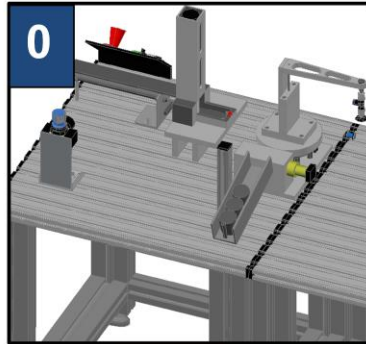




0 scenario (reference PPU)



Ctxt	Plat	SW
X	X	X

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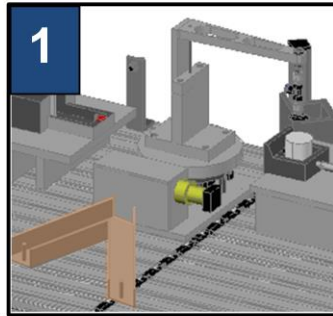
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The *initial situation* of the plant is that the pick and place unit only consist of the stack with a separator included, a crane and a slide. There is only one kind of work piece namely the metallic work piece. In the stack is only one digital sensor which is responsible to detect if a work piece is present as soon as the separator is extracted. The separator itself consists of two digital sensors – at the front and at the end of the separator – to detect if the separator is extracted or retracted. The Crane picks up work pieces at the stack, turns 90° anti-clockwise and places the work piece at the slide. Then the crane moves back to the stack. To detect the position of the crane, weather it is at the stack or at the slide, two (tactile) digital positioning sensors at the bottom plate of the crane are mounted.



1st scenario – Y-shaped slide



Ctxt	Plat	SW
X		

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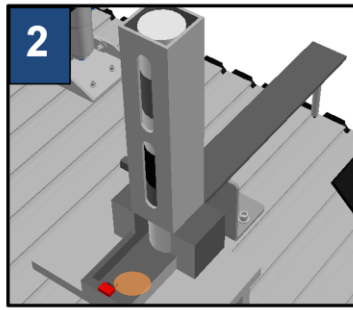
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In this scenario only the slide is replaced by a slide with Y shape. Due to this shape first one side of the slide is filled up with work pieces and then the other side. The slide is only there to increase the capacity of the storage of the slide.



2nd scenario – black plastic work pieces



Ctxt	Plat	SW
X	X	X

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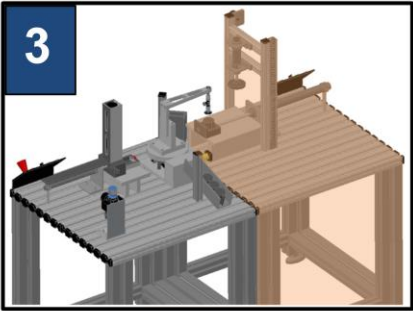
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In this evolution scenario a new kind of work pieces - black plastic work pieces – is additionally processed by the plant. To detect if there is a black plastic work piece or a metallic work piece an inductive sensor is used at the bottom of the extraction position of the separator.



3rd scenario – stamp module added



Ctxt	Plat	SW
X	X	X

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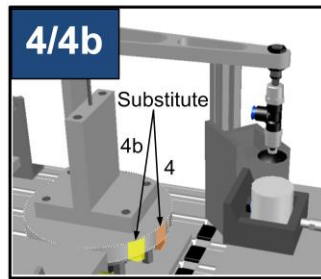
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Now the stamp module is added. Only metallic work pieces should be stamped. Black plastic work pieces are transported to the slide, directly.

To detect the stamp position of the crane, a new digital sensor is added to the bottom plate of the crane. The stamp module itself consists of a magazine where the crane places the work pieces and stamp.

The magazine retracts the work piece under the stamp. To detect if a work piece it present a digital sensor is placed in the magazine. As soon as the magazine is retracted under the stamp, the stamp moves down to press the work piece. After the pressing process the stamp moves up. To detect if the stamp or the magazine are retracted or extracted two digital sensor are placed at each device. As soon as the magazine retracts, the crane transports the work piece to the slide.



