



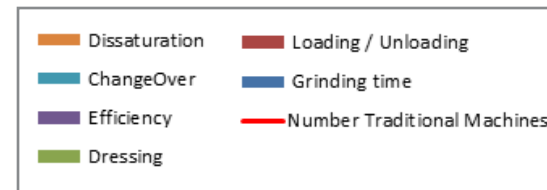
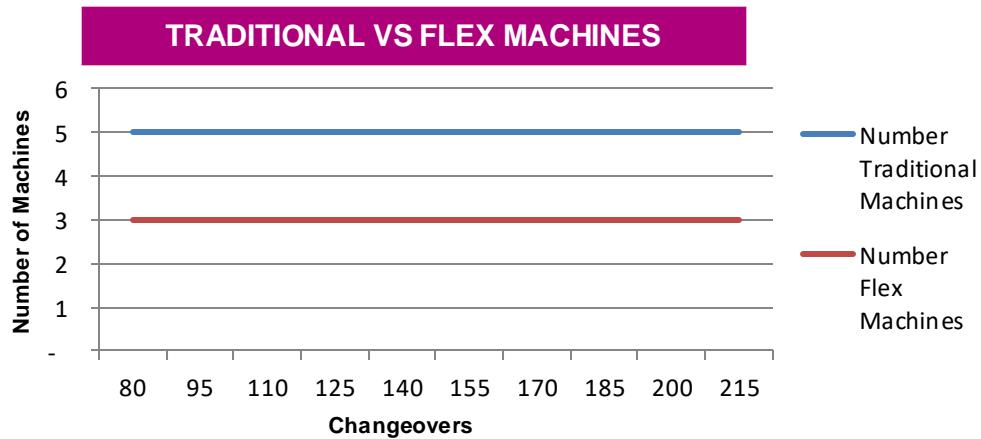
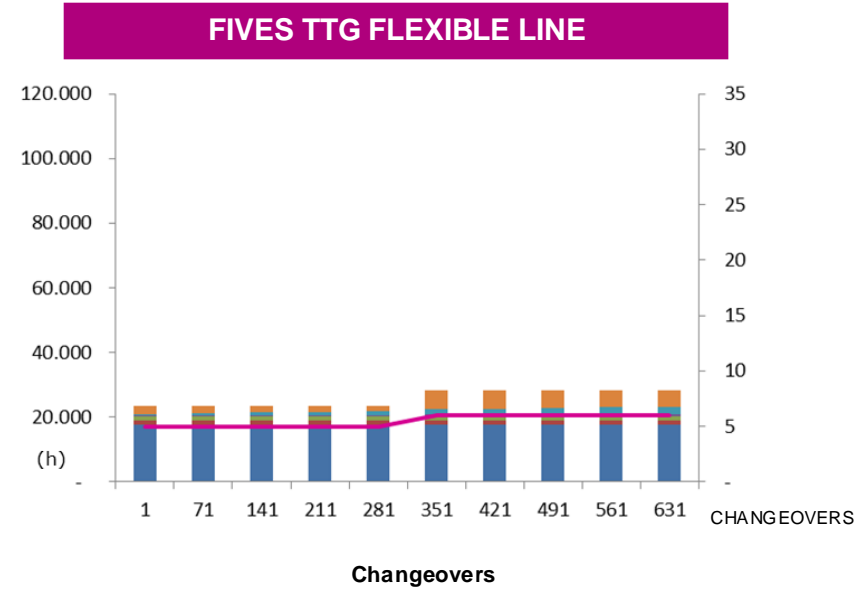
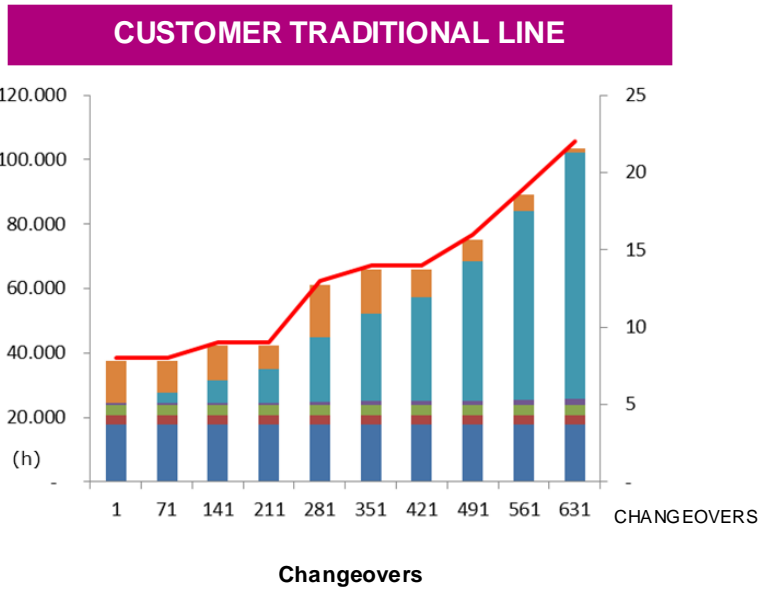
BRYANT TTG FLEXIBILITY IN PRODUCTION

