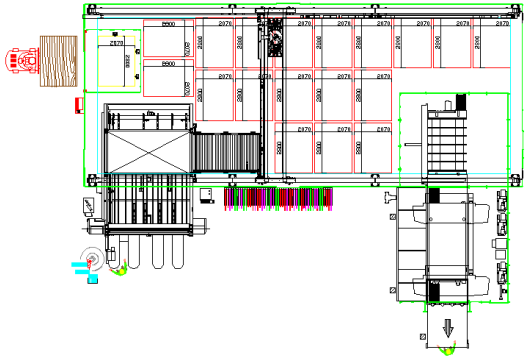


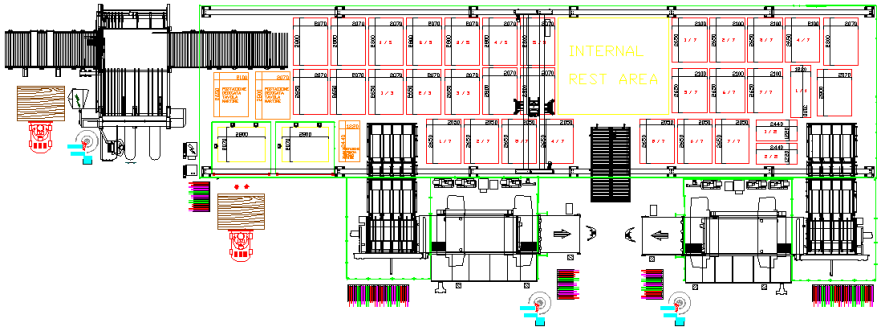
FLEXIBILITY

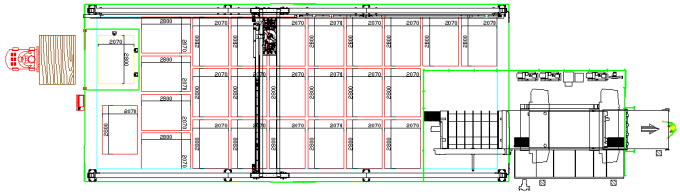
Automatic Storage and NBC Cell

Tailored Solution







