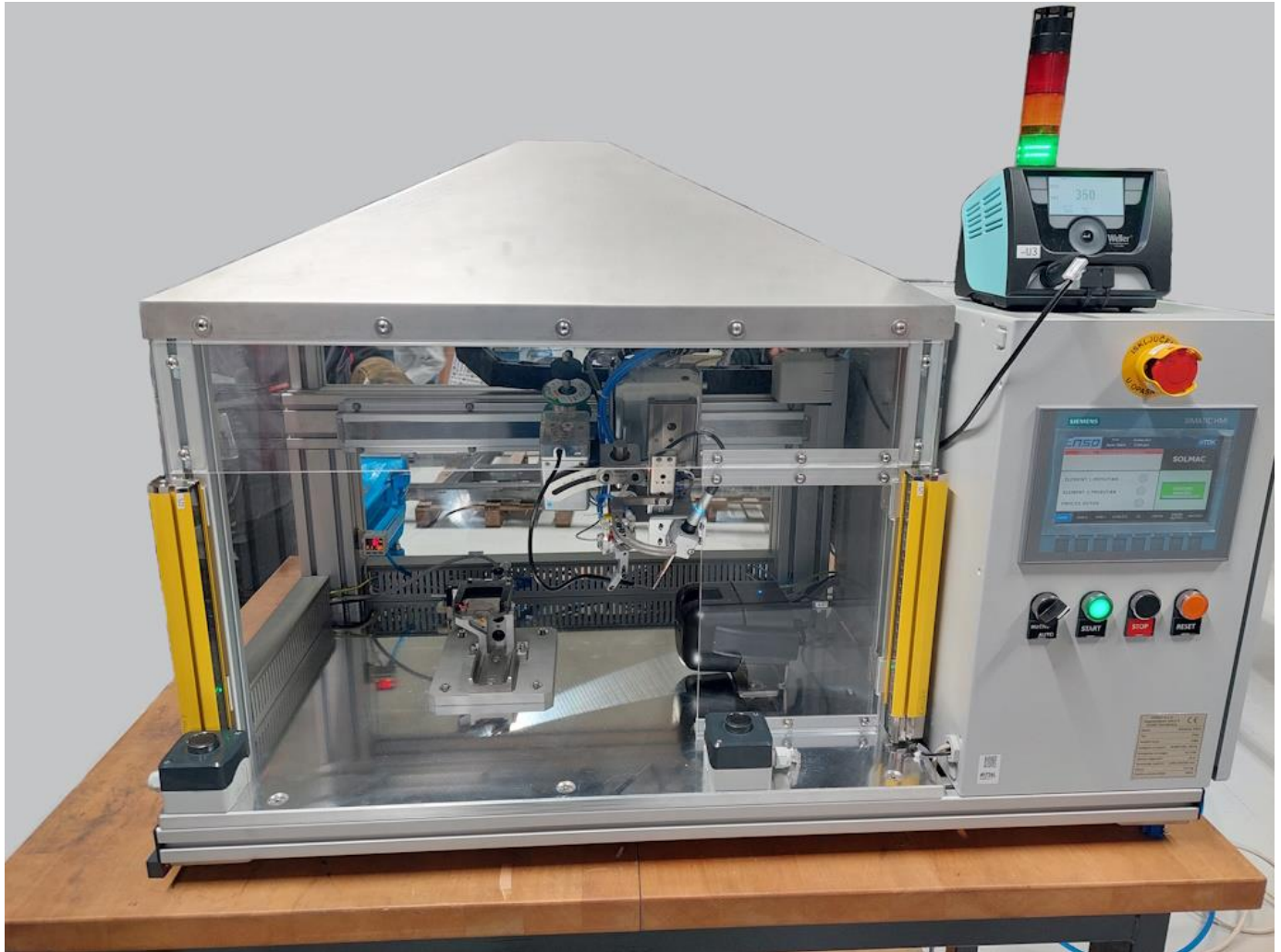


REFERENCES - ENSO

SOLMAC – Semi-automatic soldering device

The device automatically solders contacts, adding solder and cleaning the soldering tip.
Manual insertion of the element and contacts, activation of the device with two-handed control.



Video: <https://youtu.be/VNSHgNVbn9M>

REFERENCES - ENSO

DIPKO – Device for testing the solderability of electronic components

Device for checking the solderability of electronic components by immersion in a solder bath. After placing the elements in the positions, the automatic descent into the solder bath is activated. Two solder baths with regulated temperature are available.



Video: <https://www.youtube.com/watch?v=7kPE4T2GW0M>

REFERENCES - ENSO

DOBLI – Plastic box feeder system

A system for supplying plastic boxes with tools in front of the labeling and marking machine.



Video: <https://www.youtube.com/watch?v=JOVvPKejrMA>

Vibrofeeder and separator system for pyro separator elements

System with 8 sets of vibratory feeders for assembling pyro separators in car collisions.



Video: <https://www.youtube.com/watch?v=HomHbPt450&t=16s>

REFERENCES - ENSO

PANDE – Declaration marking machine

PANDE is a machine for applying declarations on bags. Unmarked bags are placed in the entrance part of the machine, where they are transferred to the lifting table with forks. Above the lifting table there are suction unit that lift the bag and place it on the conveyor belt. There is a printer on the conveyor belt that prints declarations on the bags. After gluing, the bags are stacked on another conveyor.



WEB: <https://enso.hr/en/our-work/pande-stroj-za-apliciranje-deklaracija-na-vrece/>

Video: <https://www.youtube.com/watch?v=iBiM501BMIU>

REFERENCES - ENSO

ZUBKO – AOI machine for teeth elements

ZUBKO - Machine for manipulation, optical control and packaging of metal dental segments.

The machine optically inspects the metal pieces "tooth segments" and checks their correctness and tolerances. The pieces are manually poured into a hopper, which is dosed by a conveyor into a bowl vibrator. The pieces are then positioned in the machine where they are optically examined. NOK pieces are separated into a box, OK pieces are lined up on a slat. After the entire row of good pieces is filled, the pieces are gently lowered into the box to prevent damage. In this way, the correct pieces were packed with counting and monitoring of quantity and complexity into packing boxes.



WEB: <https://enso.hr/en/our-work/zubko-stroj-za-opticku-kontrolu-zubnih-segmenata/>

Video: <https://www.youtube.com/watch?v=WLxkG7xFL84>

REFERENCES - ENSO

Vibratory feeders, hoppers, dispensers, circular and linear feeders

Production of vibratory feeders, hoppers and dispensers based on the principle of adding vibrations.

Hoppers – dispensers of different sizes from one to 20 liters. They are driven by electromagnets or pneumatic vibration drives. They are used to add material to circular vibratory feeders in order to increase the autonomy of the machine or to dose the material in the scale so that the material is weighed according to the set weight.



A bowl feeder is a device that doses bulk materials or separates, positions and leads into a series of production pieces to manipulate them in the desired way. Elements or parts come to the exit of the bowl feeder oriented in the desired way and suitable for taking or extracting.



A linear feeder is a device that transports elements or parts, and often serves as a buffer for a certain number of elements.



WEB: <https://enso.hr/en/dodavaci-materijala/>

Video: https://www.youtube.com/watch?v=Jr_gYv6DEyU&list=PLAjybhPv1NoLYMctrNnnbqGCMWAKQGPb8

REFERENCES - ENSO

GLUSTA – Gluing machine for PTC heaters

GLUSTA - Machine for manipulation, gluing and stacking of PTC heaters.

The machine picks up precisely pressed plates of ceramic PTC heaters from the press. Stacks and positions them in rows so that they are suitable for gluing and stacking. Gluing is done on one side of the tiles with special glue. PTC heaters are arranged in columns suitable for manipulation and baking. The machine is fully automated and works with a large number of different sizes and dimensions of heaters according to predetermined recipes. It is equipped with a SCADA system for monitoring, controlling and recording the height of alog tiles and the level of glue in the tub.



WEB: <https://enso.hr/en/our-work/glusta-ps01-automatic-gluing-station/>

Video: <https://www.youtube.com/watch?v=Zxh8jSRqevM>

REFERENCES - ENSO

DOVA – Spring dosing machine

DOVA - Machine for dosing different types of springs according to the given weight into packing boxes.

It consists of a input basket into which springs are supplied by a vertical conveyor. The required weight of the dosed springs is selected programmatically and the machine doses the springs into the packaging box. Dosing takes place via two vibro dispensers of different sizes. The control enables slowing down and turning off the dispenser in order to obtain a higher speed and required dosing accuracy.



WEB: <https://enso.hr/en/our-work/dova-stroj-za-doziranje-opruga/>

Video: <https://youtube.com/shorts/COv8YaygGKY>

REFERENCES - ENSO

SUKI - Dryer

SUKI - Machine for automatic drying of electronic components inside etching baskets.

The machine is an automated version of a dryer with air preparation for drying and a basket rotating system. The process parameters are monitored by a PLC and an operator panel. Setting the recipe and saving data is enabled via the SCADA system.



The machine is made of aluminum profiles and stainless steel because it dries wet components that were washed with DEMI water before this process.

Air preparation for blowing into the system is carried out by an air dryer, a regulated fan and temperature regulation by electric heaters.

Baskets with elements rotate at higher and lower speeds during drying, so that part of the liquid is removed by the centrifuge, and the rest by drying with preheated air.

At the outlet (suction) there is a probe for measuring humidity as an indicator of drying. The system is equipped with sensors for air flow measurement, temperature measurement, humidity measurement and an encoder for measuring basket rotation speed.