Combined process
<Zero changeover> time
Flexible layout

Date: 2/2023

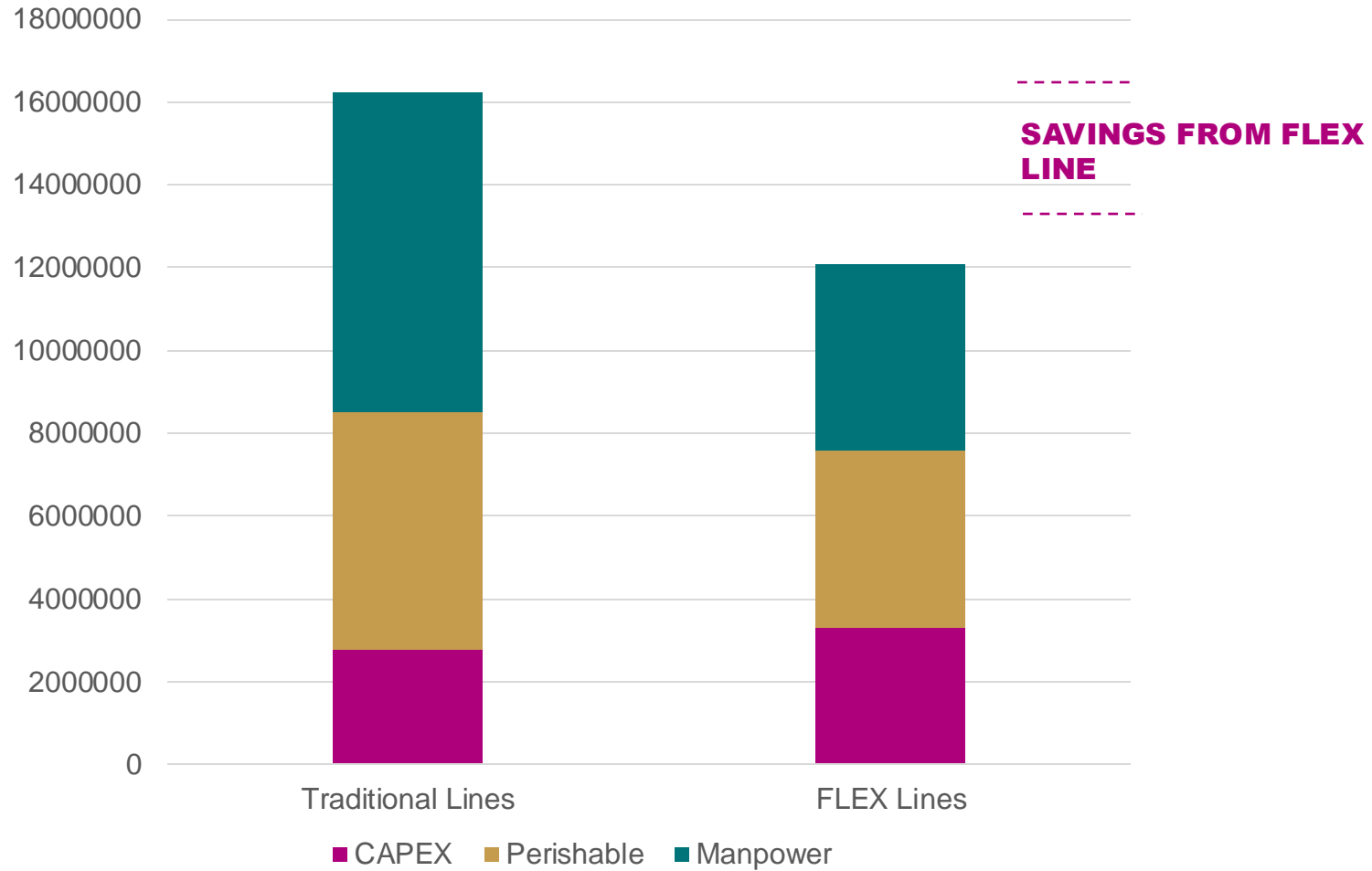
Prepared by: Caitlin Barnhart

BENEFIT OF FIVES FLEXIBLE LINE



TRADITIONAL VS FLEX LINES

Comparison of Traditional vs FLEX Lines in 10 Years



SIMULATION OF A GRINDING LINE FOR BEARINGS

200kpcs/year; Variable changeovers



NON ADDED VALUE

NECESSARY NON ADDED VALUE

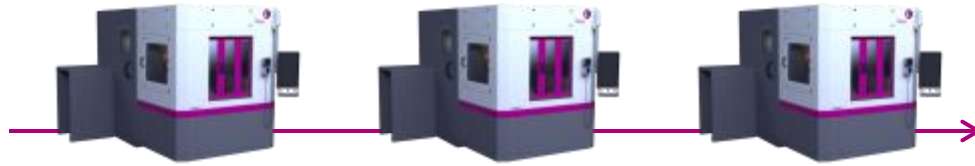
ADDED VALUE



FLEX PROCESS

Combined Process

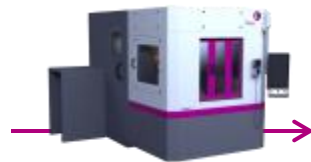
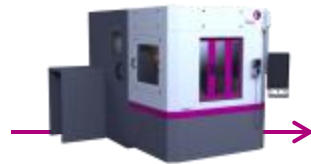
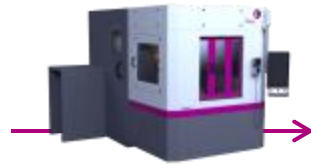
FLEX PROCESS – COMBINED PROCESS



PROCESS SOLUTION 1: Serial Process

Each machine is able to execute a single operation with a cycle time as much as possible in line with line productivity.

One OP will represent the bottleneck of the line, therefore all other OP will have not saturated machines.

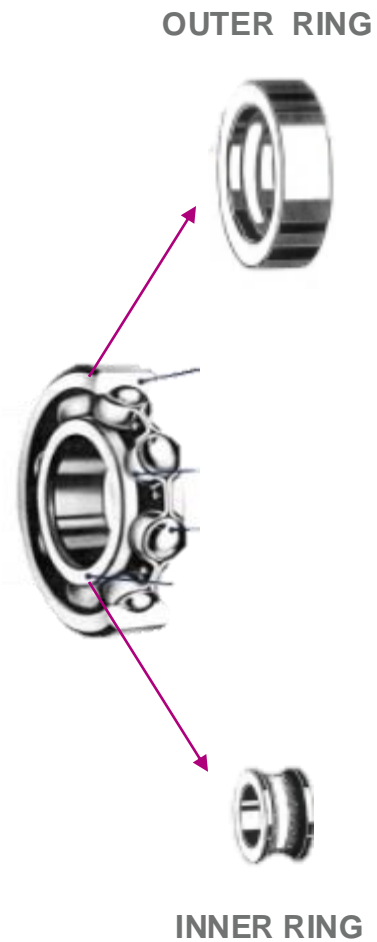


FIVES SOLUTION: Combined Process

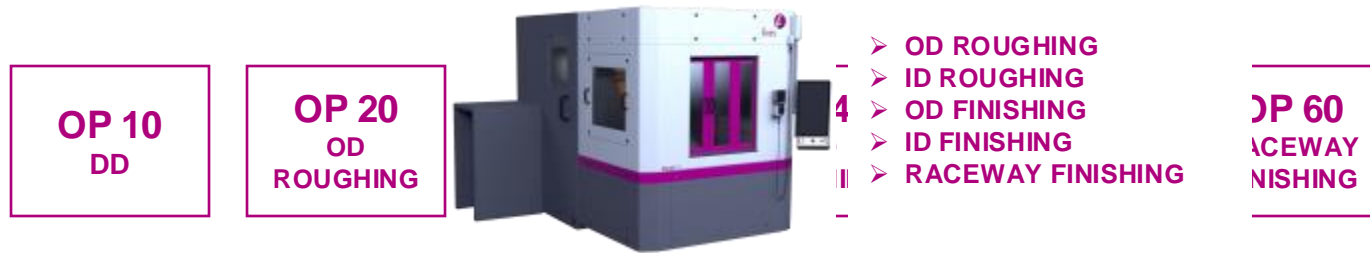
Each machine is able to execute multiple operations.

