P2

The flexible bending solution

salvagnini

CHANGE

What are the challenges faced by companies today?

Today companies have to cope with many challenges in order to remain competitive in a continuously developing market. These challenges include:

1. The need to automate information distribution, in order to create a **lean, error-proof production environment**, by integrating company ERP/MRP systems with process software for production management.
2. The growing need to **increase the autonomy and efficiency of production systems** by automating loading, unloading and sorting operations.
3. Finally, to prevent programming from becoming a bottleneck for production, the aim of **implementing simple and quick office software solutions,** able to make procedures leaner and improve overall efficiency.

Discovering Generation 4.

With the new Generation 4, Salvagnini presents innovative solutions for **improving simple use and repeatability of jobs, eliminating low added value activities, reducing lead times and optimizing production flows,** for lower product costs and increasingly high business competitiveness.
For the P2 family, Generation 4 introduces **safety guards** with a modern design, redesigned to ensure full integration with the P-Robot, the **model 1620,** the **advanced control boards, CLA** and **increased maximum workable diagonals** for most models.

What is Salvagnini's perspective on panel bending?

For Salvagnini, panel bending is an innovative and fully automated process of bending sheet metal, designed by Guido Salvagnini in 1977 with the invention of the first panel bender. Today the Salvagnini panel bender combines speed, flexibility and precision, and is the **ideal solution for batch and kit productions.**

How can we justify the investment?

In today's scenario, marked by short lead times and increasingly smaller batches, maintaining high quality and margins is a challenge that can be successfully met with **innovative technologies** that ensure **precision, flexibility** and **production efficiency.** Investing in a Salvagnini panel bender means significantly increasing these, while reducing production times and costs. The Salvagnini panel bender, in fact, combines **productivity,** with its automatic bending cycles averaging **17 bends per minute,** and **flexibility,** with its **universal bending tools,** able to process a full range of thicknesses and materials that can be machined without the need for setting up special tools, for kit and single batch production. The Salvagnini **P2** panel bender can work **independently,** in the **cell** or as part of an **automatic factory.** It can be fed **manually** or **automatically,** picking the sheets up from one or more sheet metal packs. **Unloading** can also be **manual** or **robotized.** Its evolved sensors also guarantee **zero-waste production,** automatically adapting the process to the geometrical and mechanical variations of the sheet metal being machined and the external ambient conditions, ensuring top production quality and reliability.

The flexible bending solution

The P2 natively combines **productivity,** with its automatic bending and handling cycles, and **flexibility,** with its universal bending tools.

PRECISION

How to obtain maximum precision?

The sheet metal is centered only once at the start of the process, along the notches and against controlled reference stops: this minimizes both the cycle time and any potential precision errors. The Bending Formula automatically optimizes the bending parameters to reduce waste, while the MAC3.0 system detects and compensates any variability in the material in real time to guarantee precise, high-quality bends.

ADAPTIVITY

How to make production independent of changes in material?

MAC3.0 is the set of integrated technologies – sensors, formulas and algorithms – that make the panel bender intelligent: it eliminates waste and reduces corrections, measuring in-cycle and automatically compensating any variability in the material being machined.

How to make production independent of external variations?

P2 integrates advanced sensors that precisely measure the actual thickness and effective size of the blank, also detecting any deformations caused by variations in temperature. The data is fed in real time into the Bending Formula, which calculates the correct force to apply to the sheet metal, guaranteeing the precision, repeatability and quality of the finished product.

P2 is the ideal solution for batch-one and kit productions, thanks to automatic tool adjustment without stopping the cycle. A winning choice for anyone seeking efficiency, reactivity and reduced lead times.

How to adapt the panel bender to different production needs?

In addition to the automatic blankholder, the P2 offers a range of options to guarantee maximum versatility and adaptability, to suit any production strategy or mix.

How to make the process reactive to changes in the production lists?

P2 can be equipped with the proprietary OPS software that enables communication between the panel bender and the factory ERP. Depending on needs, OPS manages the production of sequences composed of different parts. The universal bending tools, automatic set-up in-cycle and fully automated handling respond in real time to any variations in the production list.