WEB: <https://enso.hr/en/our-work/suki-susac/>

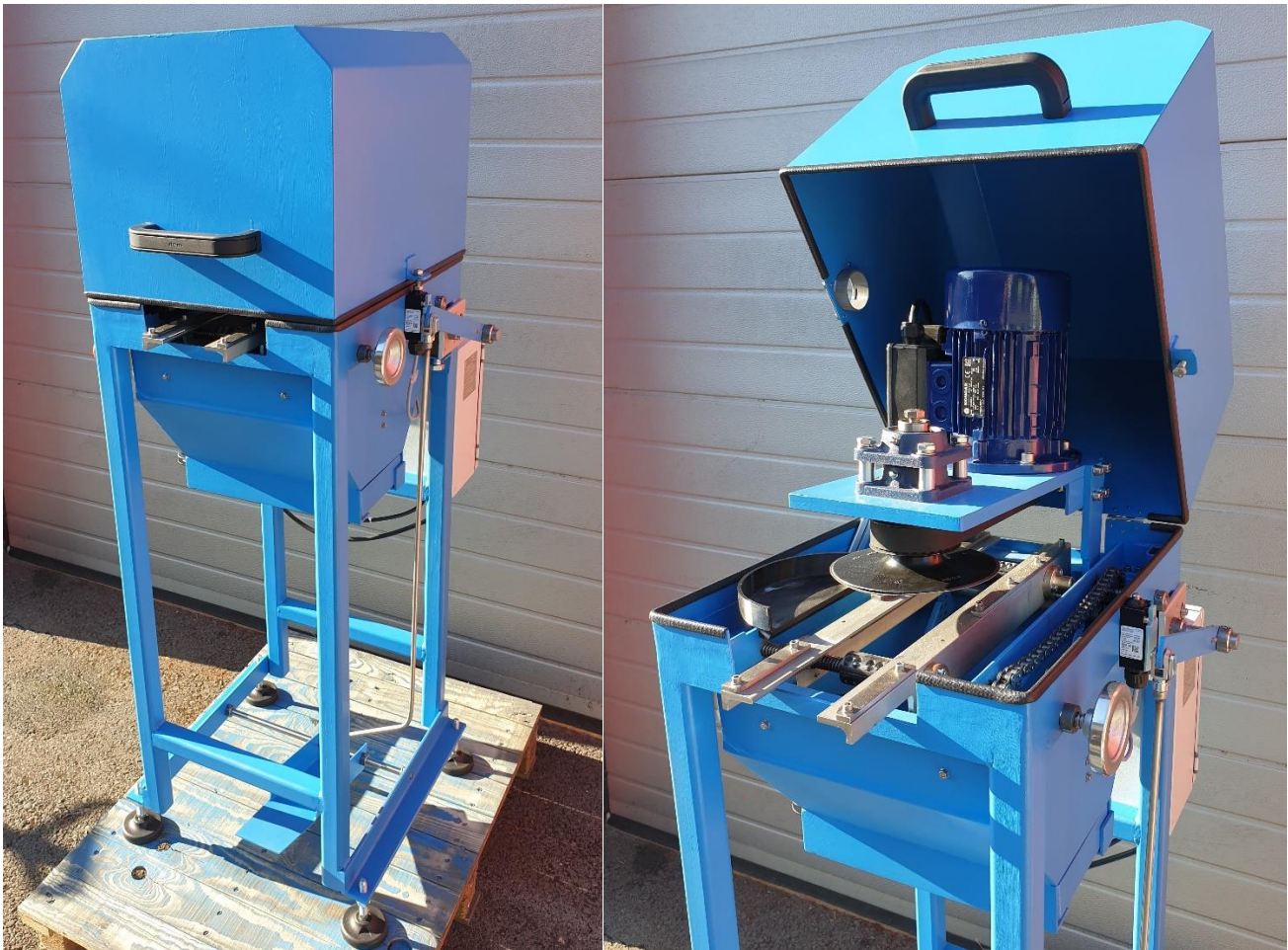
Video: <https://www.youtube.com/watch?v=GuQefLbrO4A>

REFERENCES - ENSO

BRUS – Grinder

BRUS is a machine for grinding aluminum and copper leads in the production of transformers.

The machine has a grip of adjustable width for several types of output. By closing the hood and pressing the pedal, the sander is put into operation. The sander is provided with a holder for a vacuum cleaner, which is switched on at the same time as the sander.



WEB: <https://enso.hr/de/produkte/brus-brusilica-izvoda/>

Video: https://www.youtube.com/watch?v=apw8n_wzIEo&t=1s

REFERENCES - ENSO

PRIKA – Housing marking machine

PRIKA is a machine for sorting, marking and transporting of housings.

The actuators of the machine are: hopper - pneumatic vibrofeeder of elements to ensure system autonomy, bowl feeder, linear feeder, pneumatic vibrator, pneumatic cylinders, conveyor belt, ink jet printer.



1. Control part – The machine is controlled by PLC. Appropriate software and additional modules are controlled by actuators. Communication between the operator and the machine was carried out using the HMI panel, buttons and SCADA system.
2. Input part – The machine has a container (hopper) for unmarked casing pieces. The pieces are dosed from the container into the bowl feeder.
3. Supply system – The vibratory feeder orients and supplies the pieces via a linear feeder to the conveyor belt.
4. Piece marking system – The pieces arrive on the conveyor belt where they are additionally positioned using pneumatic cylinders.
5. Positioned pieces come under the head of the printer, which prints the corresponding mark on the piece.
6. Output section – Marked pieces are transported on a conveyor belt to the box for finished pieces, where they go for further processing.

WEB: <https://enso.hr/en/our-work/prika-ps01-stroj-za-oznacavanje-kucista/>

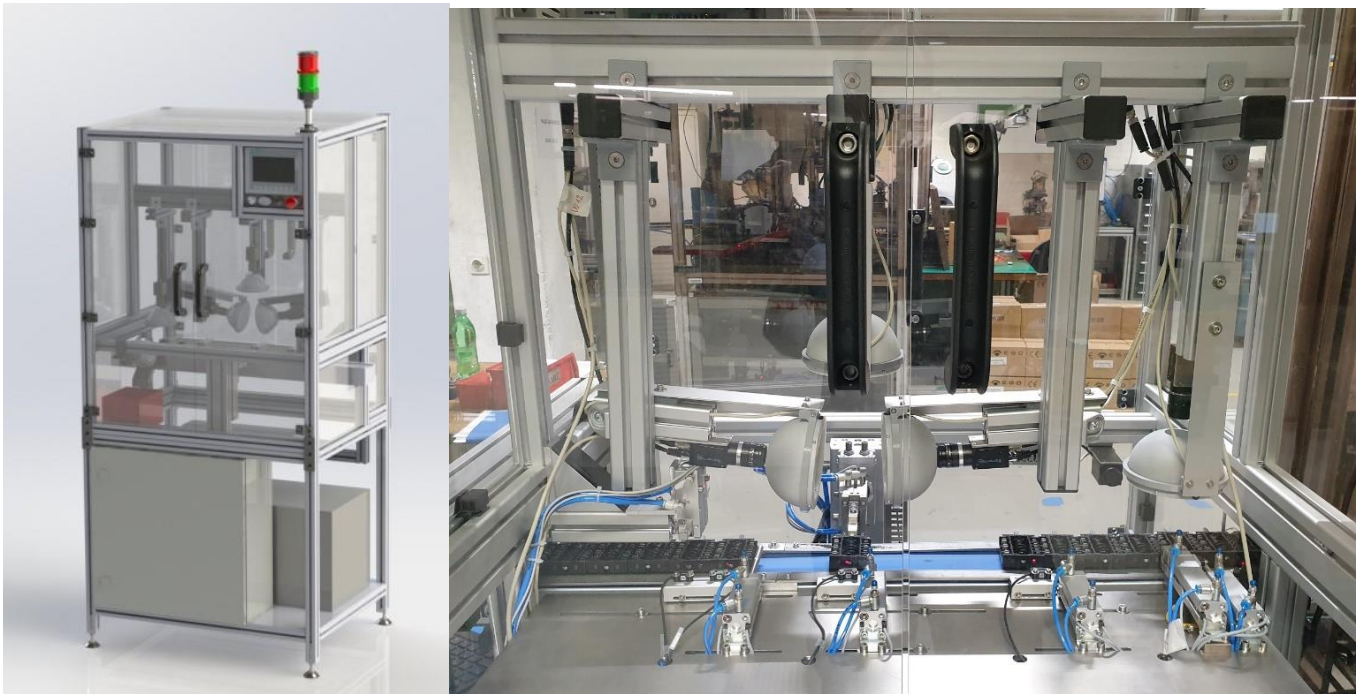
Video: <https://www.youtube.com/watch?v=uPNZIHpj1-U>

REFERENCES - ENSO

AOI Sklopka – Optical inspection machine

AOI Sklopka is automated optical inspection machine.

The transporter supplies the parts (electronic switches) from the previous station where they were laser marked. Pneumatic cylinders are used to separate the string and further manipulate the switch to get into the recording positions and decide on the correctness.



The machine consists of the following units:

1. Transporter for the delivery of switches
2. System for optical control – The pieces are positioned in the place for optical inspection.
3. The system decides on the correctness of the piece.
4. Output section – Correct pieces continue further processing while defective pieces are separated into a separate box.

WEB: <https://enso.hr/en/our-work/aoi-sklopka-ps01-ps02-stroj-za-opticku-kontrolu/>

Video: <https://www.youtube.com/watch?v=gHgnPBP9OJY>

REFERENCES - ENSO

Krivulja – PS01 – Optical control machine

KRIVULJA is a machine for the optical examination of the correctness of the curve.

The plastic parts (curves) are supplied from the large container of the vibratory feeder and inserted one by one by a pneumatic cylinder onto the rotary table. The rotary table is driven by a servo motor and delivers the elements to the camera checking position. The AOI system examines the correctness of the frontal positions of the element. The elements are sorted according to correctness into correct and incorrect.



The machine consists of the following units:

1. System for supplying elements (curves) with a bowl vibrator
2. System for supplying elements to the rotary table
3. Servo rotating mechanism for positioning elements in front of the cameras
4. Inspection system with cameras - AOI
5. System for classifying OK and NOK

WEB: <https://enso.hr/en/our-work/krivulja-ps01-stroj-za-opticku-kontrolu/>

Video: <https://www.youtube.com/watch?v=2kt1TWf9Ito>

REFERENCES - ENSO

KOTRA - PS01 - Machine for ejection of electronic components



"KOTRA - PS01" is a machine for automatic transport, ejection and stacking of electronic components on the grid. The final product are grids ready for further processing.

Actuators: electric axles, pneumatic cylinders, hydraulic cylinder, conveyor belts.