No bottlenecks of the line will affect saturation of machines. Each machine can be considered as a single line.

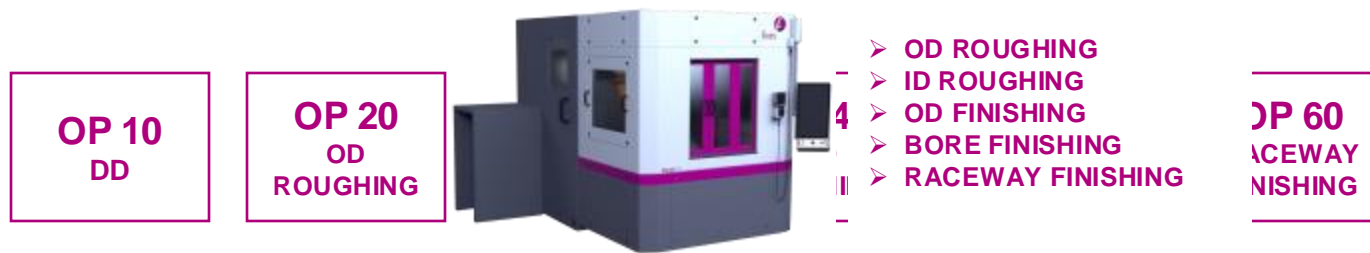
COMBINING OPERATIONS



TRADITIONAL PROCESS

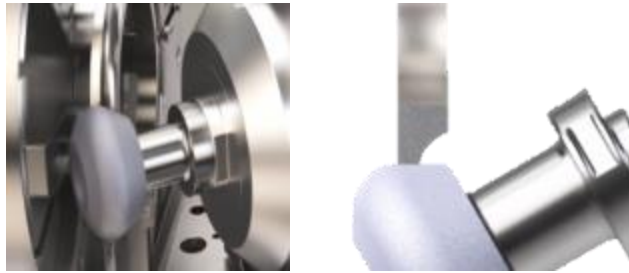


TRADITIONAL PROCESS

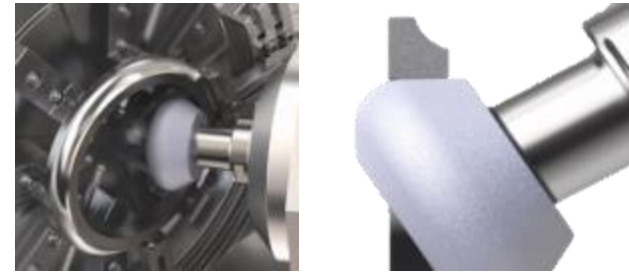


EXAMPLES OF COMBINED PROCESS – SECTION 1

OD Grinding



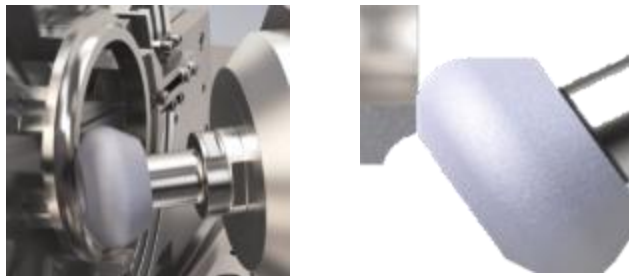
ID Grinding



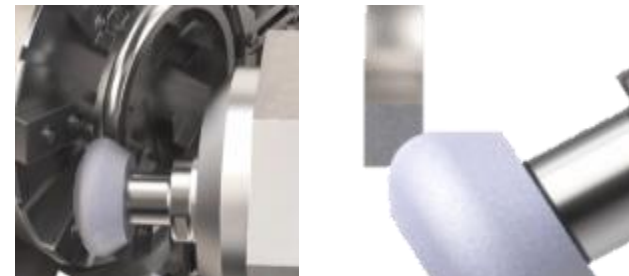
Example of a single multiprofile grinding wheel

- Capable to perform multiple operations in sequence
- Utilize interpolation capability of the machine to improve cycle time or reduce changeover time

Surface Grinding



Raceway Grinding



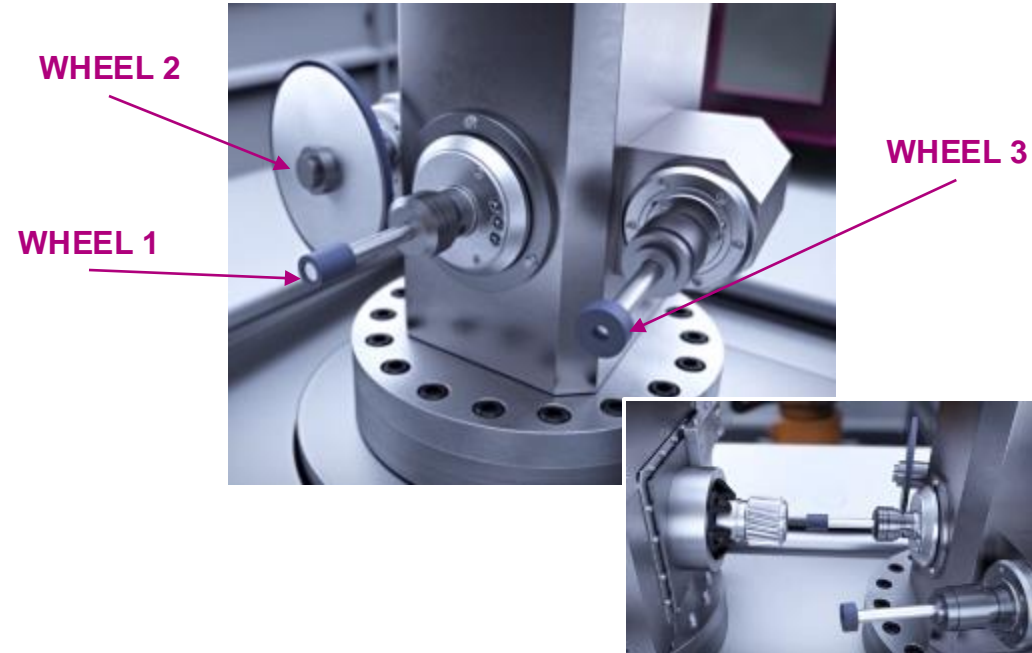
FLEXIBLE GRINDING



EXAMPLES OF COMBINED PROCESS – SECTION 2

Combined Processes

Case with 3 standard wheels to execute multiple operations by using interpolation capabilities of the machine.