How to combine productivity and flexibility?

Conventional bending is characterized by an average OEE of 30%, with flexibility dependent on the tool change system - which is often costly and more time-consuming than on a panel bender - or on the installation of more than one press brake. The P2 panel bender, on the other hand, natively combines productivity, with its automatic bending and handling cycles, and flexibility, with its universal bending tools. And with its advanced cycles, the P2 completes an average of 17 bends per minute.

How long does re-tooling take?

The P2 doesn’t require re-tooling: the upper and lower blades, the counterblade and the blankholder are universal tools that are able to process the whole range of thicknesses and machinable materials.

Do manual loading and unloading affect the total cycle time?

Loading and unloading are performed by the operator, who positions the sheet metal on the worktable and removes the product after bending. P2's advanced cycles minimize the impact of these activities on the total cycle time, allowing bent parts to be unloaded while positioning the new sheet metal: two combined actions in one.

Does the P2’s set-up affect productivity?

The set-up has minimal impact on the panel bender's productivity: when the program is loaded, the blankholder automatically adapts in masked time, and the manipulator gets into position for gripping and handling the sheet.

How to produce in kits or batch-one?

The P2 is equipped with an automatic blankholder, which automatically adapts the length of the tool according to the size of the part to be produced, without the need for machine downtime or manual re-tooling even in-cycle: the ideal solution for batch-one and kit production.

Is the P2 panel bender a sustainable solution?

Salvagnini has always worked to develop solutions with low environmental impacts, guaranteeing maximum operator safety and resource optimization.

Direct drives

The P2 panel bender adopts only electric actuators, thus removing the hydraulics. Bending cylinders are driven by brushless motors, which offers great advantages in terms of the reduced wear and deterioration of components that, unlike in other similar technologies, are no longer subjected to continuous extreme mechanical stress.

Intelligent energy use

The efficiency of the drives and intelligent cycles use the right amount of energy only when needed.

Impacts: embrace a more sustainable future and measure the difference every day

Impacts measures the consumption of electricity and compressed air on the panel bender. It is the first step towards calculating volumes of CO_2 equivalent of each single manufactured component. Impacts is used to monitor and become aware of our own consumptions, to optimize and reduce them. It increases profitability, because reducing consumption means reducing operating costs.

The compact panel bender for lean, flexible production.

Adaptive system
The integrated adaptive technologies (advanced sensors, Bending Formula, MAC3.0) make the system intelligent and able to **automatically adapt** to changes in the material and the external environment, **eliminating waste and corrections,** and extending the range of products that can be made.

Flexible automation
It uses **universal bending tools** which automatically adapt in-cycle to the panel geometry, without machine down times or manual re-tooling, allowing **batch-one or kit productions.**

Connectivity 4.0
The proprietary **LINKS** and **OPS** softwares establish communication between the system and the company departments involved in the production flow.

Production versatility
It offers **customized solutions**, including **auxiliary tools** and **additional devices** for special geometries or **different loading/unloading solutions** with additional door or robot.

Sustainable technology
The technical solutions adopted (Direct Drive and pneumatic and electric actuators) allow it to **respect both people and the environment** without reducing its productivity.

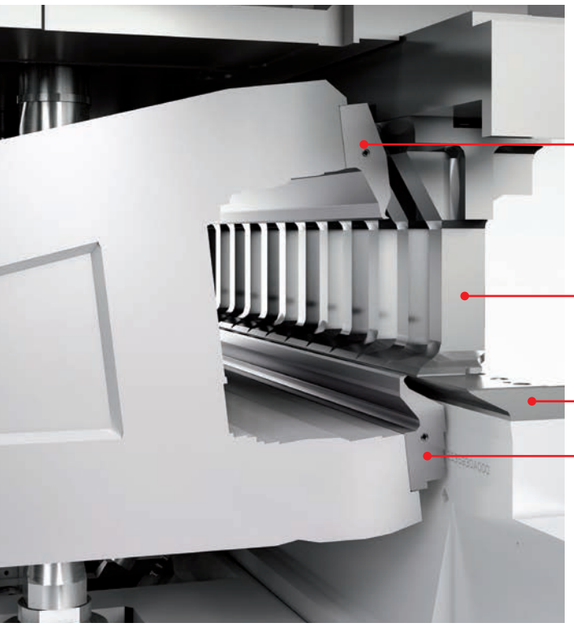
Salvagnini is panel bending, panel bending is Salvagnini.