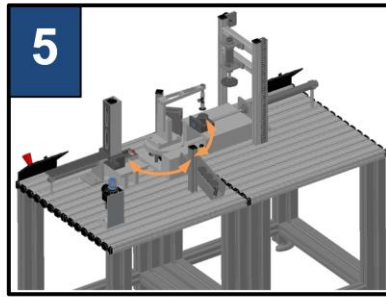
Ctxt	Plat	SW
	X (4/4b)	X (4b)

4: The (tactile) digital positioning sensor at the bottom plate of the crane are replaced by inductive sensors. The new sensors provide the same signals like the old positioning sensors, but are more robust against pollution.

4b: Same like for scenario 4, but the (tactile) digital positioning sensor are spatial shifted in comparison to scenario 4.



5th Scenario – change course of crane



Ctxt	Plat	SW
		X

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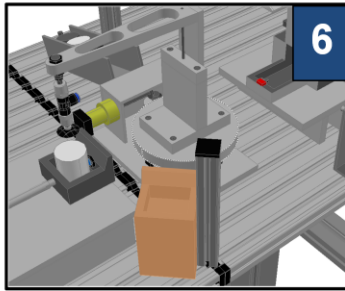
15

To realize a higher throughput of work pieces, the implementation of the crane is optimized: As soon as the crane places a metallic work piece at the stamp, it is checked if there is a black work piece available at the stack. If there is a black work piece, the crane uses the stamping time to transport the black work piece to the slide.

Then the crane moves back to the stamp, to transport the stamped work piece to the slide.



6th scenario – mechanical buffer at stamp



Ctxt	Plat	SW
	X	

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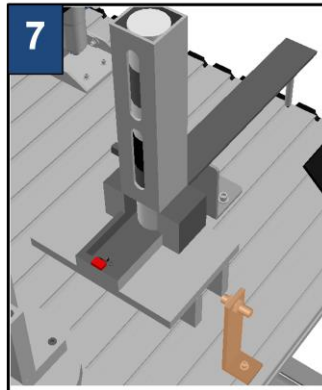
If there is a black work piece the, the crane transports the black work piece to the slide.

To increase the parallelization of the crane, a mechanical buffer is place next to the stamp. As soon as a work piece is stamped, it is checked what kind of work piece is available at the stack. If there is another metal work piece, the crane transports the work piece to the mechanical buffer and the next kind of work piece is checked at the stack.

If there is another metal work piece the crane has to wait until the stamping process is done to transport the stamped work piece to the slide.



7th scenario – white plastic work pieces



Ctxt	Plat	SW
X	X	X

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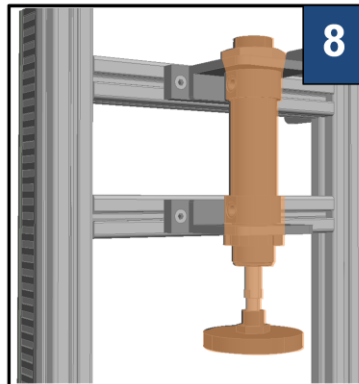
17

In this scenario white plastic work pieces are processed additionally. To detect what kind of work piece is available at the stack a (optical) digital sensor is placed next to the stack. This sensor is able to detect if there is a white work piece and a black work piece. In combination with the already installed inductive sensor all kind of work pieces can be differentiated.

White plastic work pieces are also transported to the stamp first and then to the slide.



8th scenario – different pressure profiles



Ctxt	Plat	SW
X	X	X

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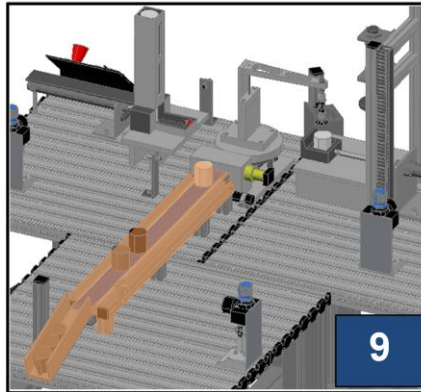
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In this evolution scenario the work pieces have to be stamped using different pressure profiles. Therefore, a proportional valve and an analogue pressure sensor are installed into the stamp, to realize the pressure control.