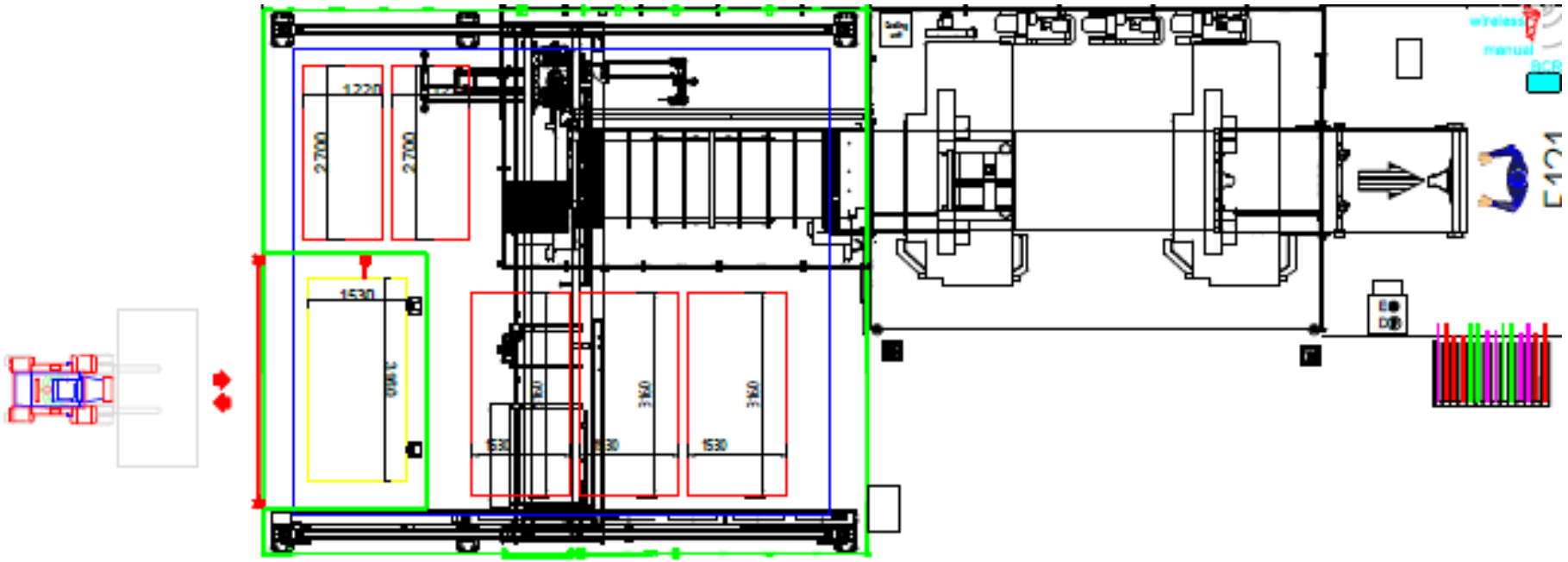


FLEXIBILITY

PRODUCTIVITY

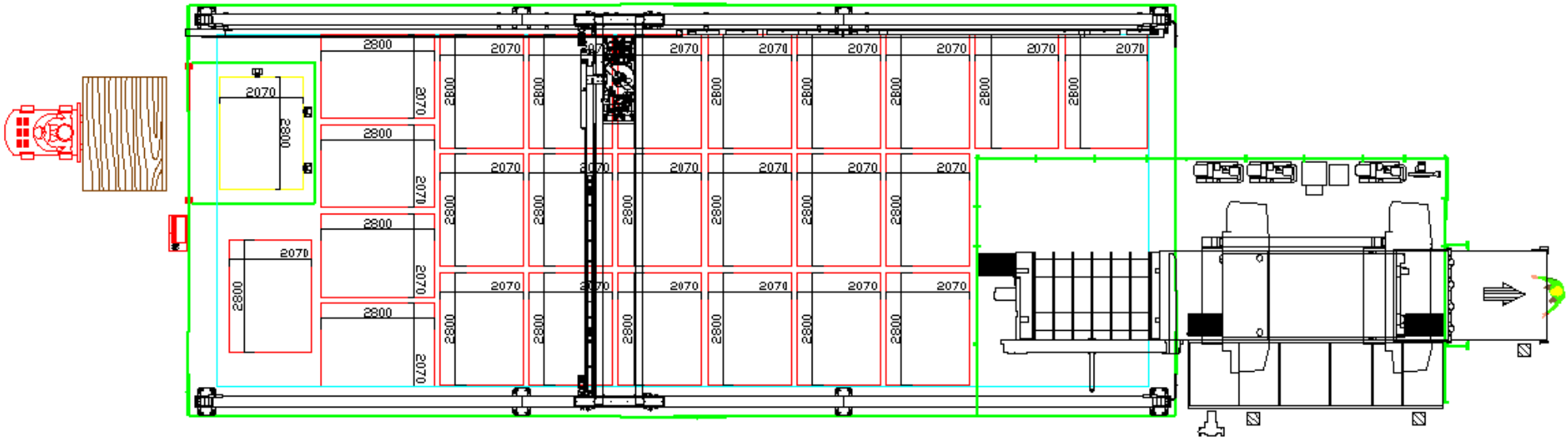
Automatic Storage and NBC Cell

Medium / Large Shops (100+ sheets/day)