4,000 installations in over 85 countries, the world's largest panel bender manufacturing plant and over 40 years of experience and competence speak for themselves: Salvagnini is an authority on "panel bending 4.0", a flexible process the likes of which has never been seen before, whose application boundaries are extended to sectors and environments that have always been considered poorly suited to this technology.

5 P2 models at your service, for bending up to 2750 mm in length and 260 mm in height.

Flexible automation.

Upper and lower blade, counterblade and blankholder are the **four universal tools** used to process the whole range of thicknesses and machinable materials, from 0.4 to 3.2 mm, during the cycle and without machine down times or manual re-tooling.



The upper and lower blades (A, D) are the two tools featuring interpolated controlled movement and responsible for bending.

The automatic blankholder (B) works simultaneously with the blades and counterblade to bend and clamp the sheet accurately and effectively.
It adapts the tool length according to the size of the part being produced during the cycle, without machine down times or manual re-tooling.

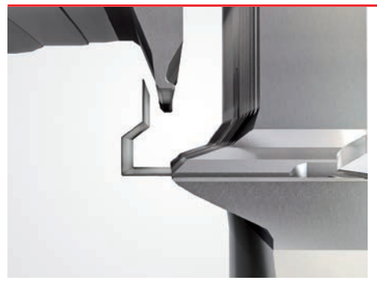
The counterblade (C) helps clamp the sheet during the cycle.

Automatic manipulator: fast and accurate.

Quickly and fully automatically, this moves, handles, grips and rotates the sheet metal throughout the whole machining cycle. **It requires no manual interventions during the cycle.** The operator positions the sheet metal on the worktable and collects the product after bending, performing only the loading and unloading operations.

Operating mode: simple, quick and lean.

Bending on each side of the sheet is achieved thanks to the controlled **interpolated movements** of the blades.



Downward bend
NEGATIVE

Upward bend
POSITIVE

Hem
WITH BLADE

Adaptive system.

One single and controlled centering process.
The sheet metal is centered, just once at the start of the process, against controlled mechanical stops: the cycle time is minimized and any precision errors are all absorbed by the first bend.
The mechanical stops are a further guarantee of finished panels of the correct size, every time.

MAC3.0: proprietary technology for automatic in-cycle compensation
MAC3.0 detects any differences in the mechanical characteristics of the material compared to their nominal value during the cycle, adapting the movements of the bending unit and the manipulator to compensate them.
Compensation is automatic if the ratio between the bending force required for the material actually being processed and that required for the material expected (Kσ) is between 0.75 and 1.25. In this case, the panel bender guarantees a constant bending angle and the correct dimension of flanges and boxes.
If Kσ exceeds this range but not the maximum value (2), the operator can quickly extend the field of application of MAC3.0 by defining a new material. For values beyond the maximum threshold the bending process is interrupted automatically.
A digital indicator integrated in FACE monitors the situation in real time, informing the operator of the actual characteristics of the material being machined.

Proprietary Bending Formula.

Developed over the years, the **Bending Formula** defines the force and manages the movements of the universal tools, analyzing different parameters in real time, including deflections, temperature and thickness, guaranteeing the precision, repeatability and quality of the finished product.

Custom solutions to widen versatility.