9th scenario – installation of conveyor



Ctxt	Plat	SW
X	X	X

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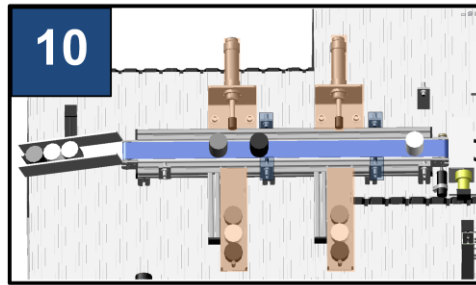
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At this stage a conveyor is installed. At the end of conveyor is one slide installed where the work pieces are transported to.



10th scenario – additional slides and pushers



Ctxt	Plat	SW
X	X	X

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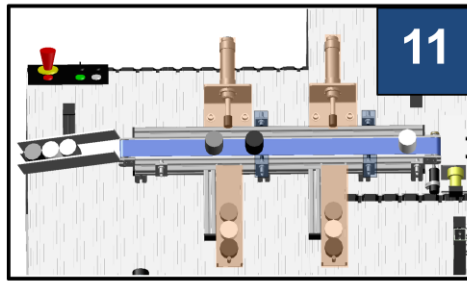
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To increase the capacity of the storage at the conveyor two additional slides are installed at the side of the slide. The pusher are pushing the work pieces into the slide. First, the slide at the end is filled with work pieces, then the mid slide and then the slide at the beginning of the conveyor .



11th scenario – sorting of work pieces



Ctxt	Plat	SW
	X	X

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To sort/order the work pieces at the slides, two optical sensor and two inductive sensor are installed to detect the kind of work piece. At the beginning of the plant there is a optical sensor. The next sensor (at the right side of the first pusher) is an inductive sensor.

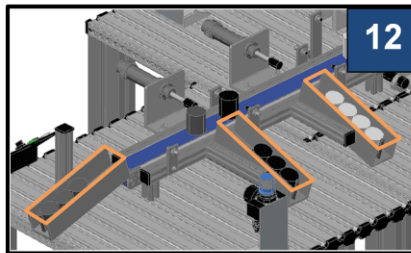
At the right of the second pusher is another inductive sensor. At the right of the last slide is another optical sensor. The sorting at follows: 1st (right) slide only white work pieces

2nd (mid) slide only metal work pieces

3rd (left) slide only black work pieces



12th scenario – specific orders of work pieces



Ctxt	Plat	SW
		X

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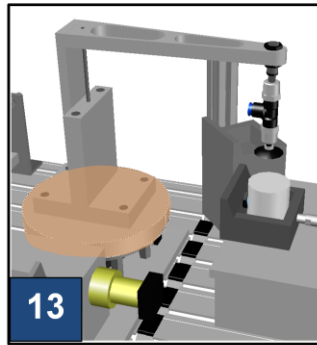
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In this scenario the sorting/order of work pieces are changed at the slides. Now there have to be similar mixtures in all slides.



13th scenario – potentiometer at the crane



Ctxt	Plat	SW
X	X	X

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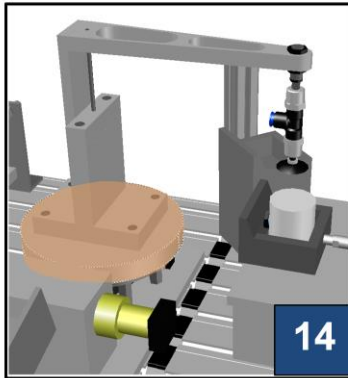
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To increase the positioning of the crane the digital sensors (at the bottom plate of the crane) are replaced by a potentiometer.



14th scenario – EMC Resistants



Ctxt	Plat	SW
X	X	X

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To increase the resistance of electro magnetic influenced the potentiometer is replaced by an incremental encoder which also has an analogue signal.