1. Control part - The machine is controlled by the PLC. Appropriate software and additional modules are operated by actuators. Communication between the operator and the machine was performed using HMI panels and pushbuttons.
2. Inlet part - The machine has buffers for full and empty supports of production pieces and a buffer for empty grids on which these pieces break out.
3. Grid handling system - The full piece carrier is positioned on the press while the press conveyor delivers an empty grid under the press. The manipulation is performed by electric axes with vacuum grippers and pneumatic cylinders and a conveyor belt.
4. Piece punching system - The press punches pieces. The press has more tools.
5. Output part - The grid with broken pieces reaches the end of the press conveyor and is transferred to the output conveyor by a manipulator. The grids are stacked on top of each other, and it is ready for further processing

WEB: <https://enso.hr/en/our-work/kotra-ps01-stroj-za-izbijanje-elektronickih-komponenti/>

Video: <https://www.youtube.com/watch?v=YJsonGidLH8>

REFERENCES - ENSO

Vibro - feeder for metal parts

In this case, the feeder in the production process serves to separate, position and guide into a series of production pieces to manipulate them in the desired way. It consists of a receiving part where the production pieces are filled. The pieces are separated, positioned and guided along the intended paths. In the output part, the pieces come out of the feeder stacked into a line one after another.



The design and construction of a circular and linear vibrator included:

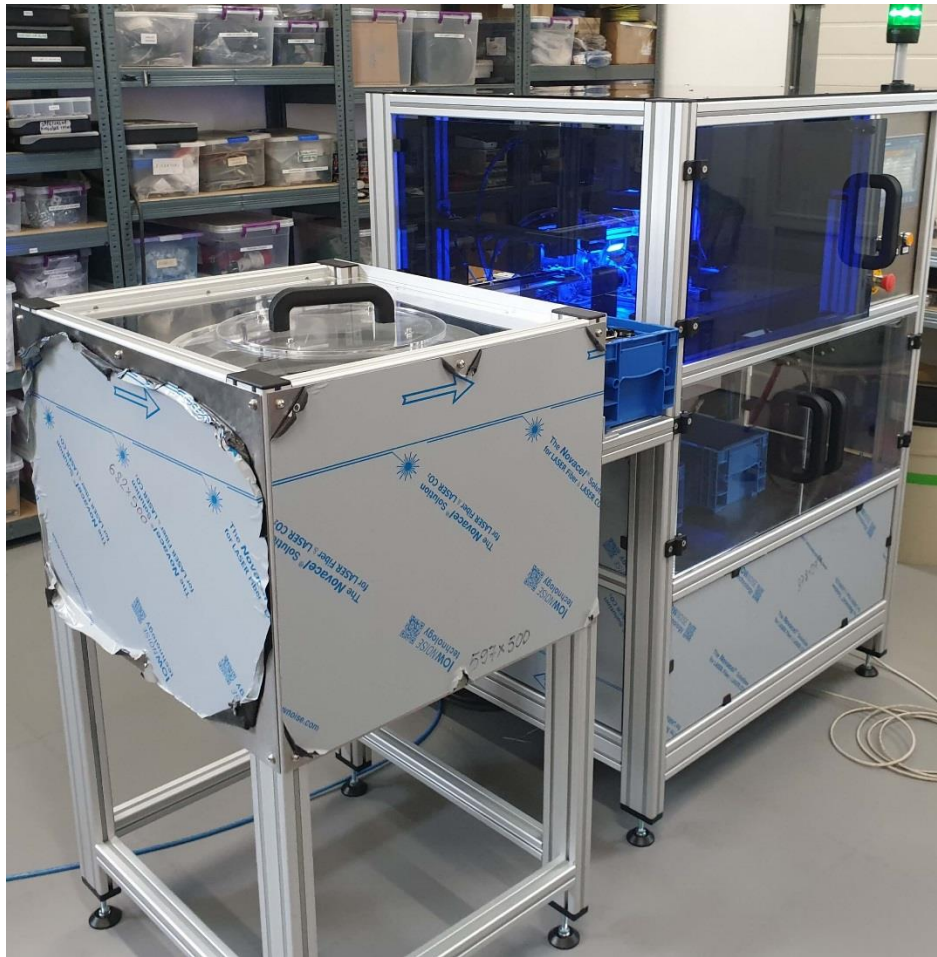
- Designing and manufacturing a bowl of a circular vibrator
- Design and construction of the linear vibrator feeder guide
- 3D bowl printing

WEB: <https://enso.hr/en/dodavaci-materijala/>

Video: <https://www.youtube.com/watch?v=0nCQxCOIzN8&list=PLAyjbhpV1NoLYMctrNnnbqGCMWAKQGPb8>

REFERENCES - ENSO

PLOK – machine for optical control and packaging of plastic components



The final products are:

1. one box with good components
2. one box with scratchy components

The design and construction of the PLOK machine for optical control and packaging of plastic components contained:

- Design and manufacture of machine construction
- Design and manufacture of circular and linear vibrator
- PLC programming
- Visualization

WEB: <https://enso.hr/en/our-work/plok-ps01/>

Video: <https://www.youtube.com/watch?v=7DgfsnlxrA8>

REFERENCES - ENSO

TUMIX – Metallic paste mixing machine

TUMIX is a machine for mixing metallization paste in containers. Intake into the machine is a non-homogenized metallization paste while the end product is a homogenized paste in containers.



The design and construction of the TUMIX machine for mixing production traps contained:

- Design and manufacture of machine construction
- PLC programming
- Visualization (SCADA)
- Parameter of the drive of the vertical and circular mixer motor
- Designing a temperature maintenance system

WEB: <https://enso.hr/en/our-work/tumix-ps01-mixer/>

Video: <https://www.youtube.com/watch?v=oKC4pcdw6kA>

REFERENCES - ENSO

PREMKO – A reel rewind machine for electronic components



PREMKO is a reel rewinder with the possibility of positioning on the desired piece in the reel bar.

The design and construction of the PREMKO rewinding machine for electronic components contained:

- Design and manufacture of machine construction
- PLC programming
- Visualization
- Parameter of the reel winder and rewinder drive

WEB: <https://enso.hr/en/our-work/premko-ps01-rewinding-machine/>

Video: <https://www.youtube.com/watch?v=8bNXg71SXi8>

REFERENCES - ENSO

BRIZ – Machine for throw-out, counting and packing electronic components

BRIZ is a machine for the automatic counting, throw-out and packing of electronic components. Machine operation is automated by performing defined operator actions. The machine obtains electronic components in paper cards from another machine or by manually inserting them into the card acceptance system. The first part of the machine counts and pushes the pieces from each card onto a board that is connected to the box into which the pieces fit. After filling the box, it is transported to the paper cover, covered and transported to exit table.



Design and construction of the BRIZ machine for out-throwing, counting and packing of electronic components contained:

- Design and manufacture of machine construction
- PLC programming
- Designing a component counting program
- Visualization (SCADA)

WEB: <https://enso.hr/en/our-work/briz-ps01-electronic-component-packaging-machine/>

REFERENCES - ENSO

GLUSTA – Gluing machine

GLUSTA is a semi-automatic adhesive station, which takes elements from the press, glues them with a glue suspension, and connects with alloys. The final product are columns of ceramics with alox tiles in arbitrary arrangement, fixed with a layer of adhesive in each space between the elements or element and the alox tile.



The design and construction of the GLUSTA gluing machine included:

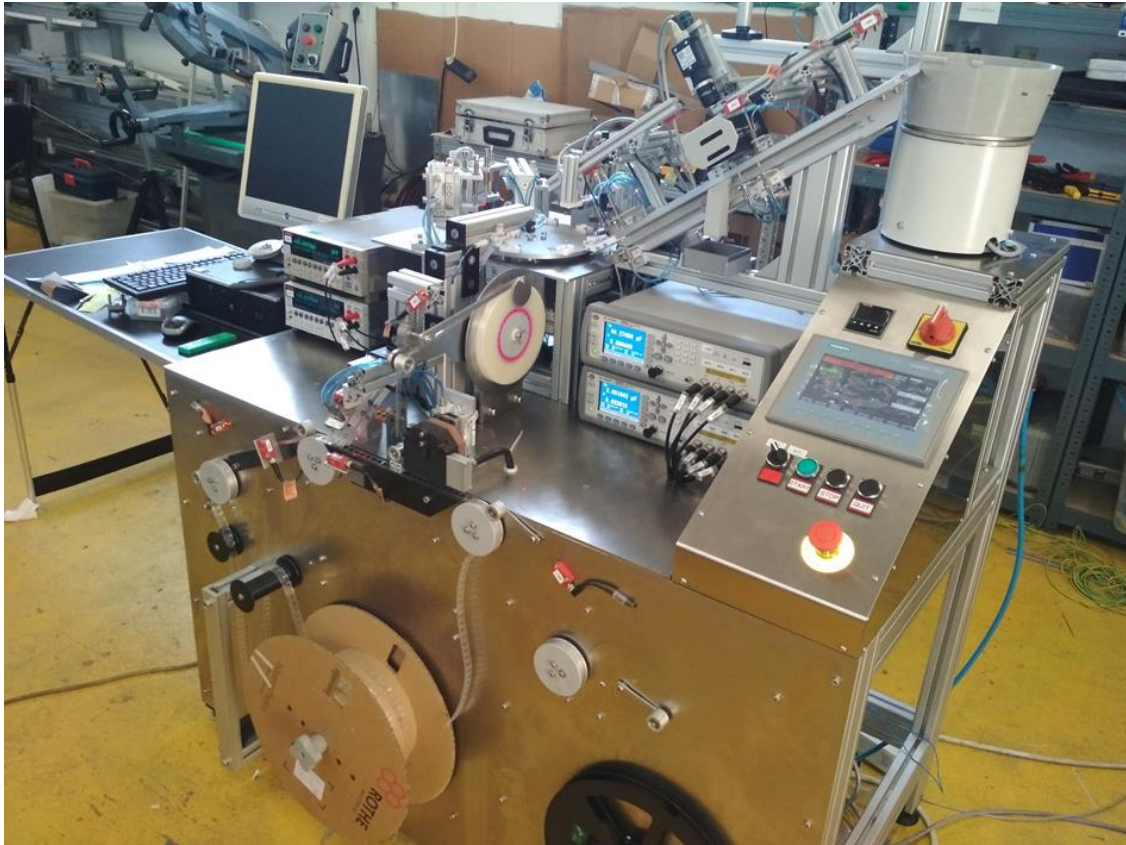
- Design and manufacture of machine construction
- PLC programming
- Visualization
- Parameterization of the drive line and linear axis

WEB: <https://enso.hr/en/our-work/glusta-ps01-automatic-gluing-station/>

Video: https://www.youtube.com/watch?v=ErwbYuGY2Rg&feature=emb_title

REFERENCES - ENSO

KOMPA – Machine for controlling and packaging electronic components



The final product is a full supporting tape with sorted and processed electronic components.