- **P tools:** auxiliary tool that can be engaged and disengaged beneath the blankholder, rapidly and automatically, to make narrow panels, tubular, hidden or radius bends, or bends with intrusive embossings. Available only on P2**20.
- **CLA tools:** auxiliary blades, modular in length, available in both positive and negative versions, for making upward or downward tabs or bends that are shorter than the whole sheet length. Auxiliary blades can be set up automatically, with the CLA/SIM option, which composes sequences of different lengths in masked time.
- **CUT tool:** combination of a specific P tool and an auxiliary blade for automatic and sequential cutting of profiles of different lengths, materials, shapes and thicknesses. An unloading belt device on the bladeholder is used for manual unloading.
- **DPM manipulator:** suction-cup device used to handle narrow parts, or frames without material, minimum width 105 mm. Used together with the specific P tool, it can produce panels up to 45 mm wide.
- **AQC - Angle Quality Control:** automatic integrated system that measures and corrects the bend angle, even with tight bends, thus reducing the cycle time. Complementary to MAC3.0, it is ideal for sectors demanding high quality, such as the automotive or aerospace industries, or for lines with downstream automated processes.

P-Robot: 100% flexible production strategy.

P-Robot is the application which combines a **Salvagnini panel bender** with an **anthropomorphic robot** to independently produce kits, batches and single parts.

Salvagnini's answer to the challenges of today's industrial context marked by high item turnover rates, quick lead times and constant personnel shortages.

- P-Robot is **easy to program and use,** with the MOVE software and smart teaching systems;
- **it is used to select the most suitable strategy** for current production needs (R2R; H2R; R2H modes);
- its **configuration can be customized,** from loading/unloading based production flows to advanced systems with pallet handling and third-party integrations such as corner forming, labeling, laser marking, riveting and welding.

RVS – Artificial intelligence serving the cell

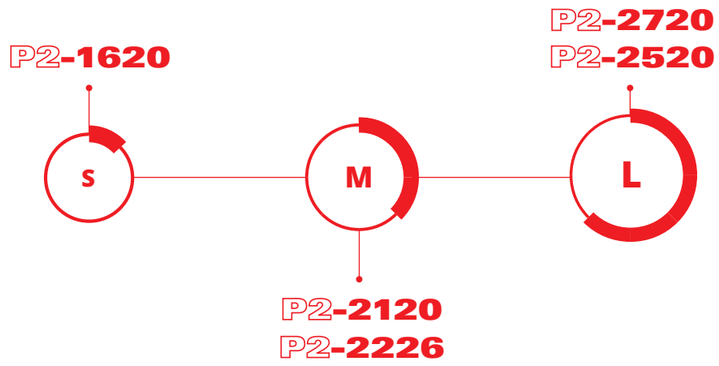
P-Robot is equipped with the innovative **RVS artificial vision system** (Robot Vision System), the only one of its kind on the market, which **further simplifies use,** optimizing production flows as it **accelerates the intermediate steps of part recognition, handling and programming.** The incoming sheet metal **quality control** option during loading maximizes the efficiency of the whole process, preventing non-conforming parts from being machined.

Choose the model that best suits your needs

Salvagnini offers 5 different models, which bend up to **2750 mm in length and 260 mm in height,** responding to all production needs and maximizing use of the panel bender.

