

Contract number: 2023/364026

Procurement number: 2023/364026 - P3

## **TECHNICAL SPECIFICATION**

### **ACQUISITION OF COMPONENTS FOR DEVELOPMENT OF HIGH-SPEED AUTOMATED ROLLING LINE TO INTEGRATE WITH CURRENT EQUIPMENT**

## 1. SHORT DESCRIPTION OF THE EXISTING PRODUCTION PROCESS

Two main wheel types manufactured by STARCO are “pressed” and “spun”. Pressed wheels are made by joining 2 formed halves into one and welding them together, whereas spun wheels are made by forming the cylinder on a spinning machine into a rim, followed by inserting a disc inside and welding the two pieces together. Current production layout is shown in Figure 1 below. A sheet of metal is inserted into EF1 guillotine which cuts it to desired length. Newly cut metal sheet is inserted into rolling machine FD that rolls it into cylinder shape. In order to complete the perfect circle, two ends must be welded together on F1 or E1 plasma welders. Afterwards, the cylinder is placed into G2 hydraulic press that forms the cone end on both ends. After achieving the cone shape, the cylinder is now fit for F3 spinning machine and F4 hump machine that form the final shape of a rim. In order to fit the valve, a hole must be punched in the rim on F5 valve hole puncher. Premade disc from the disc production line is then pressed into a rim on F6 assembly press and the final step to complete the wheel is to weld the two pieces together on F7 turn table welder.