The design and construction of the KOMPA machine for the control and packaging of electronic components contained:

- Design and manufacture of machine construction
- PLC programming
- Design of optical component control programs
- Creating a circular vibrator
- Visualization
- Parameterization of the tape drive servo drive for component packing

WEB: <https://enso.hr/en/our-work/kompa-ps01-machine-for-orienting-optical-and-electrical-measuring-and-packaging-of-electronic-components/>

Video: <https://www.youtube.com/watch?v=dl6ngK0wNlg>

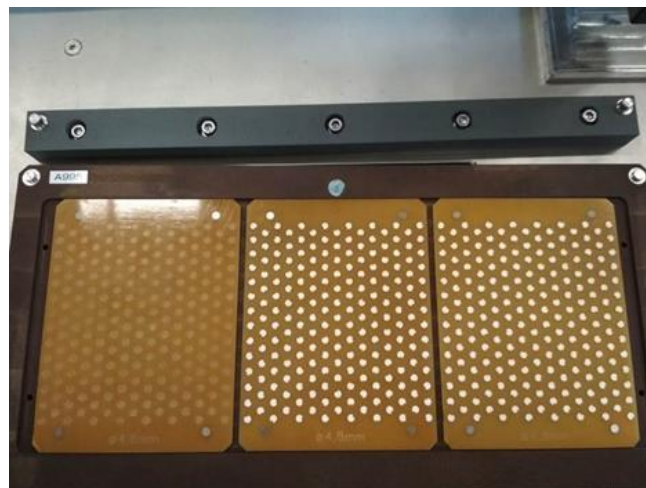
REFERENCES - ENSO

EPRI – Point printing machine on electronic components

EPRI is a dot-printing machine on electronic components, which are polarity markers.



The frame has two holes for attaching the frame to the print position. The frame contains three print plates with pins to secure the panels to the frame. Each print plate contains cavities for the parts. The frame has two holes for attaching the frame to the print position.



The design and construction of the GLUSTA gluing machine included:

- Design and manufacture of machine construction
- PLC programming
- Visualization
- Parameterization of the drive line and linear axis drive

WEB: <https://enso.hr/en/our-work/epri-ps01-electronic-component-marking-machine/>

Video: https://www.youtube.com/watch?time_continue=25&v=YWl1hui5Qf8&feature=emb_title

REFERENCES - ENSO

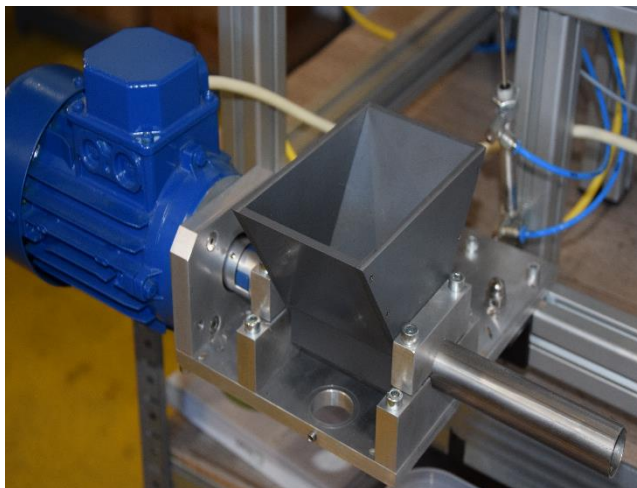
DOZA L – machine for dosing bulk materials

The function of the DOZA L-01 is to quickly and accurately dispense scattered small materials according to the defined mass value on the balance indicator into a hopper or a conveyor feed system.

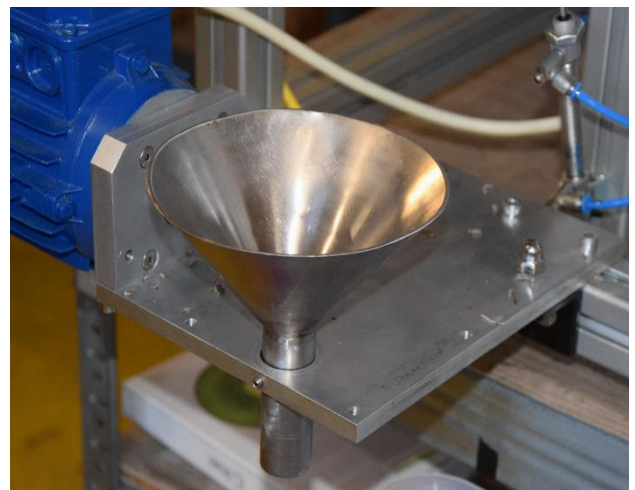


There are two ways to fill the container after emptying the container with the dosage material:

- A snail conveyor or a system consisting of a funnel, an electric motor and a conveyor screw. By rotating the helical element, the material is transported from the funnel toward the end of the tube to which the filling container is placed (e.g., filling lavender bags).
- With a funnel or material, through a free fall, the material passes through the hopper to the end on which the filling container is placed (e.g. filling flax seeds).



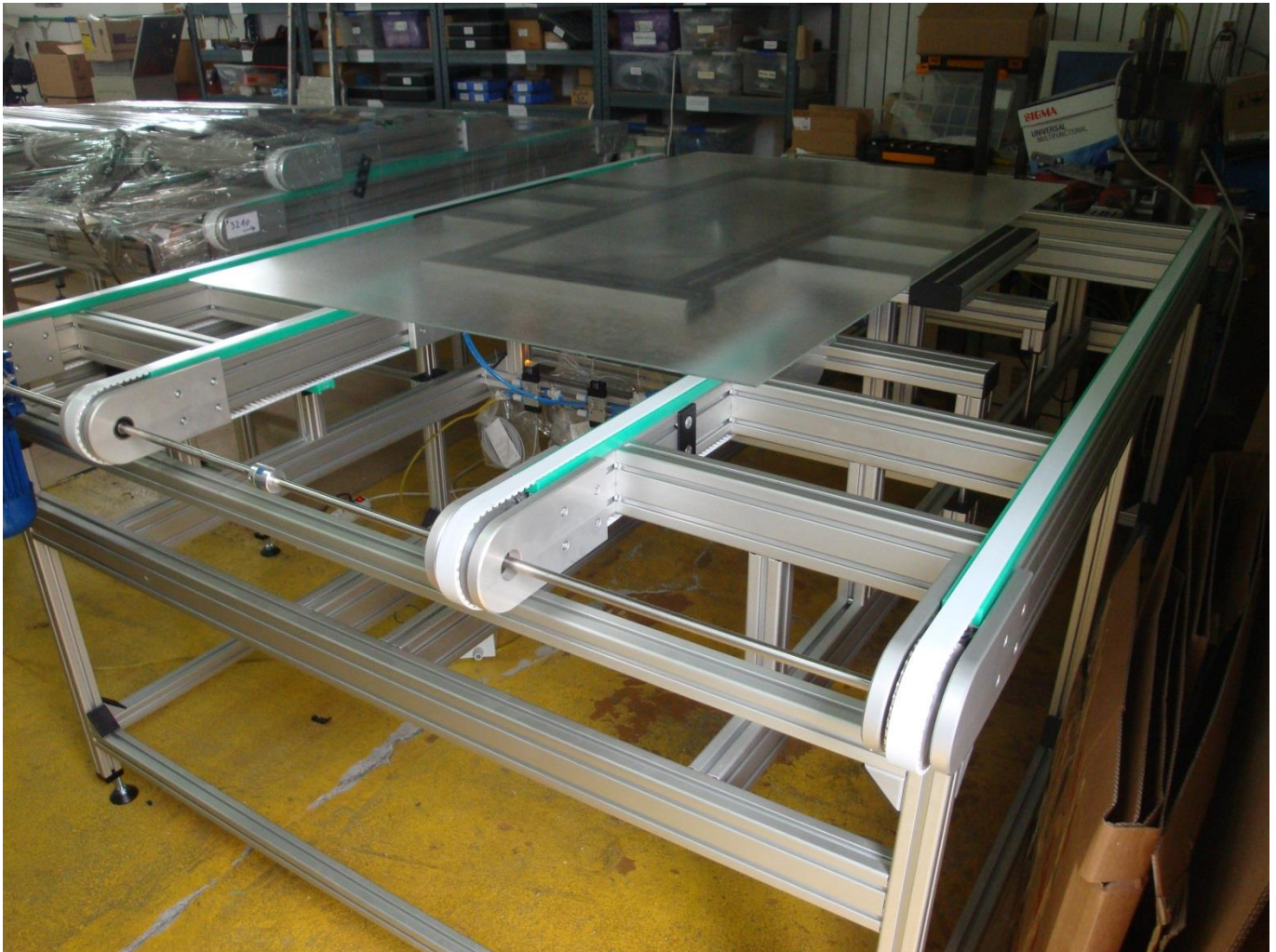
Snail conveyor



Funnel

REFERENCES - ENSO

Belt conveyors, with rotary, lifting and transverse movement



The construction consists of aluminium profiles. The transmission is via a gear belt, which is located between the pulleys, two of which are driven and driven by the motor through the drive shaft (shaft). The belt slides along the polymer band. The conveyor is designed for low-speed movements and high positioning accuracy. The transmission motor can be of different designs, depending on the need for specific transportation. The motor can be dc with or without brushes, stepper motor or asynchronous. Speed control is provided for all engines.

The conveyor is used for the horizontal transportation of tempered glass for the production of solar panels. The conveyors are made according to the needs of the particular transmission, and there are angular and pivoting ones for the need of rotation of the glass or transport transversely with respect to the incoming motion.

REFERENCES - ENSO

BMW, Dingolfing

Programming and commissioning of the line for the production of the axle bracket for BMW

The line is used for the production of half-axle brackets. It is automated by Motoman robots and operated by the Siemens 400 Series PLC, with "Zenon" visualization across the panel.

Communication through Profinet provides connection to the peripheral input output modules "PILZ".



Programming and commissioning of the BMW i3 battery assembly line

- Programming and commissioning of the BMW i3 car battery line. The line is for mounting a battery block that fits into the floor of an i3 car and serves to power the electric drive.