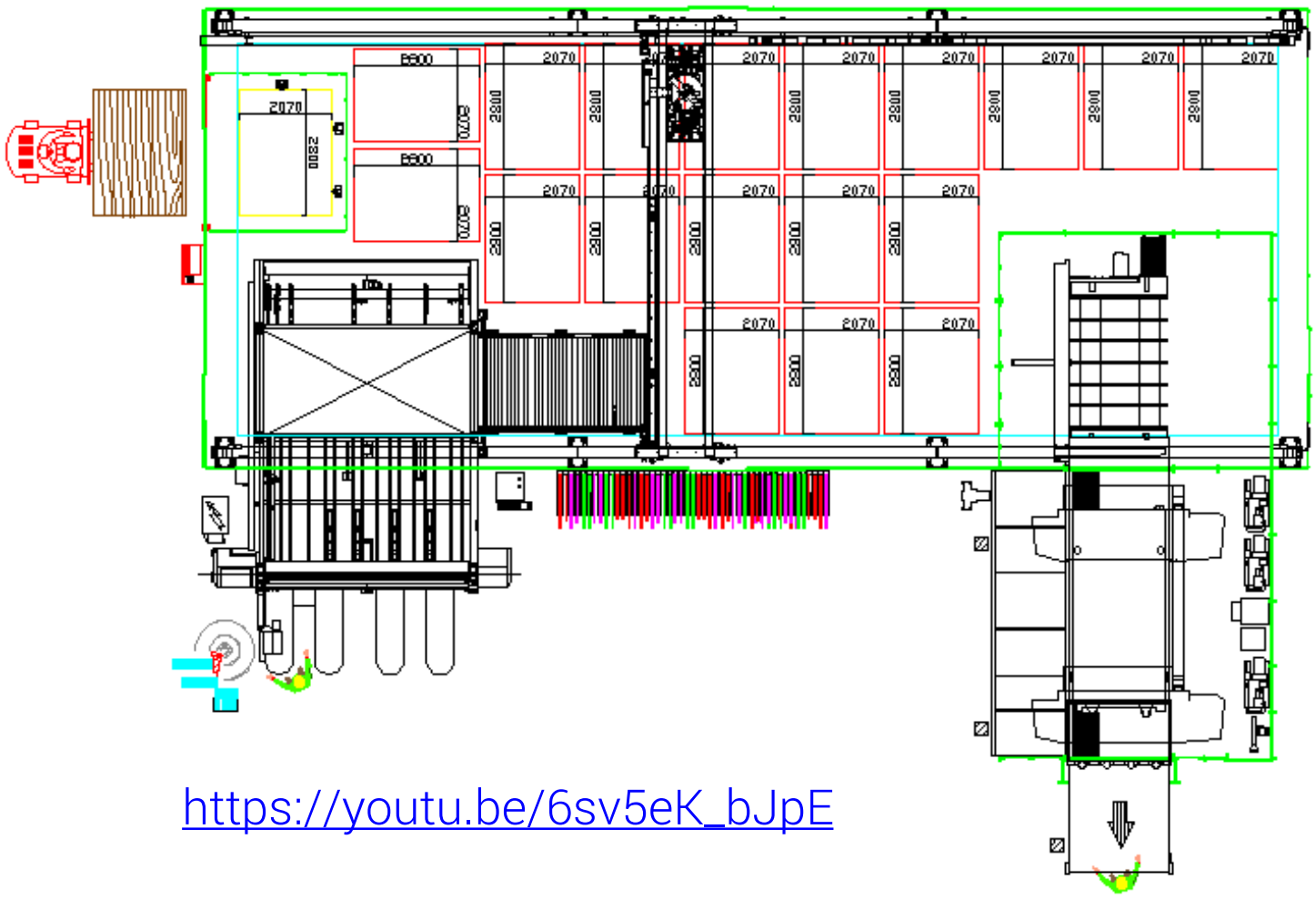
Automatic Storage and NBC Cell

Medium / Large Shops (100+ sheets/day)