ID Taper 1 (wheel 1)



ID Cylindrical (wheel 1)



ID Taper 2 (wheel 1)



Surface 1 (wheel 1)



Chamfer or Radius (wheel 1)



OD Cylindrical (wheel 2)



Surface 2 (wheel 3)



FLEXIBLE GRINDING

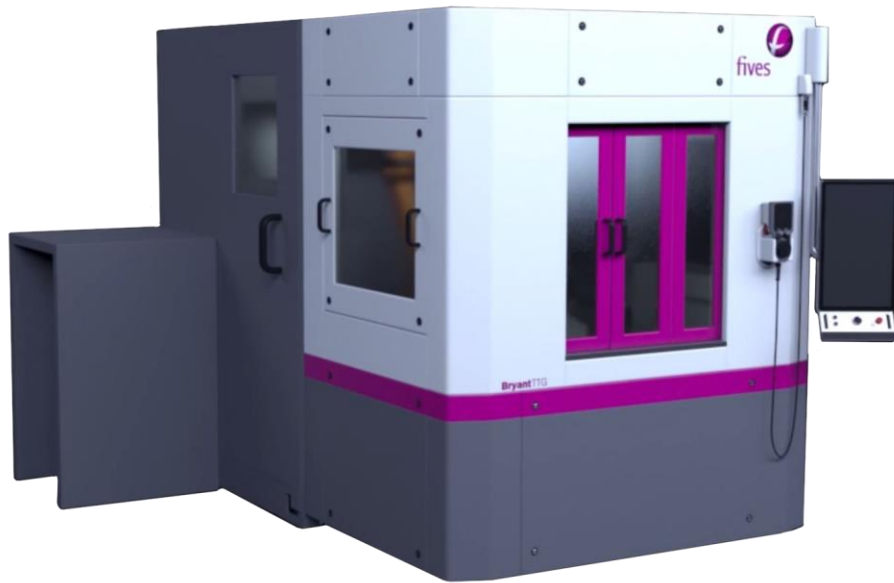




FLEX MACHINE

Zero <Changeover> Time

FLEX MACHINE – ZERO <CHANGEOVER> TIME



CHANGEOVER SOLUTION 1: Manual Changeover

Each machine is requiring a «long» manual changover time

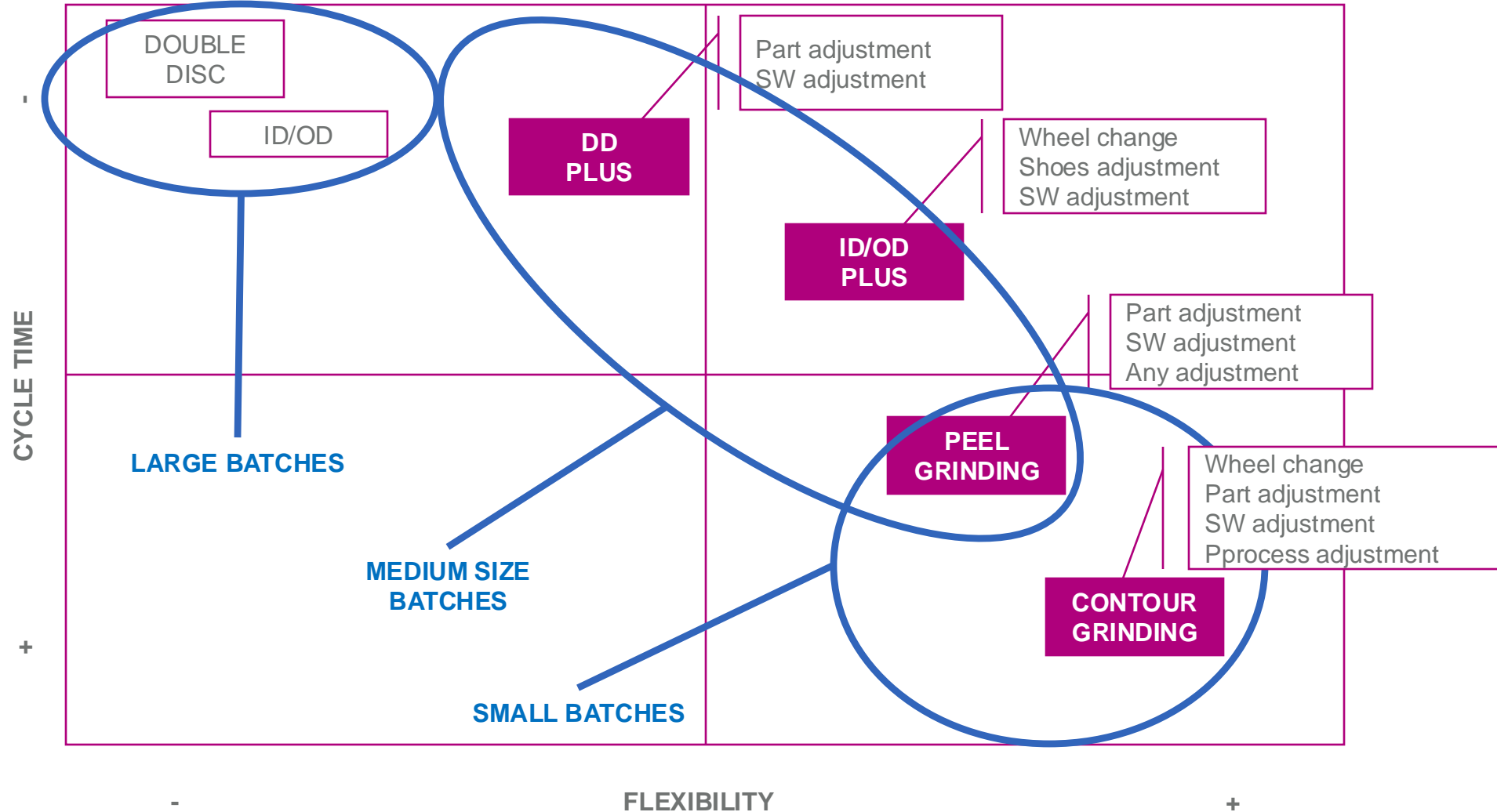
CHANGEOVER SOLUTION 2: Automatic Changeover