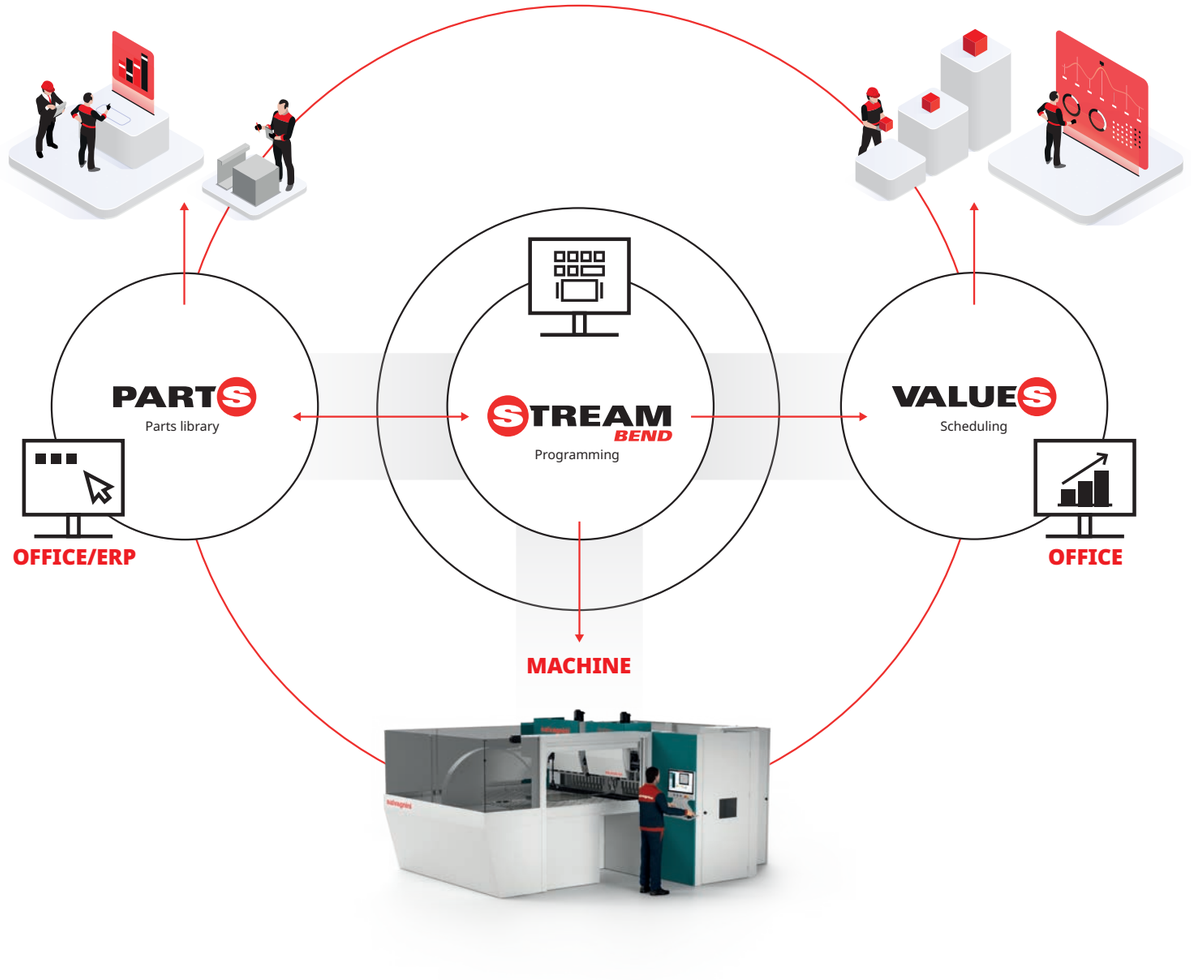
TECHNICAL SPECIFICATIONS	P2-1620		P2-2120	P2-2226	P2-2520	P2-2720
Maximum length of incoming sheet (mm)	1995		2495	2815	2795	3050
Maximum width of incoming sheet (mm)	1414		1600	1600	1600	1600
Maximum diagonal that can be rotated (mm)	2000		2500	2820	3200	3200
Maximum bending force (kN)	240		330	590	660	660
Maximum sheet bending force (kN)	380		530	635	1060	1060
Maximum bending length (mm)	400-1000	1000-1600	2180	2200	2500	2750
Maximum bending height (mm)	203		203	260	203	203
Minimum thickness (mm)	0.4		0.4	0.4	0.4	0.4
Maximum thickness and bending angle steel, UTS 410 N/mm² (mm)	3.2 (±90°) 2.5 (±120°) 2.1 (±130°)	2.5 (±90°) 2.1 (±130°) 1.6 (±135°)	3.2 (±90°) 2.5 (±120°) 2.1 (±135°)	3.2 (±90°) 2.5 (±130°) 2.1 (±135°)	3.2 (±90°) 2.5 (±130°) 2.1 (±135°)	3.2 (±90°) 2.5 (±130°) 2.1 (±135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm² (mm)	2.5 (±90°) 2.1 (±120°)	2.1 (±90°) 1.6 (±135°)	2.5 (±90°) 2.1 (±120°) 1.6 (±130°)	2.5 (±90°) 2.1 (±125°) 1.6 (±135°)	2.5 (±90°) 2.1 (±125°) 1.6 (±135°)	2.5 (±90°) 2.1 (±125°) 1.6 (±135°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm² (mm)	3.5 (±120°) 3.2 (±125°)	3.2 (±120°) 2.5 (±125°)	4.0 (±120°) 3.5 (±130°)	4.0 (±120°) 3.5 (±130°) 3.0 (±135°)	4.0 (±120°) 3.5 (±130°) 3.0 (±135°)	4.0 (±120°) 3.5 (±130°) 3.0 (±135°)
Average absorbed power (kW)	3.0		3.0	6.0	5.0	5.0
Noise level (Machine Directive 2006/42/EC) (dB)	68		68	68	69	69