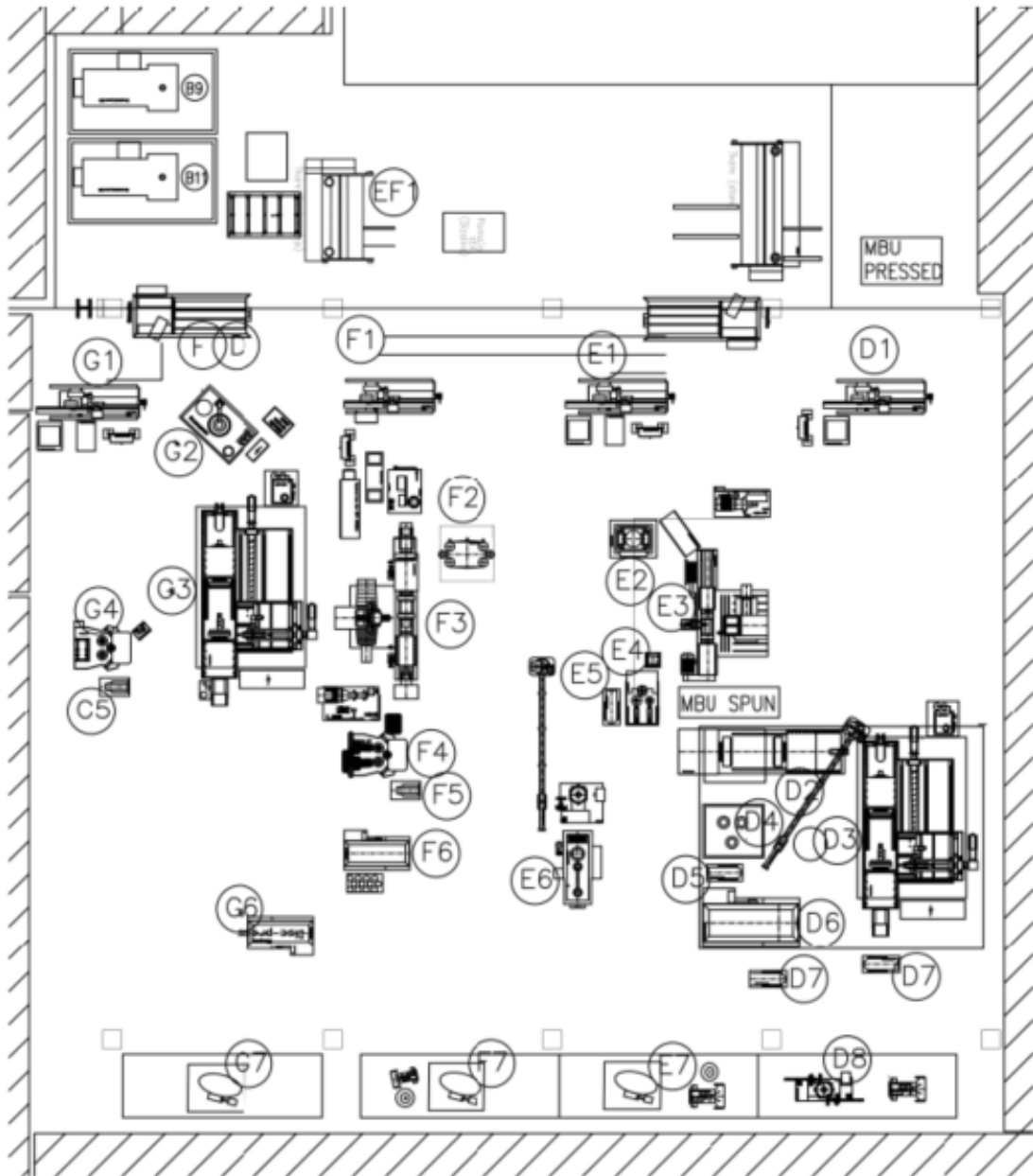


Figure 1: Current production layout

## 2. TECHNICAL SPECIFICATIONS OF THE NEW HIGH-SPEED PRODUCTION LINE

In order to meet the customers' demands STARCO would like to procure additional automated rolling line equipment which will integrate with existing equipment to form a new rolling line including welding assembly. The line shall be automated with minimal low level labor requirements, but training shall be provided for 2-3 higher skilled operators/specialists to allow the company to produce a significant increase in volume in the mid-range size of industrial/agricultural/high speed wheels.

Technical specifications of the subject matter of procurement are contained below; product types, standards or other features mentioned in the specification are references, but "equivalent" features from the supplier are also accepted.

Evidence of equivalence must be provided by the bidder in the context of the tender using suitable means, such as submitted technical specifications, technical data, and the like.

Technical data serves as a basis for assessing whether the subject offered has the specified properties.

New high-speed production line will be supplied with cone shaped cylinders as a semi products made by EF1, FD, F1, E1, G2, and will form them further.

The final product coming from the line shall be a welded unpainted steel wheel with punched valve hole and trimmed edge. The specification for the final products, which are also valid for the semi product handled on the line are shown below. A valve guard will be added manually by existing worker.

### **\*Specification that will be used in the scoring criterion, Invitation to Tender Section: Award Criteria**

Material specification	: DD11 or S235JRG Steel
Minimum width of rim	: 5"
Maximum width of rim	: 13"
Minimum diameter of rim	: 12"
Maximum diameter of rim	: 20"
Minimum thickness of rim	: 2.5 mm
Maximum thickness of rim	: 5 mm
Maximum weight of wheels	: 70 kg
Line production capacity	: 50-100 rims/hour (with 100% production efficiency)

\* The line capacity will vary according to rim size.

Expected uptime	: 24 hours/day - 4 shift pattern
Warranty	: 5 years
Spare parts support	: 10 years
Remote support	: over internet connection

Number of operators:

- 2 multiskilled operators to load / unload and supervise the production line while running
- 3 skilled people for changeovers (can include the 2 operators from the line above)

### 3. EXISTING EQUIPMENT WHICH WILL BE REINSTALLED INTO NEW HIGH-SPEED PRODUCTION LINE

**EF1 - Guillotine** - steel sheets are brought by a forklift to the guillotine which cuts them to the specified width

Manufacturer: Edwards Pearson

Model: 8/2050

Outer dimensions: 2800mm x 3100mm

\*Existing Guillotine will be an integral part of a new rolling line, not subject to procurement