Each machine is equipped with automatic changover devices that will require stop of machine with no intervention of operators

CHANGEOVER SOLUTION 3: Zero Changeover Time

Each machine is equipped with automatic changover devices that will no require stop of machine

FLEXIBILITY SOLUTIONS

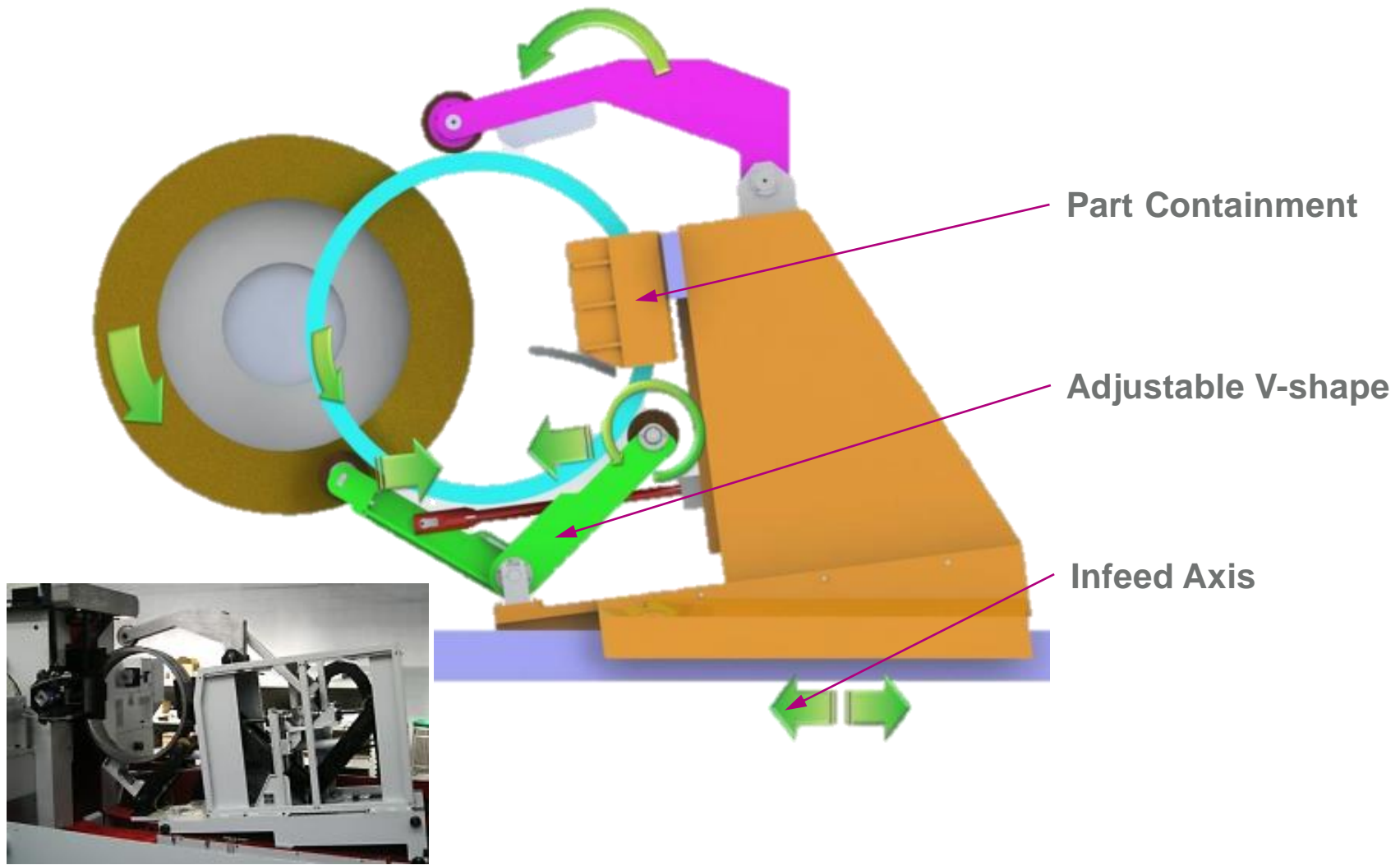




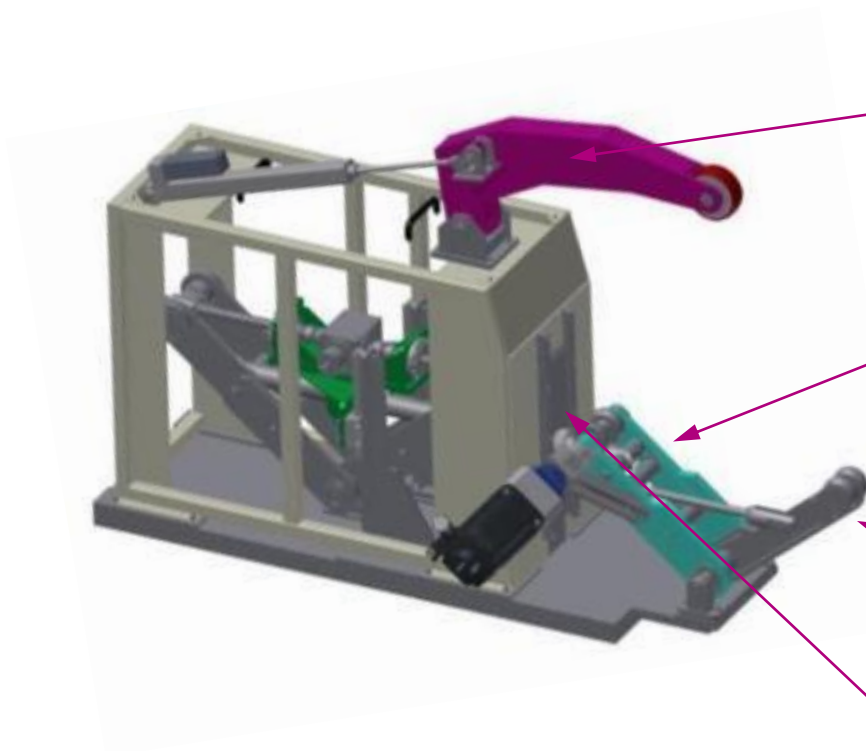
HORIZONTAL DOUBLE DISC

Zero <Changeover> Time

FIXTURE DETAILS



FIXTURE DETAILS



Rocking Arm

For unrivalled quality in sever cutting conditions

V-shape Fixture

With servo controlled actuator for a stepless Flexibility