Values refer to a standard machine. Salvagnini reserves the right to modify this data without warning.

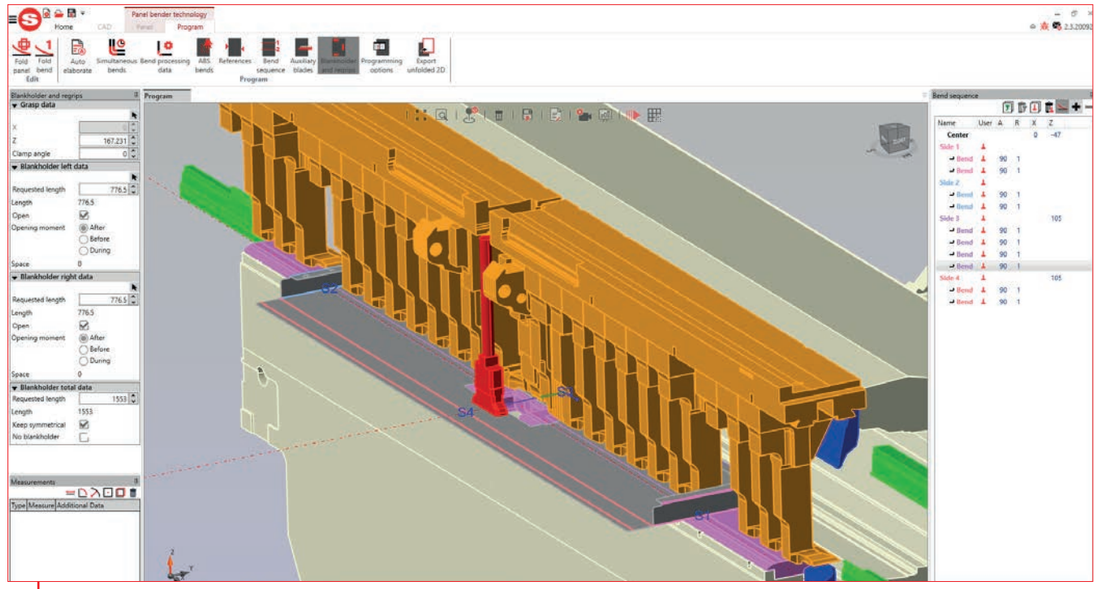


The software ecosystem.

STREAM, Salvagnini's answer to the modern industrial context, is a programming suite that improves reactivity and reduces costs, operating errors and process inefficiencies.



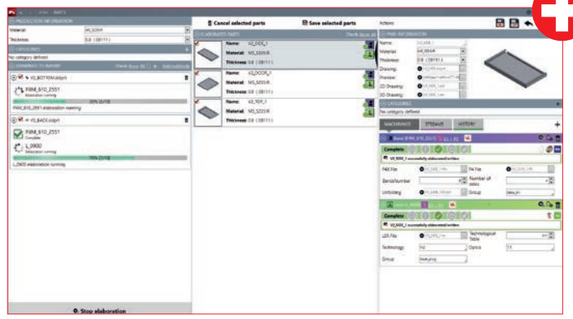
It is an integrated environment for **managing all activities in the office and on the factory floor;** it constitutes a **single point of access for all technologies,** from cutting to bending; it is capable of meeting all planning, programming, production, management, control and optimization needs throughout the production process. STREAM can also be used to **calculate costs,** including those for upstream and downstream processes where necessary.