The control is derived from multiple Siemens S7-300 PLCs, and much of the assembly is by ABB robots.



REFERENCES - ENSO

Machine for separating galvanized and non-galvanized pieces with magnets - MARA SR-01

The machine is intended to separate magnetic (galvanized) from non-magnetic (poor or non-galvanized pieces). Machine operation is performed through several stages:

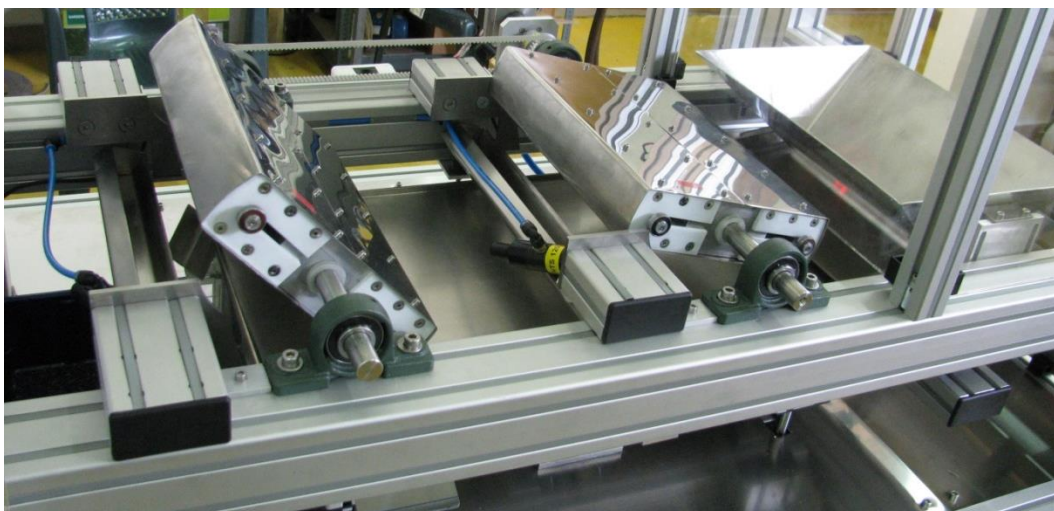
- Machine filling system
- Transportation system
- Separation system
- Machine discharge system

The filling system consists of a funnel beneath which is a plate with a pneumatic vibrator. The operator can easily place the pieces in this way.

The transport system is carried out by means of a transport plate, which, due to the formation of vibrations, transports the pieces below the separation system of the pieces towards the output of the machine.

The separation system is the centrepiece of the machine. It consists of two rotors on the shafts driven by a stepper motor through a toothed belt. The function of this whole is to separate galvanized (good) and non-galvanized (bad) pieces. The separation of good pieces from the impeller is done by moving the magnet inside the impeller.

The machine's emptying system consists of two transport hoppers into which pieces of magnets on the rotors fall. The transport of the pieces contained in the hopper is made possible by the vibrations created by the pneumatic vibrators. Such good pieces end up in a bowl for good pieces.



WEB: <https://enso.hr/en/our-work/mara-machine-for-magnetic-separation/>

REFERENCES - ENSO

Design and Construction of Passivating Machine for Electronic Components - LAKI

The machine is intended for passivation of electronic components. It consists of a rotating drum, air preparation, syringes of passivating fluid and output filter.

The first sequence of the machine is preheating, during which warm air is blown through the heating and blowing system, and the drum rotates and rotates the pieces at the same time. By reaching the set temperature and maintaining it during the set time, the varnishing sequence, ie passivation, is automatically started.

The second sequence is varnishing, which consists of periodically spraying the varnish in the form of a spray, blowing air at a constant temperature, flowing and turning the piece by rotating the drum. The parameters of the selected program set the conditions for the speed, temperature, number and duration of the syringe.

The third sequence is the drying of the piece by blowing in air of constant temperature and flow, with the simultaneous rotation of the drum. After the specified drying time, the machine switches off the automatic operation and waits for the operator to open the door, set up the discharge funnel and press the "Start" button to start the discharge sequence.

The fourth sequence is the emptying of the pieces in such a way that the drum rotates counter-clockwise and the production pieces are poured into the outflow channel into the container provided therefor.



WEB: <https://enso.hr/en/our-work/laki-machine-for-electronic-component-passivation/>

REFERENCES - ENSO

EPCOS CROATIA, Kutina

Design and construction of electronic component seeding machine - SIVI

The purpose of the machine is to leak electronic components into existing special mounts. The construction is made of aluminium profiles and the openings are filled with stainless steel sheet and plexiglass. The opening in the front is not filled and serves for filling and emptying the machine. The safety of the staff at this opening is resolved by a light curtain, as shown in the figures.

The machine consists of a hopper for receiving a piece, a turntable, a frame and a pocket as parts of the gripper system.

The operator inserts the trays into the turntable through the opening at the front of the machine. Pressing the "Start" button starts the duty cycle. The exact number of pieces previously defined by the operator is poured from the pocket. Then the frame is lowered, and then, with a combination of table rotation and vibration, the work pieces fill the slots in the tray. The process ends so that the excess piece goes back into the pocket and the frame is lifted to allow the operator to change the trays on the machine.



WEB: <https://enso.hr/en/our-work/sivi-machine-for-positioning-electronic-components>

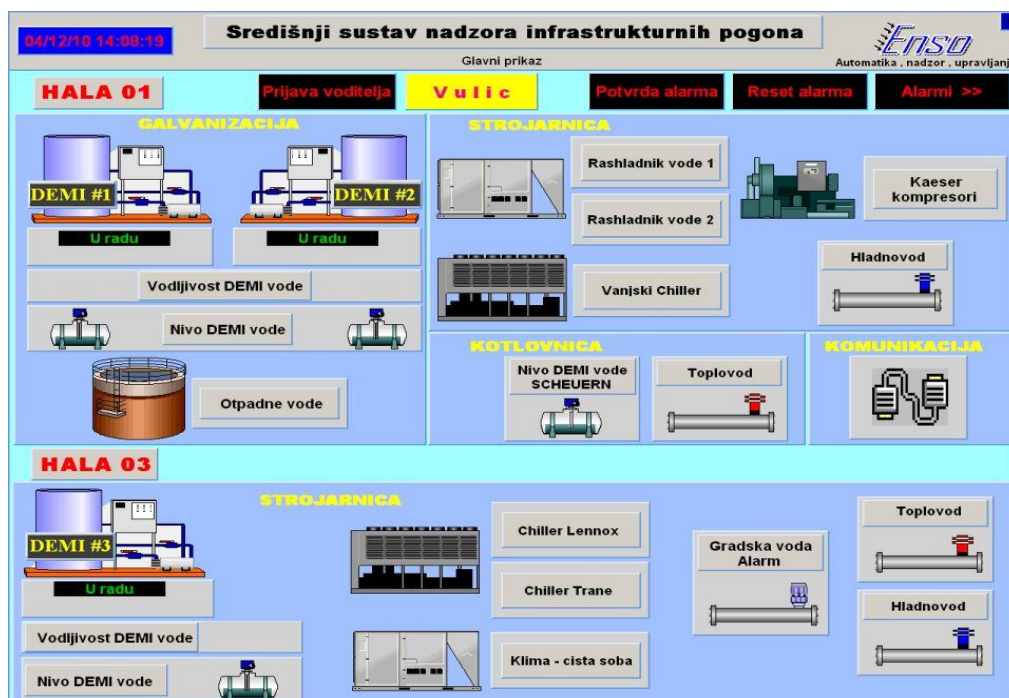
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REFERENCES - ENSO

SELK, Kutina

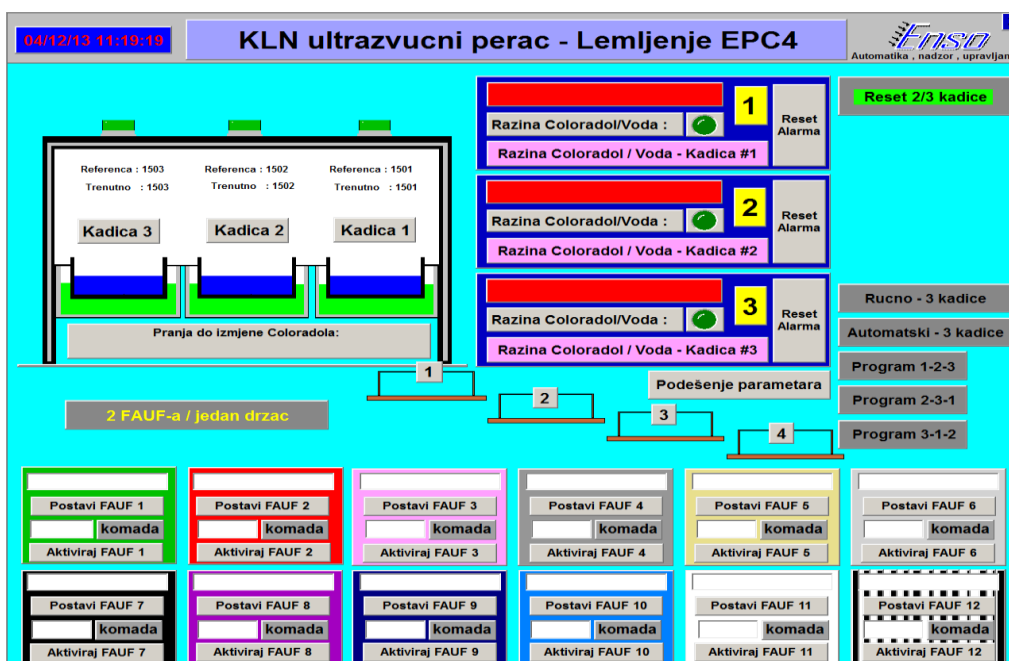
Monitoring and visualization of infrastructure facilities, data processing, alerts and alarms

Monitoring of infrastructure drives at several locations within the factory, error messages (mail to SMS, sound and light signaling), alarm logs ... Used existing Ethernet infrastructure, Modbus TCP-IP
Supervision of boiler rooms, wastewater treatment, air-conditioning, compressor stations, demineralization plant, cold and hot water pipelines.



Weight measuring system for ultrasonic cleaners, data processing and visualization

Data acquisition is via the RS485 communication module and the Seneca weighing module. Data on pieces that are cleaned by ultrasound are entered using a barcode reader. Data is visualized, processed and stored on a computer. The need to change the washing medium and the various faults was made by an acoustic signal from the signal tower.