**FD - Rolling machine** - The cut sheet is loaded into the rolling machine which creates a cylinder shape out of it

Manufacturer: MG

Model: EH 208 A/S

Outer dimensions: 3900mm x 1800mm

\*Existing rolling machine will be an integral part of a new rolling line, not subject to procurement

**F1, E1 - Plasma welding** - In order to finalize the cylinder shape, it's required to weld the two ends together

F1 Manufacturer: SAF France

F1 Model: M 1210000

F1 Outer dimensions: 2700mm x 2200mm

E1 Manufacturer: SAF France

E1 Model: M 2360000

E1 Outer dimensions: 2900mm x 2200mm

\*Both existing plasma welders will be integral parts of a new rolling line, not subject to procurement

**G2 - Hydraulic press** - the cylinder is loaded into a hydraulic press which presses the cylinder on both sides to create a cone shape on both ends of cylinder

Manufacturer: SMG

Model: HZPU 400

Table dimension: 1100mm width, 1000mm depth

\*Existing G2 hydraulic press will be an integral part of a new rolling line, not subject to procurement

Finished product after all the existing machines to be integrated into new production will be a "flared cylinder", which is further formed on the new rolling line, utilizing the automated equipment as specified below.

The flow chart below shows the required steps to manufacture a wheel by utilizing the current process.

\*Please note that the machine naming can be different than the actual state, but the production flow remains the same.