STREAMBEND

STREAMBEND is the software for developing panel bending programs, even for multiple parts:

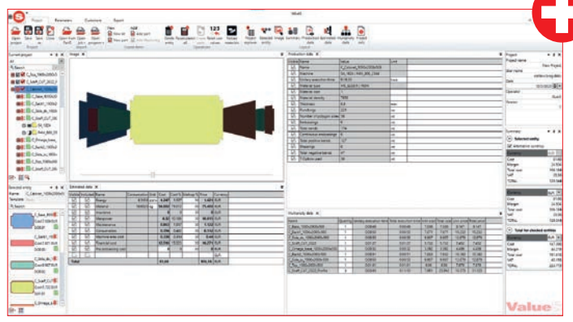
- **Automatic mode:** it develops programs independently, starting from a 3D model.
- **Interactive mode:** it is used for generating/editing/completing operations.
- **Simulator:** virtually assesses the results obtained on the machine.



PARTS

PARTS is the software used to manage the whole database of products and parts:

- it is the point of access to all programming activities;
- it is fully integrated with all STREAM software;
- it defines the production flows for each part to be machined;
- it classifies the elements according to common or customized categories.



VALUES

VALUES is the software which provides an accurate estimation of production costs.

It allows calculation not only on the basis of the individual technology, but also over the entire process, including upstream and downstream machining where necessary.

Coordinate your factory with OPS in real time.

The adoption of evolved digital technologies makes it possible to implement and manage complex, integrated, highly automated high-performance systems, and can help develop simple solutions that require no structural changes to the production layout, making the world of smart manufacturing much more accessible.

In the production equation, **OPS,** the **modular Salvagnini process software,** acts as a central coordinator, managing and distributing information among all the environments to make the process truly efficient.

OPS receives the production list from the factory ERP/MRP in **real time** and supports the programming activities.

OPS defines **rules and algorithms** for automating the process, **adding intelligence to the system:** it can set constraints for the part production sequence and the composition of the kits to produce, guaranteeing greater process efficiency.

OPS can make **independent decisions,** according to a production logic – or according to a mix of multiple production logics. It is used to exchange information between different technologies, such as the components of an FSJ cell (Flexible Smart Job shop).

- **It organizes production,** defining priorities, managing any order changes or cancellations and checks the availability of the semi-finished parts needed for production;
- **It automatically produces the production lists** by grouping parts according to order, job and production sequence;
- **It provides feedback to the factory ERP/MRP,** updating the state of production in real time, part by part.

Advanced solutions for logistics management.

The OPS Shop Floor Control module integrates solutions for labeling and traceability downstream of the bending process, supporting operators in the logistics management of parts.

The software permits displaying on an intuitive interface touch monitor, or printing on a label, the information about the part, such as the production code, job code, or next work station. A bar code can also be placed on the label to automatically call up the program for the next job.

OPS Shop Floor Control also provides feedback to the factory ERP/MRP, marking a picked part as completed and updating the production list. It is simple technology that helps to reduce sorting times of the parts produced, avoiding identification errors, reducing process costs and increasing production reactivity.

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Transforming values into value.

A modular solution developed on 3 service levels, designed respectively for:

Act
managing day-to-day needs

Plan
offering preventive maintenance and planning services

Grow
maximizing system use and performance

Proximity, reliability and orientation to the future are the values that have always been found in the wide range of services available for responding to contemporary challenges.

LINKS

LINKS (ACT) is the IoT solution that improves the overall effectiveness of Salvagnini systems, using the latest business intelligence technologies. LINKS is used to monitor the machine performance and access the production data, logbooks, performance KPIs, telemetry and parameter monitoring, through the Condition Monitoring process.

SupportYou

SupportYou (ACT) is a subscription-based service that manages updates and provides support for using and programming STREAM and all the applications in the office station.

Close2You

Close2You Report (PLAN) uses LINKS data to offer an overview of the state of health of a system, suggesting the required maintenance interventions according to their criticality and proposing agreed interventions to minimize the risk of malfunctions.