Automatic Storage and NBC Cell

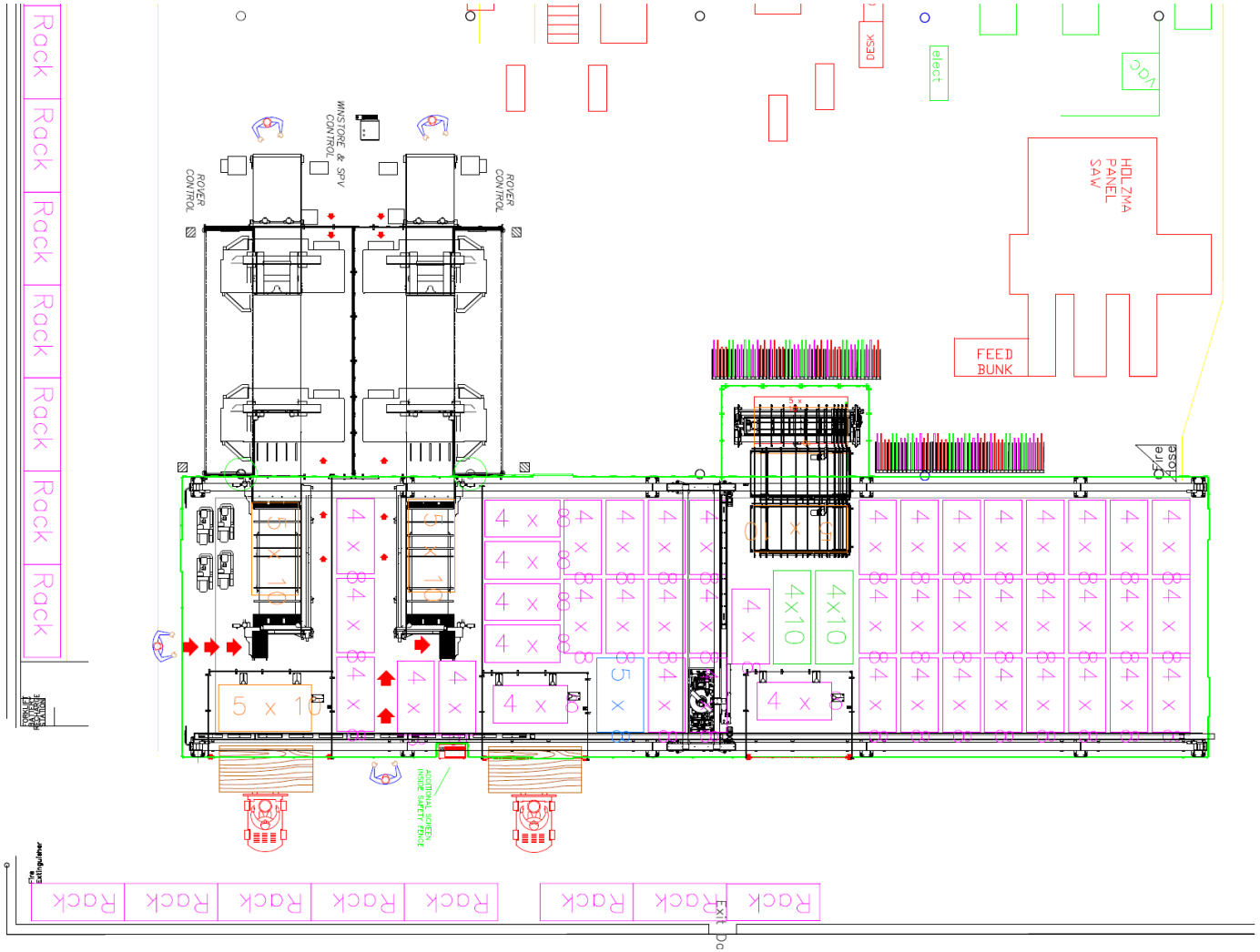
Medium / Large Shops (200+ sheets/day)