REFERENCES - ENSO

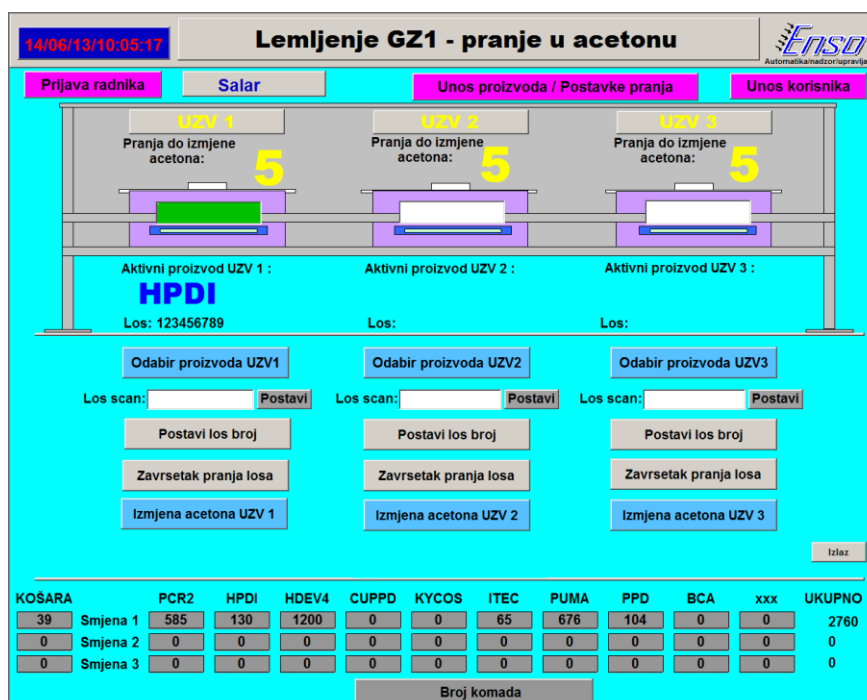
Automation and monitoring of time intervals of the drying and baking process

The SCADA application is used to signal the completion of the process of baking a product in a particular oven at a particular position. The start and end times are stored on the computer. The alarm was made by displaying on a computer screen, a light-sound signal from a signal tower. The furnaces are connected to the system via Turck modules that communicate via the Modbus TCP protocol.



Acetone washing automation, visualization and monitoring

Data acquisition is via the RS485 communication module and the Seneca weighing module. Data on pieces that are cleaned by ultrasound are entered using a barcode reader. Data is visualized, processed and stored on a computer. The need to change the washer medium was performed by an acoustic signal from the signal tower.



REFERENCES - ENSO

MAGNA, Graz

- Programming and commissioning of the "MINI" body windscreen reinforcement station
- Programming and commissioning of the "MINI" rear body cover station

Programming and commissioning of the "MINI" body roof preparation and installation station

The line is automated by rolling rollers to transfer body from station-to-station movable positioning tables and KUKA robots for manipulation, welding, gluing ...

Management is done by Siemens PLC 400 Series and WinCC visualization via PC.

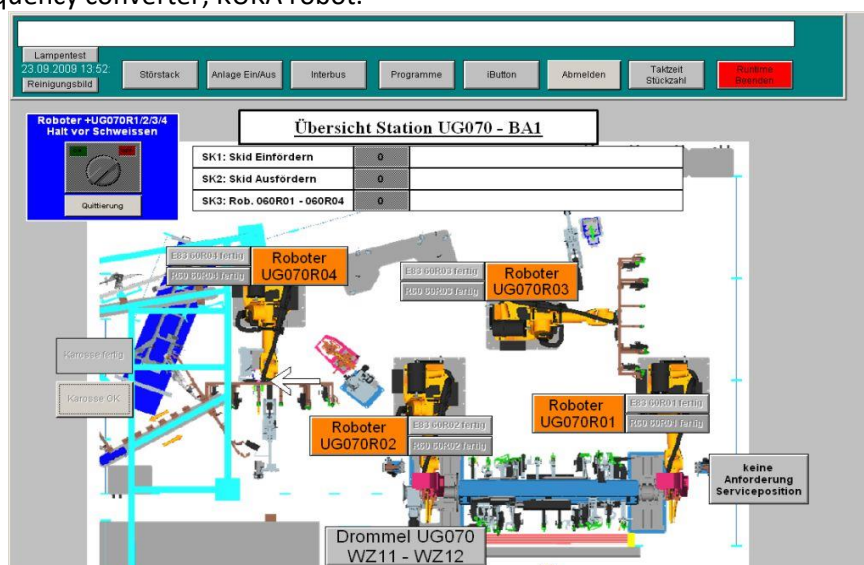
The safety part is operated by the PLC "PILZ".

"SEW" motors and frequency regulators and "KUKA" robots are connected to the PLC via fibre optic Interbus.



Integration of the Mini body assembly into the BMW x3 production line

PLC-i Siemens S7-400; Siemens WinCC visualization; Interbus communication (optic); Safety - PILZ; SEW motor and frequency converter; KUKA robot.



- Programming and commissioning of the PEUGEOT body production line "
- Programming and commissioning of the "MINI" body side mounting station
- Assembly and welding of car bodies
- Conveyor line management

REFERENCES - ENSO

GENERAL ELECTRIC, Hungary

SECO-WARWICK Poland

Programming and commissioning of furnaces for annealing steel parts of turbine engines

Controller design for PLC Siemens S7-300 - Furnace temperature control and control of other functions such as records, data storage, transport trolley management ...

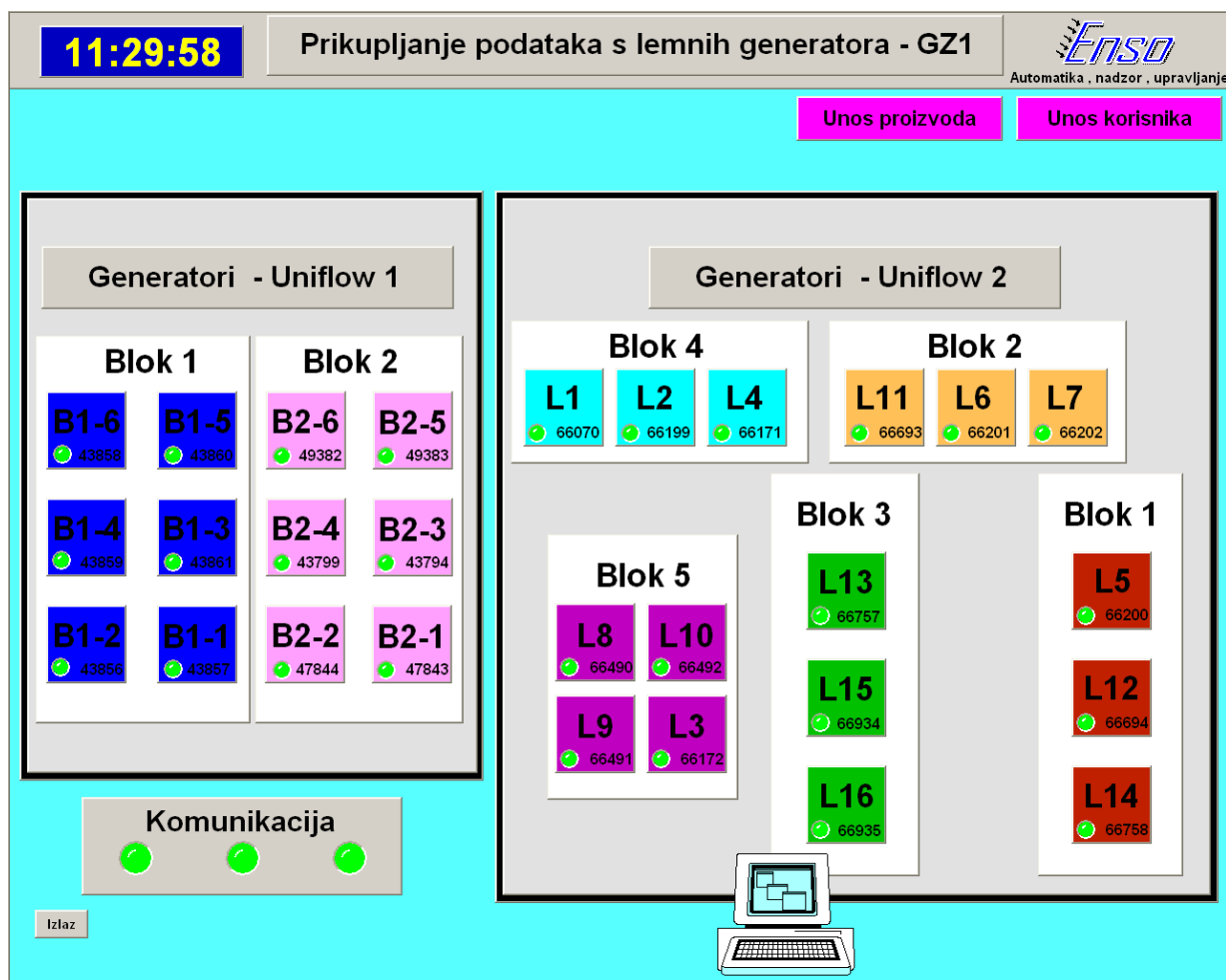
Creating a control panel utility.



REFERENCES - ENSO

Collection, processing and visualization of soldering machines

Data collection performed via RS485 communication directly from the soldering device to the computer. The solder product data is entered with a barcode reader, archived along with soldering start and end times. In the event of an error, a sound-light signal is output.



REFERENCES - ENSO

Design and production of a seed, drying and cooling machine - NASU tunnel kiln

The line, that is, the machine, is intended for seeding, drying, cooling and collecting electronic components. It consists of four parts connected together as a whole, namely the seeding, drying, cooling and collecting part with the vibrator.

The inlet unit, that is, the seeding unit, consists of a funnel for receiving pieces from a ball separator and a vibrating seating plate with an electric line vibrator. The pieces are added from the funnel to a vibrating plate that evenly strands the pieces onto the Teflon conveyor belt.