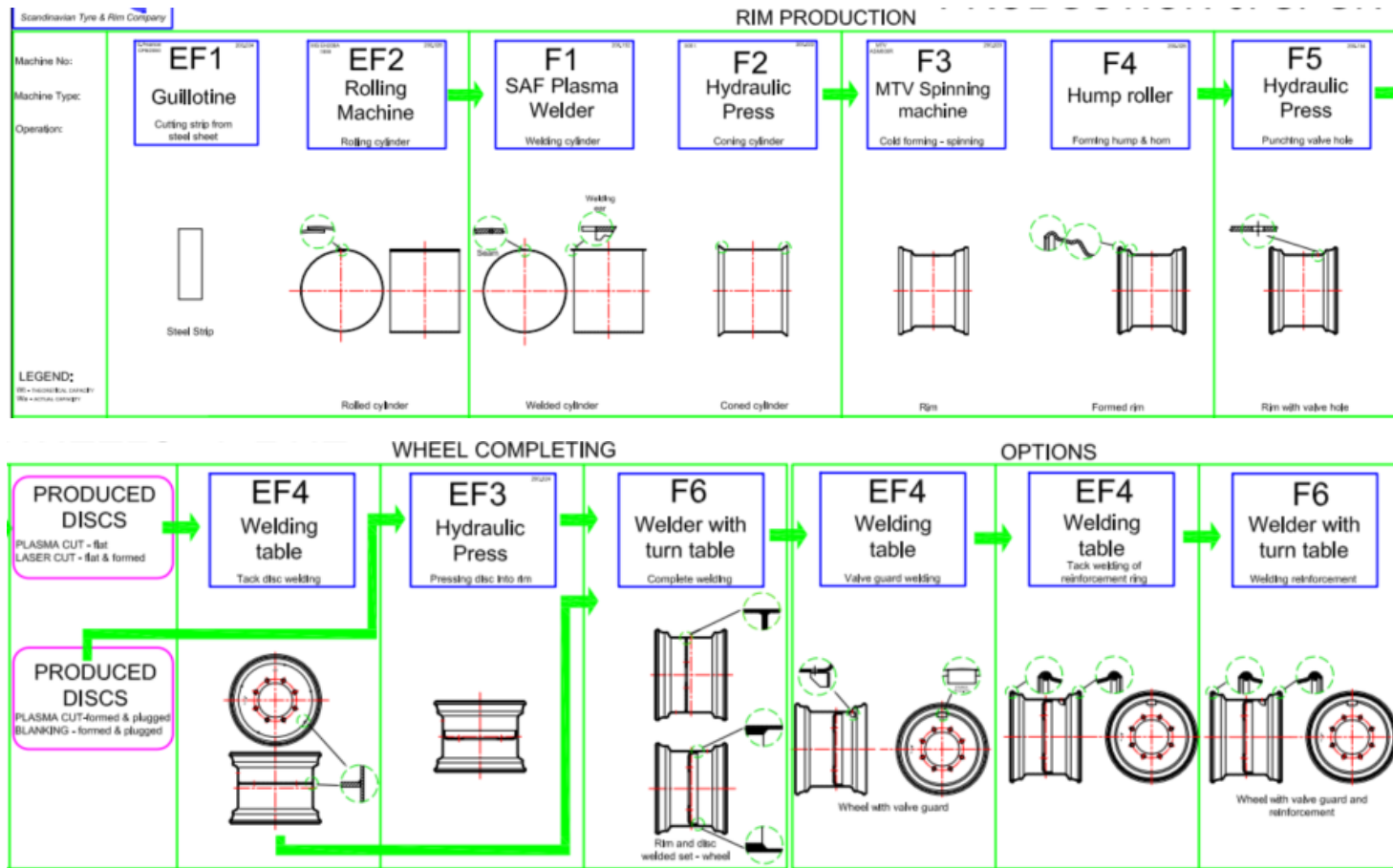


Figure 2: Current production flow

#### 4. DESCRIPTION OF THE SUBJECT MATTER OF PROCUREMENT

In order to meet the new production requirements the following equipment will be procured:

1. **High volume wheel line machine for less steel and less CO<sub>2</sub>** (Rim Rolling Machine): Complete Rim Rolling Line (multi-stage, including coolant recycling system and air curtain for drying) including 1 set of tooling

The Line should be specially designed for the forming operation of the rim. **High volume wheel line machine is formed** of machines as stated below.

- Rim Rolling Machine (2 pcs.)
- Loading & Unloading Group (from conveyor to Rim Roller-1 & from Rim Roller-2 to exit station)
- Rim Transfer Group (from Rim Roller-1 to Rim Roller-2)
- Hydraulic Power Pack
- Pneumatic Control System
- Coolant System
- Electric Control Cabinet

Rim roller machine, there should be upper and lower shafts with closed ends.

The upper shaft should be move up and down, and the lower shaft should be move back and forth.

The rim should be formed in 2 operations with the tooling attached to the shafts.

The line should be positioned into maximum area 7500 x 4000 mm with all accessories. The height of the machines should be limited maximum as 4000 mm.

Total electric power requirement for the line should be maximum 250 kW.

Rim roller machine should be fixed on the floor without any pit requirement. Pit and collecting channels can be provided only for coolant system.

2. **Pick & place robot** - start of line (1 piece)

Maximum reach should be 2700 mm.

Maximum payload should be 165 kg.

Maximum rate load should be 120 kg.

KUKA robot will be preferable.

Robot should be supplied with steel construction robot base to fix robot on the floor.

Robot should be supplied with all of necessary electric control cabinet and necessary accessories.

**3. Transfer robot** - rolling machine to calibration (1 piece)

Maximum reach should be 2700 mm.

Maximum payload should be 275 kg.

Maximum rate load should be 210 kg.

KUKA robot will be preferable.

Robot should be supplied with steel construction robot base to fix robot on the floor.

The suitable “double” gripper system should be designed to transfer formed rim bodies from rim rolling machine to calibration press and to transfer calibrated rim bodies from calibration press to idle station.

Robot should be supplied with all of necessary electric control cabinet and necessary accessories.

**4. Transfer robot** - calibration/assembly/valve press (1 piece)

Maximum reach should be 2700 mm.

Maximum payload should be 165 kg.

Maximum rate load should be 120 kg.

KUKA robot will be preferable.

Robot should be supplied with steel construction robot base to fix robot on the floor.

The suitable “single” gripper system should be designed to transfer calibrated rim bodies from idle station to assembly press. Additionally in between the route the robot should be parked the rim under valve hole punching press for valve hole punching process.