https://youtu.be/6sv5eK_bJpE

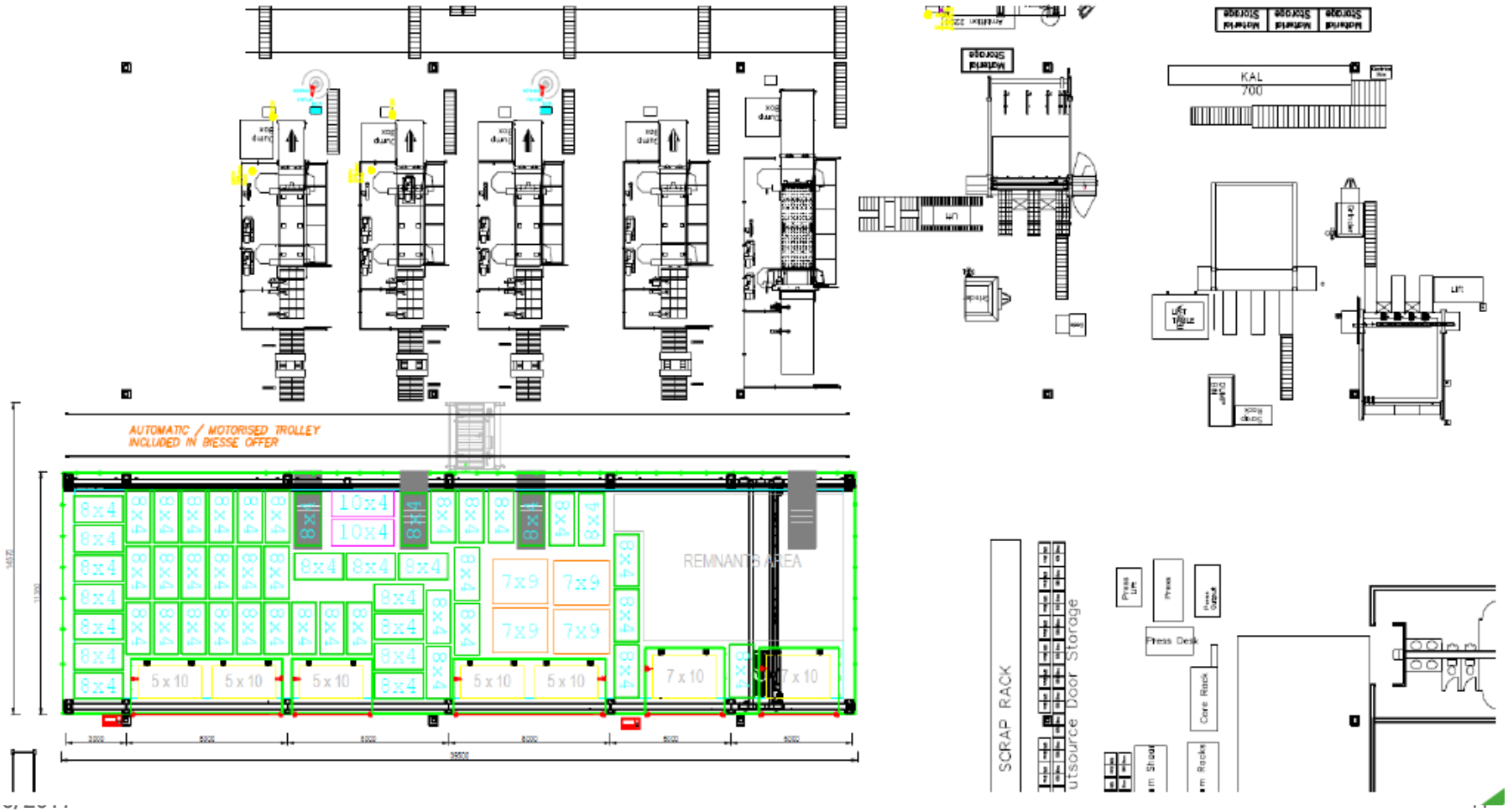
Automatic Storage and NBC Cell

Medium / Large Shops (up to 400 sheets/day)



Automatic Storage and NBC Cell

Medium / Large Shops (400+ sheets/day)