The dryer is the second part of the line that has the purpose of drying the piece according to the set temperature curve. It was constructed as a tunnel kiln. The conveyor belt transports the pieces through a "tunnel" lined with insulation. The strap is made of antistatic teflon between the drive and tensioning rollers. Above the strip are heaters and temperature probes. The heaters heat the space in the tunnel, and their on / off switch is controlled by thermostats according to the data from the temperature probes. The insulation of the sides of the dryer is made of ceramic fiber insulation boards, which also serve as supports for heaters and temperature probes. In addition, ceramic wool was placed on the sides, under the strap and on the top of the dryer due to the insulation. The cover of the dryer and insulation is made of AISI 304 stainless steel sheet. The inside of the tunnel on the sides is coated with Teflon foil to ensure dust contamination. The cooling section is located behind the dryer and is an integral part of the conveyor.

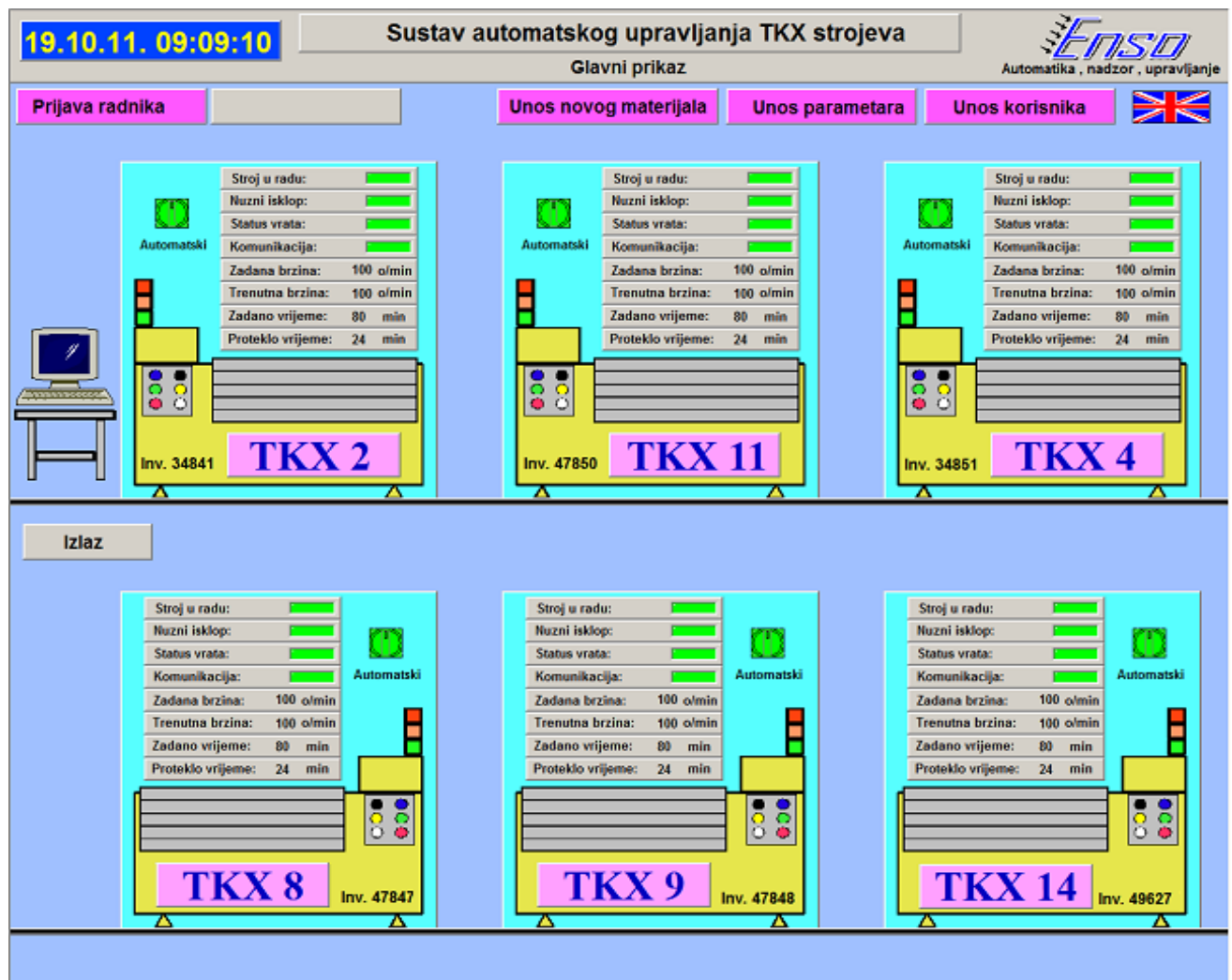
At the outlet of the conveyor, a structure with a hopper and a vibrator is mounted to receive the components from the conveyor.



REFERENCES - ENSO

Automation and visualization of six machines for rounding the edges of electronic components

Reconstruction of management of old vending machines. The product type is entered by a barcode reader on the SCADA application. The parameters for the operation of the individual machine are automatically downloaded from the database and forwarded to the Siemens PLC 1200 series to a defined machine, which further controls the operation of the machine. SCADA is used to visualize and compare the set parameters and actual sizes with which the vending machine works, as well as the archive of data.



REFERENCES - ENSO

Guitar Cleaning Machine Design and Construction - BURE SR-01

The machine is intended for cleaning sieves (guitars), which after the baking process of the pieces cause the bonding of the sieve pieces (guitars). The removal of the pieces from the screen is done with brushes. The function of the machine is performed in several stages:

- Inlet sieve tank
- Sieve pickup and transport system
- Rotating brush system
- Sieve outlet tank
- Brush positioning system

The sieve inlet tank allows the operator to easily place uncleared sieves in the inlet tank. It consists of guides that direct the sieves to the pneumatic cylinders and the lifting table responsible for transferring the sieves to the gripping and transport systems.

The conveyor system consists of two linear axes connected by a solid shaft driven by a stepper motor. On the linear guides, there are grips that hold the sieve in the required position. One grip is passive while the other is driven via a pneumatic cylinder.

Once the sieve is in the grips, the linear guides transport the sieve inside the rotating brush system, where the sieve is cleaned from glued pieces. Such a system consists of two rotating brushes, an induction motor and a vacuum cleaner.

After passing the sieve between the brushes, the cleaned sieve reaches the sieve output tank system, which consists of a lifting cylinder, a gripper release cylinder, and switches to hold the sieve in the output tank.

The brush positioning system consists of threaded spindles for vertical brush positioning. The height of the brushes changes manually independently of each other. The height of the brushes is adjusted according to the position of passage of the screen between the brushes.



REFERENCES - ENSO

EKB Braunau

Operation of injection moulding and plastic processing line inside the car door.
The robot brings the plastic inside the car door and positions it under the press.
The metal nut is brought to the pressing position by the vibrator system and the manipulator.
It is operated by the Siemens PLC 400 Series and a visualization and control panel.



TKSE Hohenstein

- Programming and commissioning of the BMW i3 electric car battery production line

AUDI Neckarsulm

- Managing the transportation and sorting of bodies

AUDI Ingolstadt

- Programming and commissioning of PVC fill lines for the AUDI body
- Commissioning of the PVC fill station for the AUDI body
- Programming and commissioning of marking and decoration lines

BMW Leipzig

- Thorough preparation and varnishing of car bodies
- Classification and redistribution of movement and transportation
- Management of conveyor belts and conveyor lines

BMW München

- Thorough preparation and varnishing of car bodies

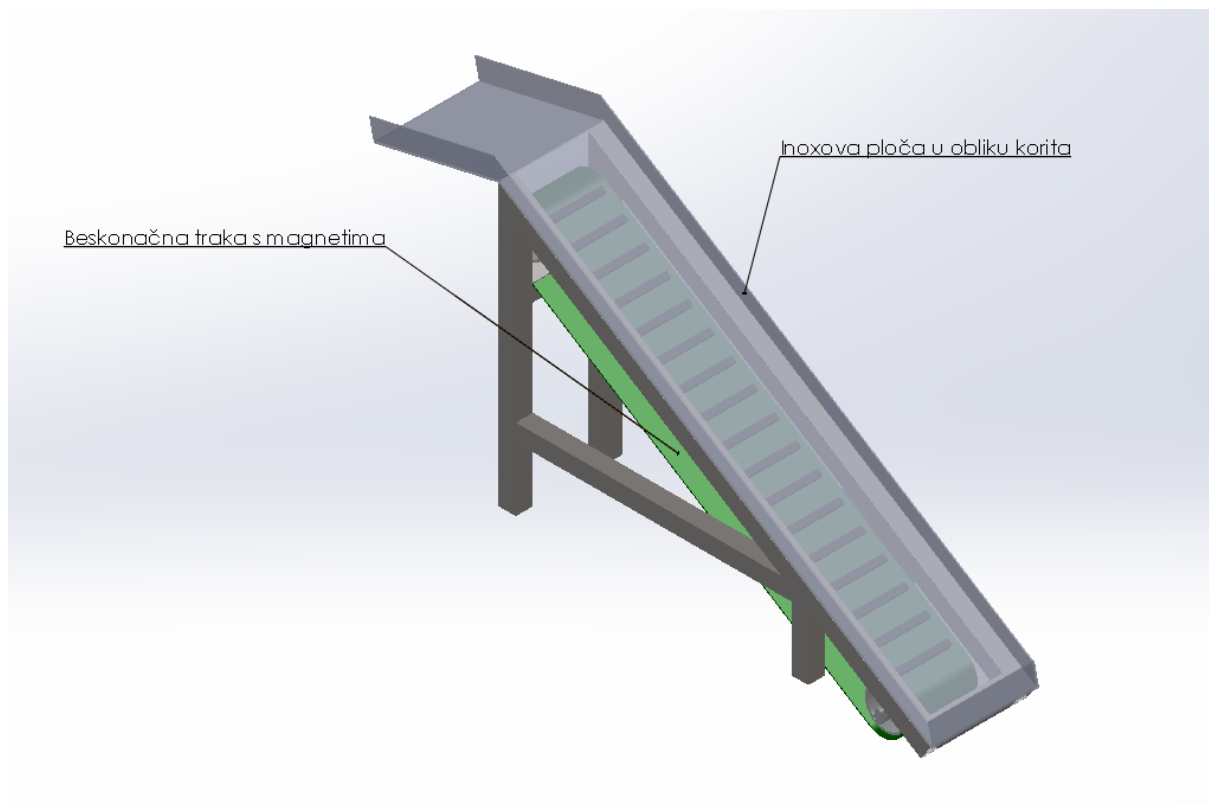
DEUTZ Köln

- Classification and redistribution of movement and transportation
- Management of conveyor belts and conveyor lines

REFERENCES - ENSO

Conveyors

• Conveyor with magnetic transmission



The conveyor consists of a metal structure, a stainless-steel trough plate and an infinite magnet strip. The system operates on the principle that the material is poured into the bottom of the metal plate in the form of a trough and is attracted by a magnet. As the magnets move upward and parallel to the stainless-steel plate, the material moves upward over the surface of the stainless-steel plate. At the highest point of the plate, the material moves over the fold and moves downward, and the magnet attracting it across the roller begins to move in the opposite direction, moving away from the material. The material moves down the slope due to gravitational force.