Rethinks

Rethinks (GROW) is the ideal solution for anyone wishing to optimize their production process and improve quality and efficiency, reducing the number of work steps, material usage and costs.

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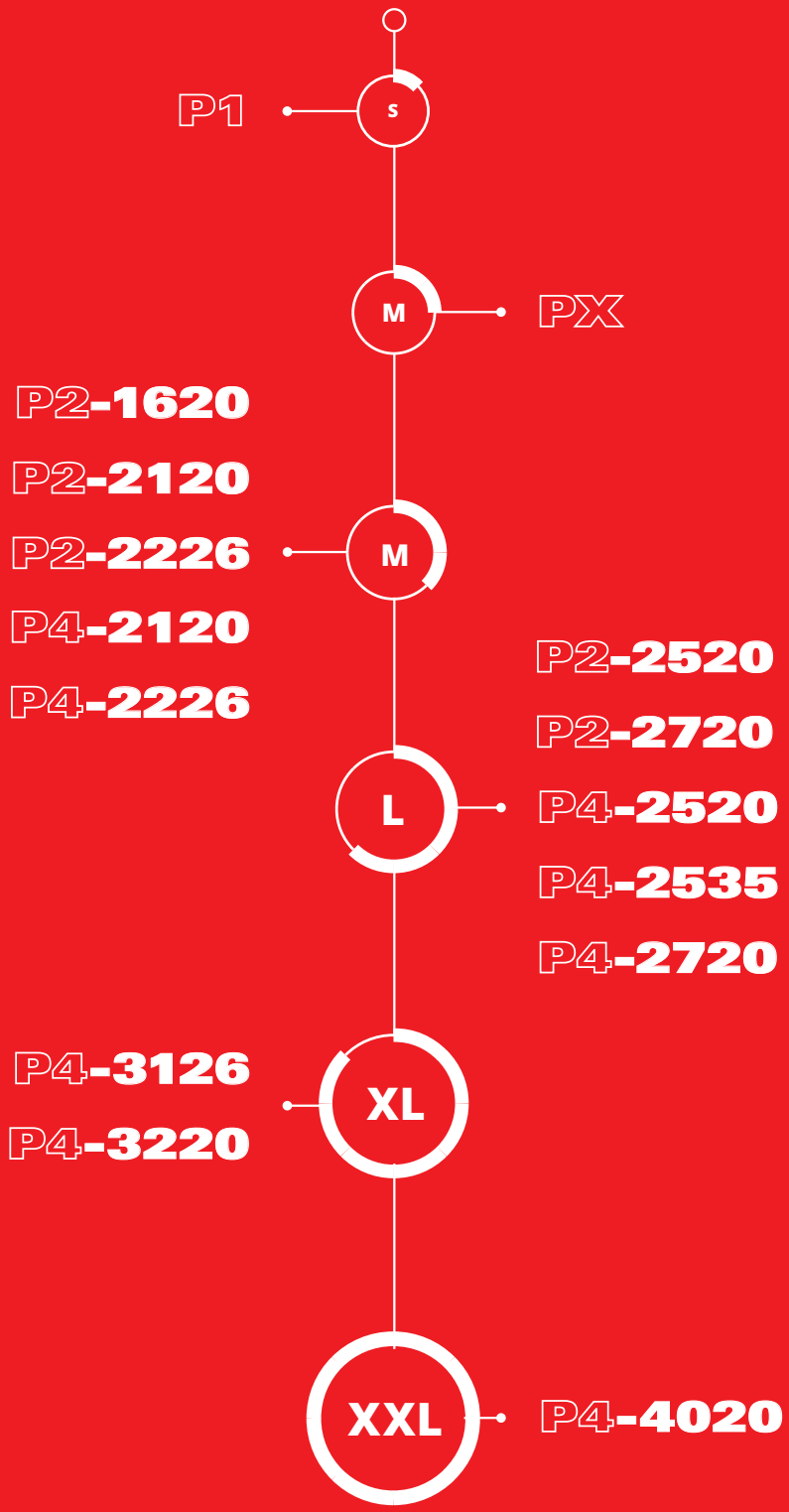

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