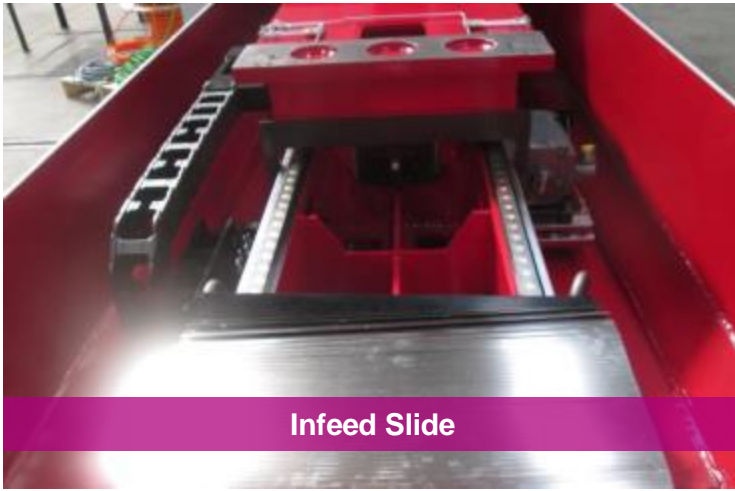
Free Roller Support

To guarantee best part quality and minimize machine components' wearing

Motor-Driven Roller

To guarantee best parallelism and surface finishing

FIXTURE DETAILS



Infeed Slide



Rocking Arm Servo



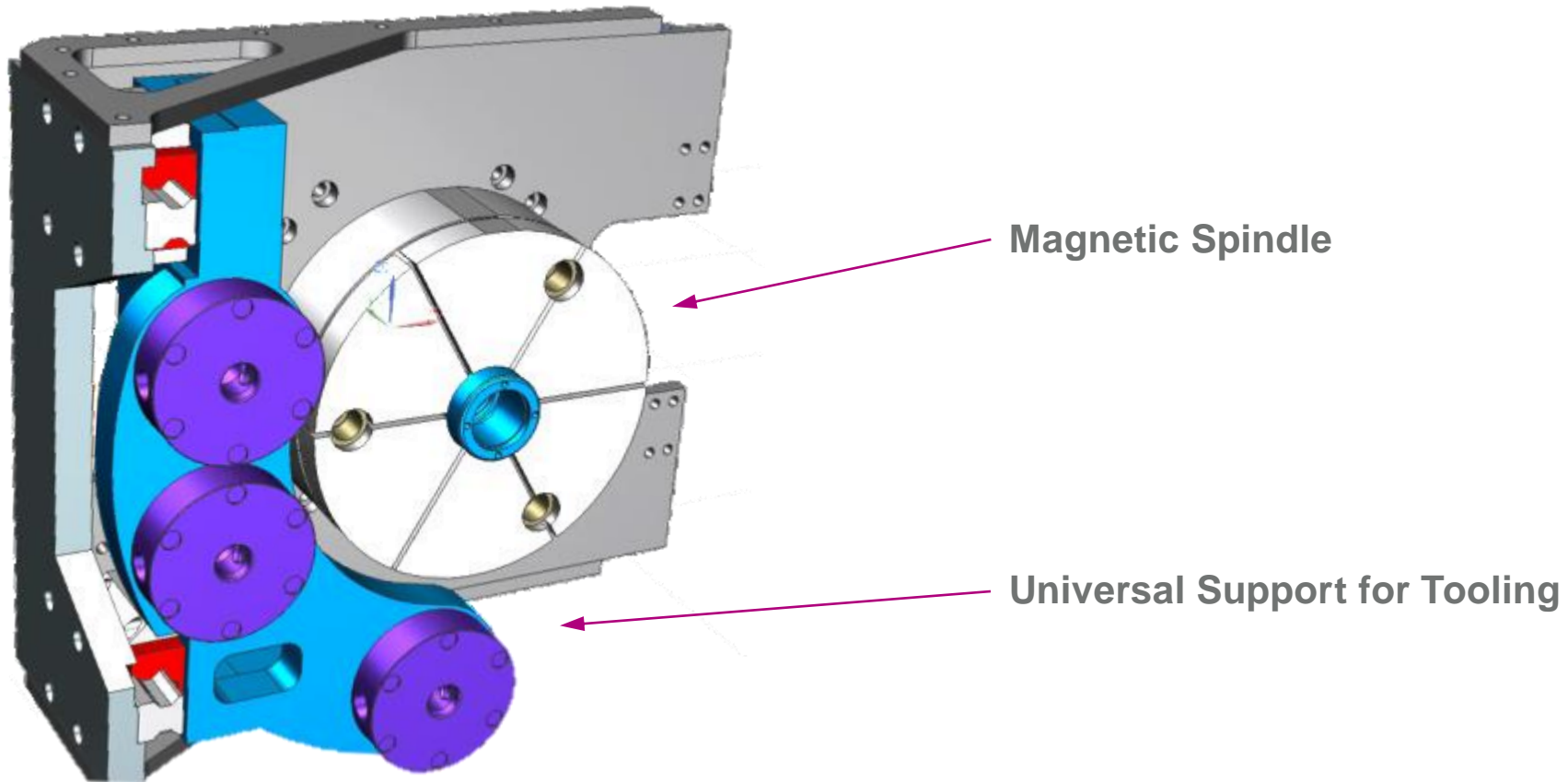
V-shape Fixture



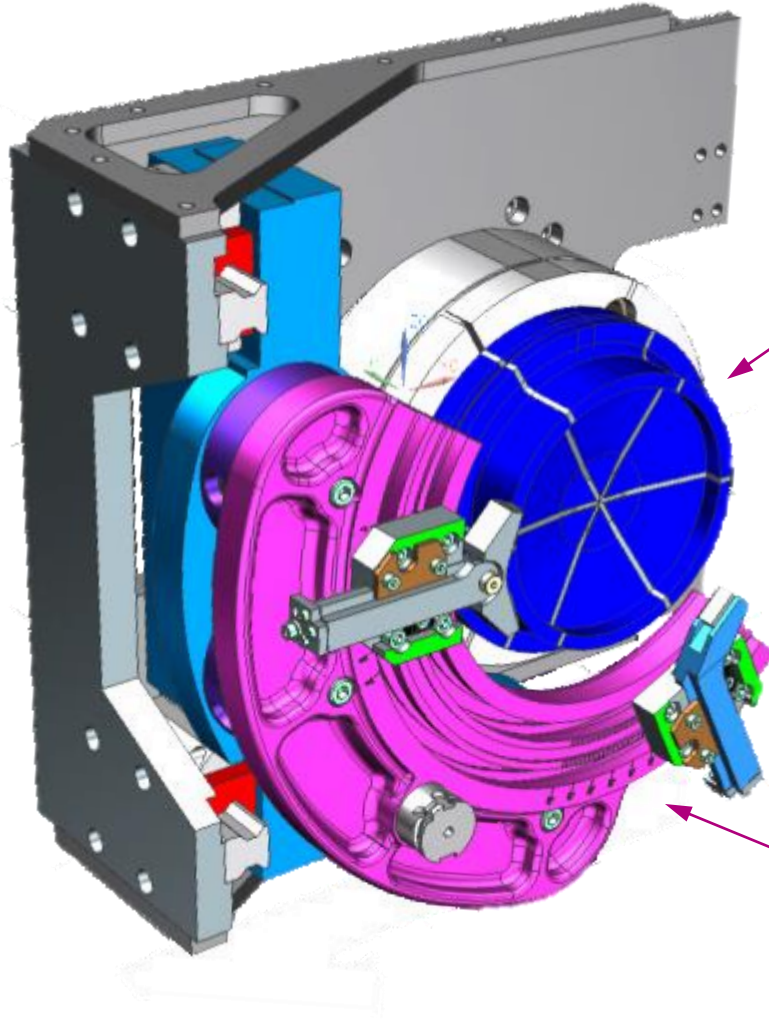
INNER DIAMETER / OUTER DIAMETER

Automatic Changeover

HEADSTOCK WITHOUT TOOLING



HEADSTOCK WITH TOOLING PLATE MOUNTED



Interchangeable Ring Support

All toolings can be changed manually by the operator or automatically by a robot.