Integrated Factory

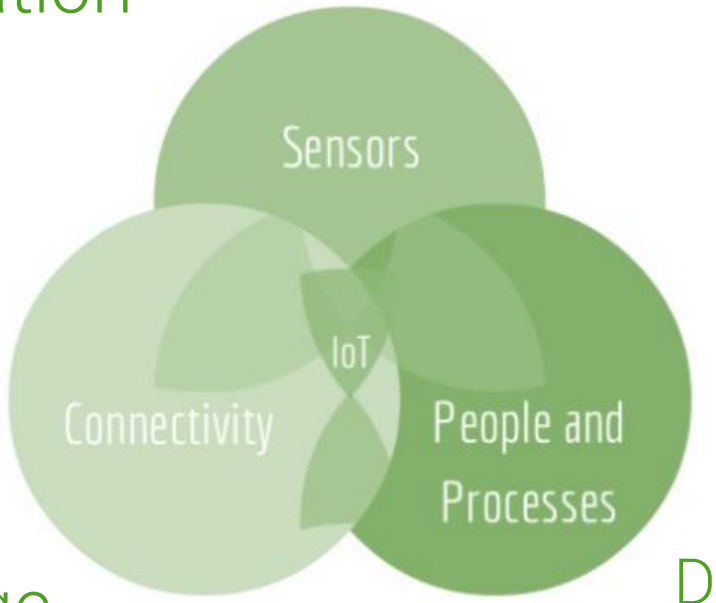
Smart decisions

Communication

Cloud

Monitoring

Algorithms



Smart machines

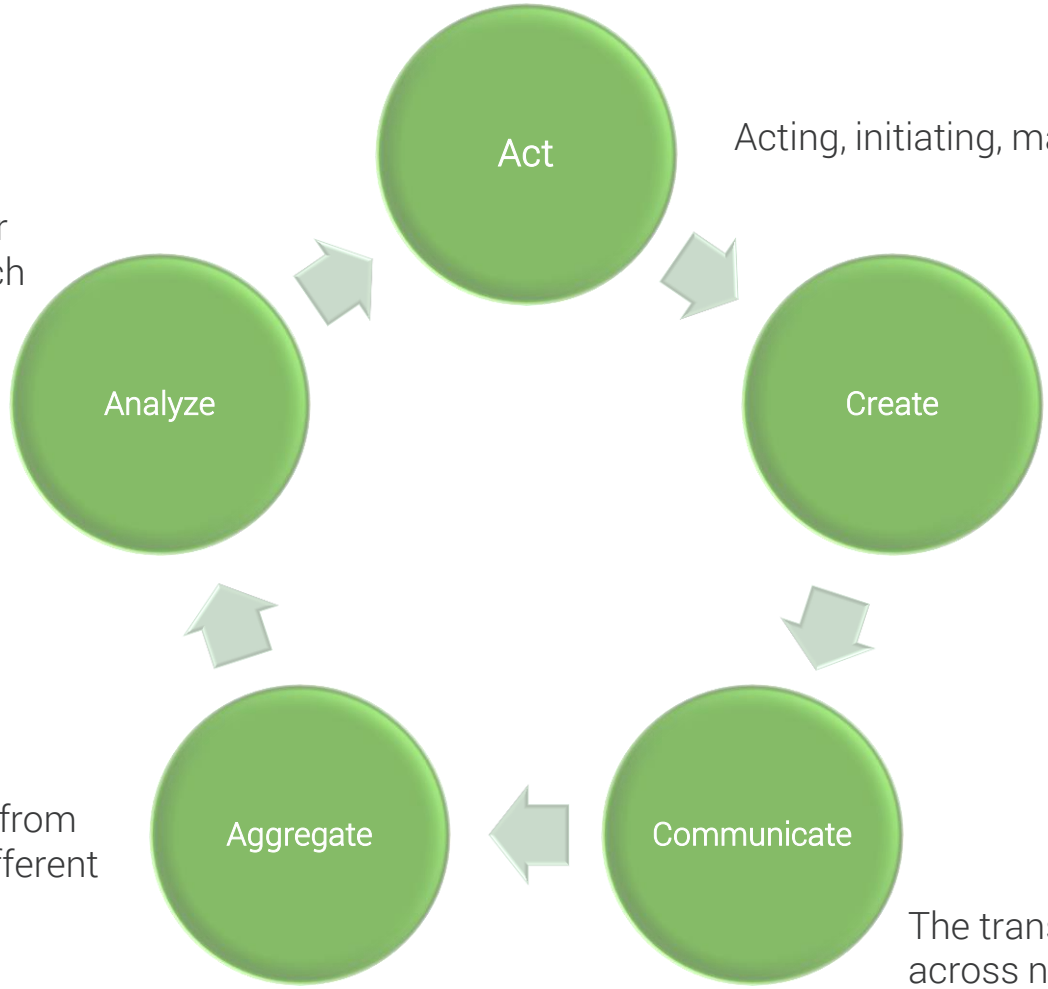
Data exchange

Data analysis

Smart factory

Integrated Factory

Value creation in a never-ending value loop:



Acting, initiating, maintaining in a driven way

The use of sensors to generate data

The transmission of information across networks, to cloud storage systems

Information gathering from different sources at different times

Data analysis, patterns and/or relationships recognition which leads to predictions and preventive actions

Integrated Factory

Internet Of Things (IOT)

- Data collection and real time analysis
- Real Time Monitoring of production/machine performances
- Real Time Monitoring of machine and compoenents status: e.g. Electrospindle speed, amps absorption, bearings working temperature, stator temperature, and level of vibrations)
- Display of electrospindle parameters message service to improve electrospindle and tool usage.
- Consistent Production Output (period/day)
- Support to select the correct working parameters
- Schedule of maintenance activity , maximizing unit performances and life