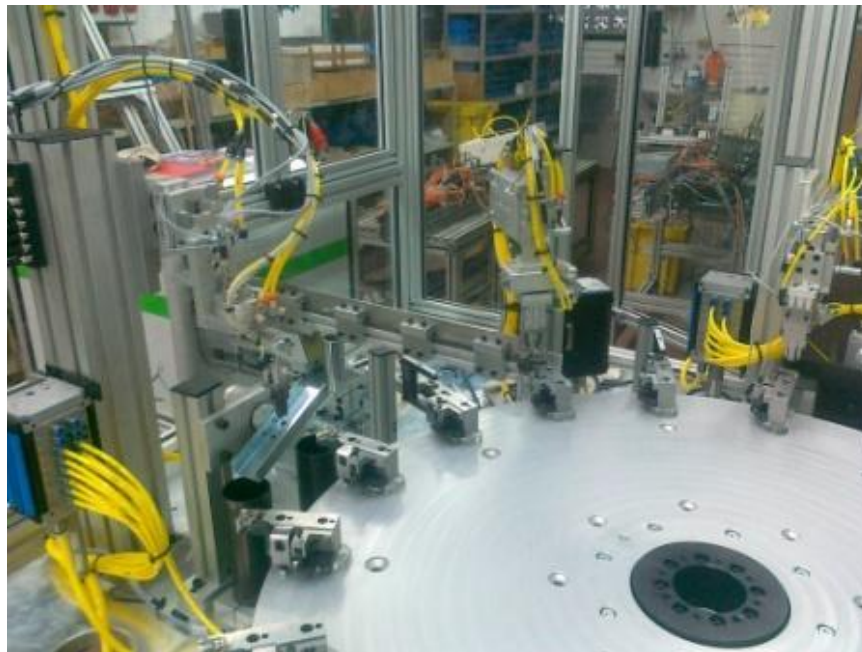
The conveyor is used for transporting material containing iron.

REFERENCES - ENSO

ELEKTROKONTAKT, Zagreb

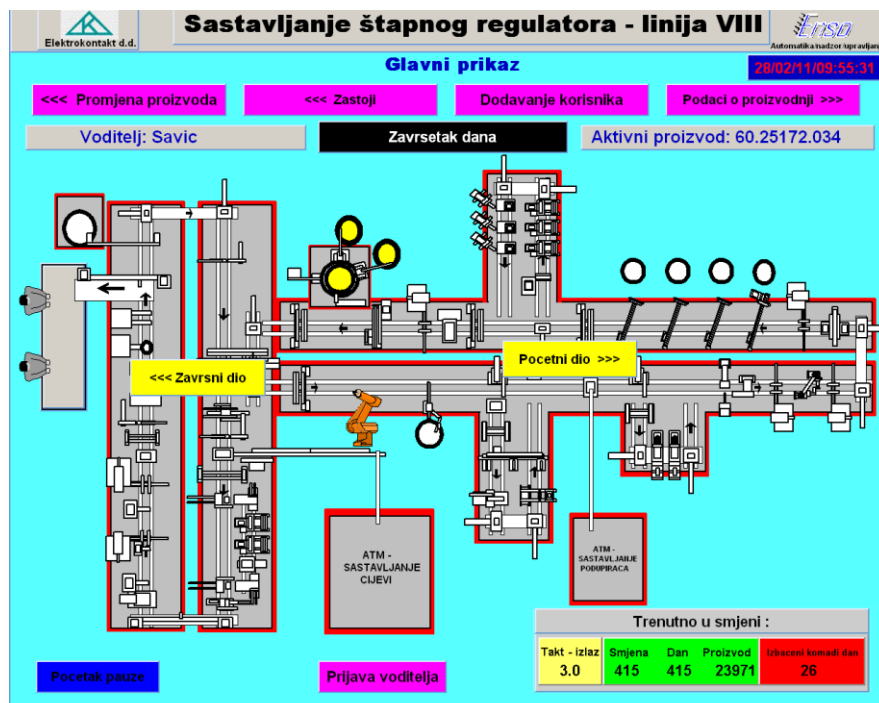
Design of PLC program, design and commissioning of machine for assembly of main support of rod controller

The machine is made by turning table and stations for loading, mounting, fastening, riveting, welding, checking Management is performed by Siemens PLC 300 Series and Operations Panel for visualization and control. The turntable is driven by an electric motor and the cells are made by pneumatic manipulators. All machine elements are connected and controlled by the PLC (Welder, Camera). In addition to tracking the data of operations performed by each station for each nest on the turntable.



Visualization, collection and processing of 3 line data for "stick controller"

Data acquisition is performed through 3 Siemens PLCs that communicate via an OPC server with a DAQFactory SCADA application that is used for line visualization, processing, display and archive of data, and visualization of line delays.



REFERENCES - ENSO

Design and production of Blowing, Drying and Cooling Machine - Tunnel kiln - SIPA

The line is intended for blowing, drying and cooling electronic components housed in separate baskets after washing in washing machines.

It consists of three parts connected together by a blower, a dryer and a cooling outlet. A conveyor belt is passed through all three parts, which is tasked with transporting the baskets from the blower through the dryer and the part intended for cooling to the exit table of the line.

The blower is tasked to drain or remove water from the actuators coming in the washing baskets in the washing machines.

Constructed of aluminium profiles, aluminium sheet covers, doors and forms a closed whole. Inside the blower is a pneumatic cylinder controlled by an automatic that moves the nozzle carts left to right.

The cylinder, trolley and nozzles are located above the conveyor belt of the line. Water removal is done in such a way that they place the baskets in the blower on the conveyor line in the intended places (between stainless steel rails) and close the door. Closing the door automatically starts the process of blowing with compressed air. The pneumatic cylinder moves the nozzles above the actuator baskets, and the compressed air through the nozzles blows water from the actuators. Below the tape there is a container for collecting and draining the water blown from the actuator.

The dryer is the second part of the line, which has the task of warming the actuators previously removed from the blower according to the defined temperature curve. It was constructed as a tunnel kiln. Above the strip are heaters and temperature probes. The control is performed by thermoregulators. The insulation of the sides of the dryer is made of ceramic fibre insulation boards, which also serve as supports for heaters and temperature probes. In addition, ceramic wool was placed on the sides, under the strap and on the top of the dryer due to the insulation. The cover of the dryer and insulation is made of AISI 304 stainless steel sheet. The inside of the tunnel on the sides is coated with Teflon foil to ensure dust contamination.

The cooling outlet consists of two fans mounted below the strip. They air-cool the baskets with actuators coming out of the dryer. Above this space, there is an additional suction hood to keep air out of the production plant. Below the fan is a tray for installing an air filter.

The outlet table from which the actuator baskets are removed continues to the cooling section.



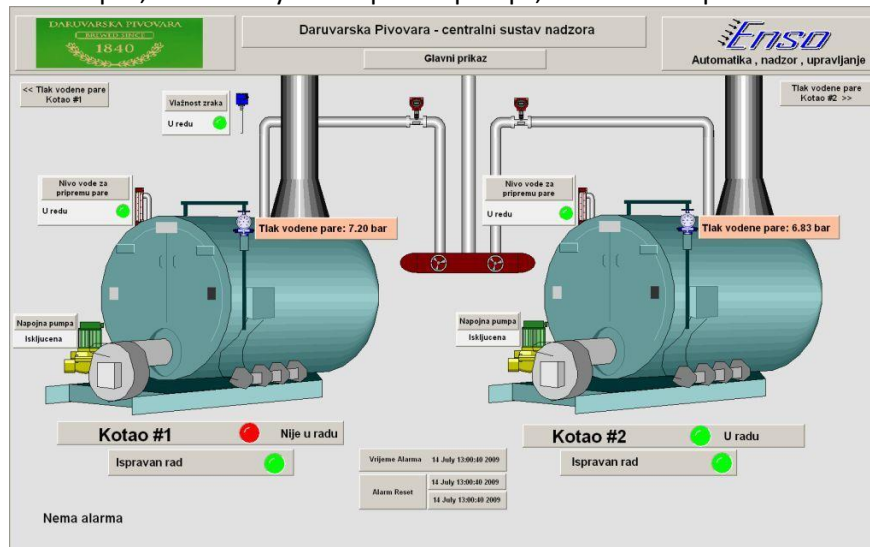
REFERENCES - ENSO

DARUVARSKA PIVOVARA, Daruvar

Visualization, signaling and monitoring of the boiler room

The system is implemented by RTU (Remote Terminal Unit) modules for collecting analog and digital signals, which via Ethernet communicate with the SCADA application for visualization and monitoring of boiler operating parameters.

Measure the water vapor pressure of each boiler (pressure transmitter for high temperature), the water level for the preparation of water vapor, the activity of the power pumps, the correct operation of the boilers ...



Belt and side conveyor



The construction consists of aluminium profiles. The transmission is via a gear belt, which is located between the pulleys, two of which are driven and driven by the motor through the drive shaft (shaft). The belt slides along the polymeric strap, and the same strap is mounted on the side to ensure that the transport parts are guided. The conveyor is designed for low speed movements and high positioning accuracy. The transmission motor can be of different designs, depending on the need for specific transportation. The motor can be dc with or without brushes, stepper motor or asynchronous. Speed control is provided for all engines.

The conveyor is used for horizontal transport of containers or trays.

REFERENCES - ENSO

Change log:

21.07.2020. Danijel Horvat dipl.ing.

28.09.2022. Marko Bratković mag. ing. el