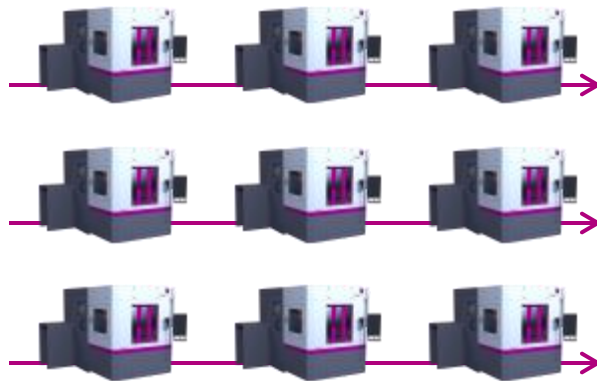
Interchangeable Shoes



FLEX LAYOUT

<Virtual> Line

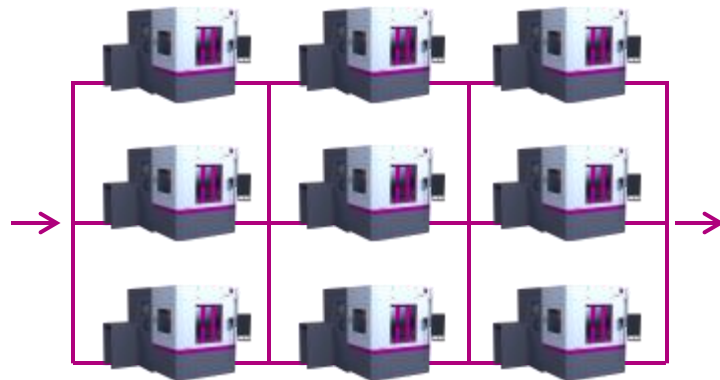
FLEX LAYOUT - <VIRTUAL> LINE



LINE SOLUTION 1: Traditional Line

Straight line with machine connected rigidly by conveyor. In order to satisfy high production demands, multiple lines in parallel are required.

If a machine is down, the entire line is down.



FIVES SOLUTION: Free Flow

Each machine in the OP can be connected with any machine from previous and next OP.

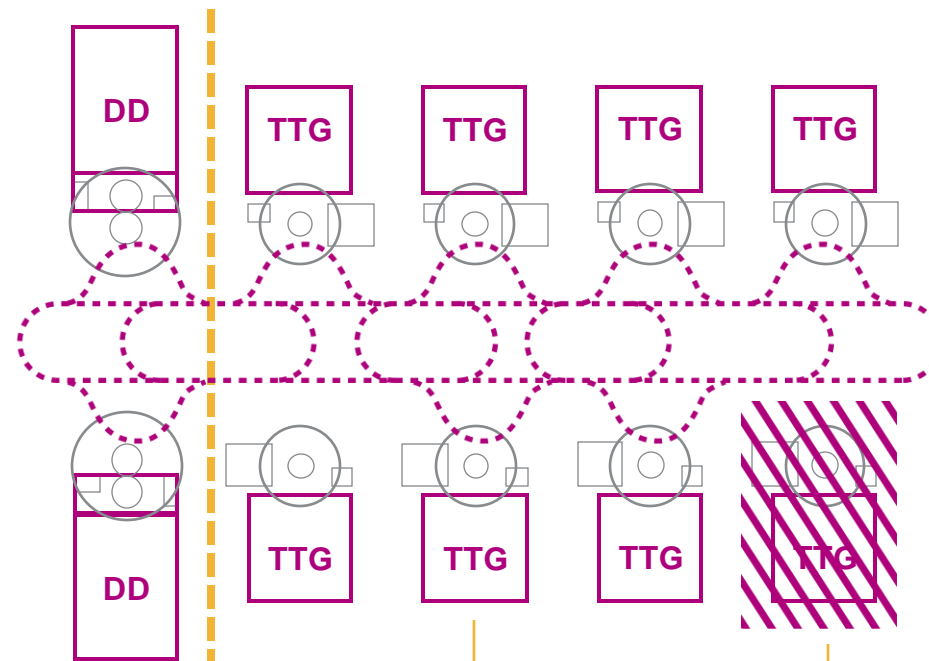
If a machine is down all remaining machines will continue to work.