Integrated Factory

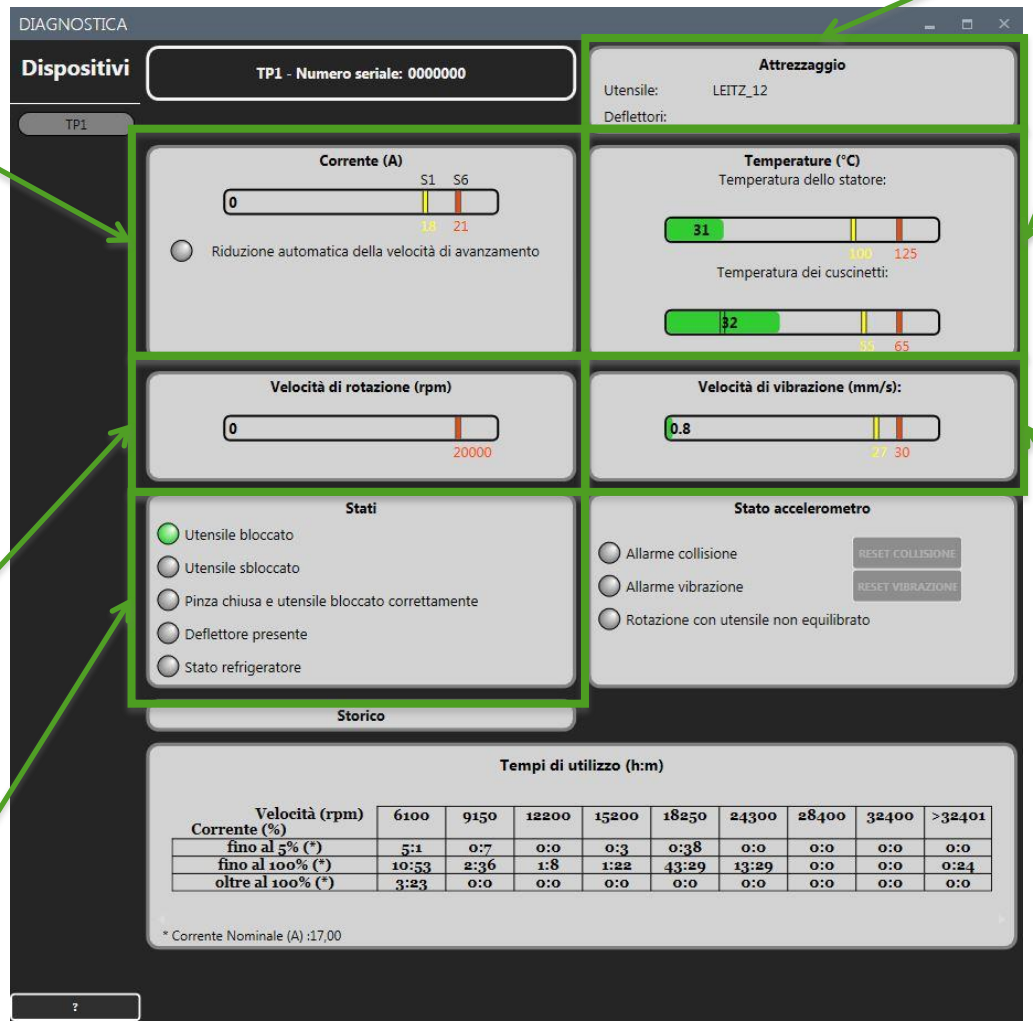
Tool USED

Amps Absorbed
- Green: continuous work allowed
- Yellow: Alternate working al
- Red: the unit is working above safe paraneters

In Red state auto adptive mode is engaged

Speed
- Green: normal
- Red: alarm: above max speed

State
- Green: sensor active
- Grey: sensor non active



Temperature Statore and bearings
- Green: normal
- Yellow: pre alarm
- Red: alarm high temperature. Stop Electrospindle (Stop inverter and axes)

Electrospindle Vibrations
- Green: normal
- Yellow: above standard values but not dangerous. Double checkk on feed speed and tool rotation
- Red: alarm: dangerous level of vibartions. Stop machining

Integrated Factory

Real – Time service monitoring

- Machine is directly connected with the Service Center. Service technician receives a sensor notification that the spindle vibrations on machine sn XYZ are above standard

- Support system automatically notify the user proposing possible solutions: double check feed speed or tool rotation

- Service technician is able to monitor real time and check any taken action. Predictive analysis allows for proactively contact machine operator. System can automatically release a request for spare parts if a broken component is detected even before operator realize it

- Potentially dangerous situation are predicted before they happen and they can be solved within minutes, or allows to have components and technician dispatched preventing down time.

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