FLEX LAYOUT - <VIRTUAL> LINE

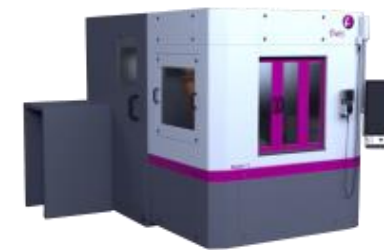
Horizontal Double Disc



Vertical Double Disc



Twin Turret Grinder

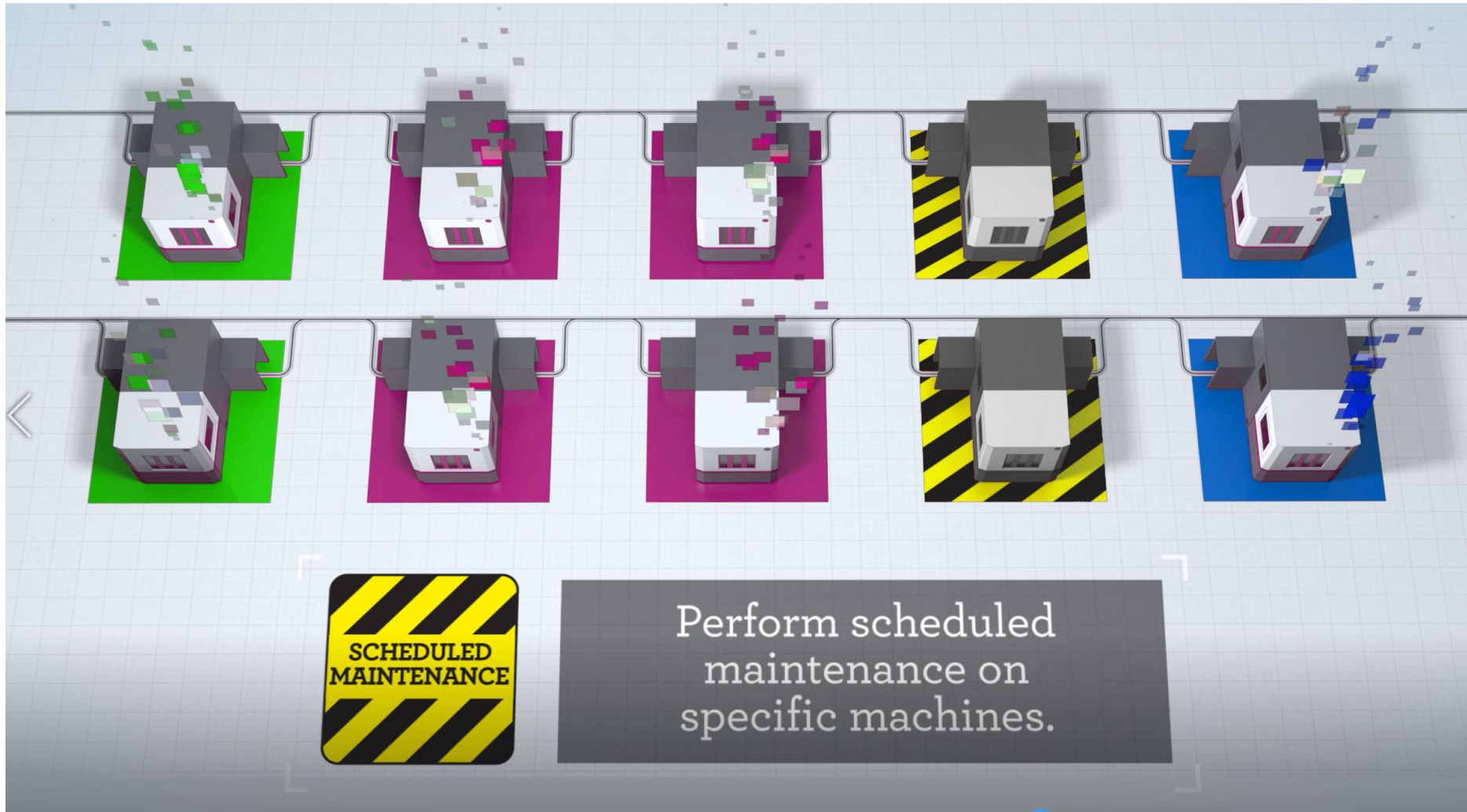


Face Grinder

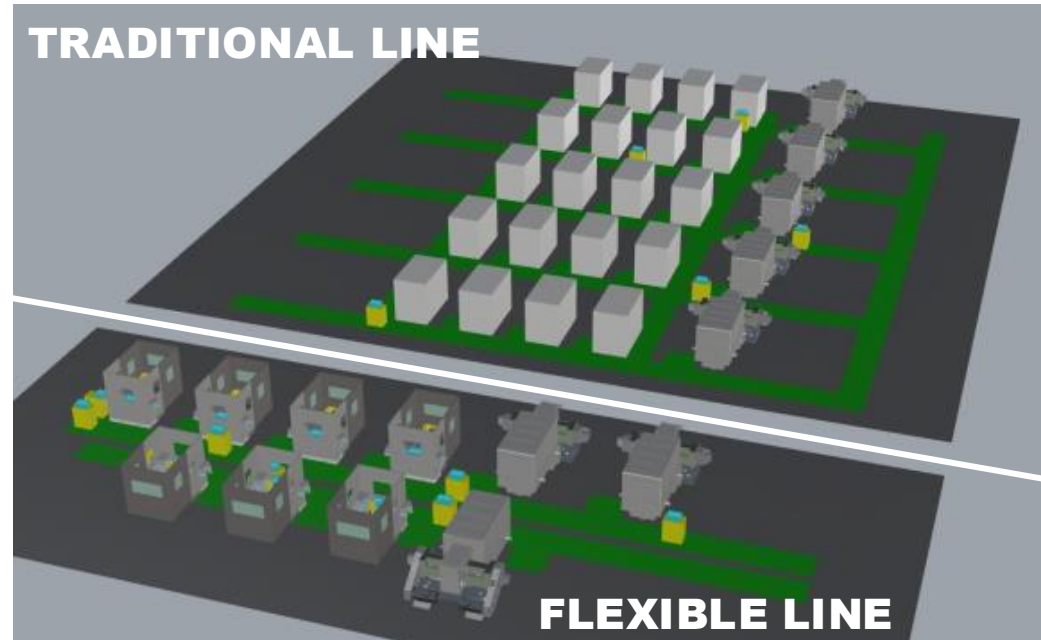
ID/OD
Grinder

Protection for
Future Expansion

AGV Path



LAYOUT COMPARISON



FLEXIBILITY

- Multiple part families on a single line
- Shorter changeovers
- No rigid production planning
- Smaller warehouses

COMPETITIVENESS

- Increased uptime
- Lower number of machines
- Lower manpower
- Lower tooling

INVESTMENT

- Scalable investments
- Shorter ROI

10 Machines vs 25!