Robot should be supplied with all of necessary electric control cabinet and necessary accessories.

**5. Transfer robot** - valve press to weld station to transfer track (1 piece)

Maximum reach should be 2700 mm.

Maximum payload should be 275 kg.

Maximum rate load should be 210 kg.

KUKA robot will be preferable.

Robot should be supplied with steel construction robot base to fix robot on the floor.

Robot should be supplied with all of necessary electric control cabinet and necessary accessories.

**6. Transfer robot** - transfer track to palletizer (1 piece)

Maximum reach should be 2700 mm.

Maximum payload should be 165 kg.

Maximum rate load should be 120 kg.

KUKA robot will be preferable.

Robot should be supplied with steel construction robot base to fix robot on the floor.



Robot should be supplied with all of necessary electric control cabinet and necessary accessories.

**\* All robots listed above must be compatible with Siemens Simatic / KUKA control system**

**7. Weld Seam Detecting Table** (based on plasma weld technology, with future compatibility for butt welding)

The unit should be positioned just after rim rolling line before calibration process. The formed rim bodies should be taken automatically to the station (from rim rolling exit conveyor) and clamped by pneumatic system from the side. After that the servo motor & drive system should be rotated the rim automatically and welding seam should be detected by suitable welding detector. Once welding seam is detected the rim should be stopped at requested angle/position.

The unit should be positioned into maximum area 1750 x 2500 mm with all accessories.

**8. Automation transfer equipment pre-process** (roller track & automated loading/unloading of existing flare press)

The suitable "single" gripper system should be designed to transfer rounded & welded rim bodies from conveyor to flare press and to transfer flared rim bodies from flare press to rim rolling line entry conveyor. Additionally robot should be capable to load welded rims on the dedicated wooden pallets.

The gripper design should be done taking existing flare press & flare tooling and entry conveyor conditions.

The gripper should be fit for all sizes of rims which are mentioned in Section 2.3.

The gripper system should be suitable with 120 kg rate load & 2700 mm maximum reach pick & place robot.

The necessary intelligent part recipe design at HMI and routing of the robot for all types of rim types should be provided.

**9. Automation transfer equipment post-process** (roller track & automated loading/unloading of discs/weld tables/edge roller/palletizer)

The suitable "double" gripper system should be designed to transfer assembled rims from assembly press to rim welding stations and to transfer welded rims from welding stations to rim transfer conveyor.

The suitable "single" gripper system should be designed to transfer produced finished wheels to load from conveyor on the wooden pallets.

The gripper design should be done taking related machine/station/conveyor conditions.

The gripper should be fit for all sizes of rims which are mentioned in Section 2.3.

The "double" gripper system should be suitable with 210 kg rate load & 2700 mm maximum reach robot.

The "single" gripper system should be suitable with 120 kg rate load & 2700 mm maximum reach transfer robot for palletizing.

The necessary intelligent part recipe design at HMI and routing of the robot for all types of rim types should be provided.

The linear disc loading system should be designed and supplied for loading discs to assembly press for rim & disc assembly process. The automation system should be synchronized with assembly press.

#### **10. High volume line machine tooling** Extra 3 tool sets for rim rolling machine

The rim rolling process steps should be created by supplier in accordance with "STARCO" provided drawings.

All rim rolling tool sets should be designed according to created rim rolling process details.

All rim rolling tool sets should be suitable for rim rolling line machines main shaft and stroke dimensions.

All active forming parts should be produced from West Europe origin 1.2379 cold tool steel.

All active parts should be vacuum hardened to 58-60 HRC.

All parts should be delivered with quality control reports prepared by supplier.

All raw material certificates and heat treatment reports should be provided along with tools.

#### **Important remarks!**

\* All machines should be supplied with safety fences & equipment according to EU regulations (CE mark & appropriate documentation) - **To be included in price**

\* Delivery, spare parts list, manuals in local language (Croatian), documentation, installation, training - **To be included in price**

New production layout is shown in Figure 3 below.

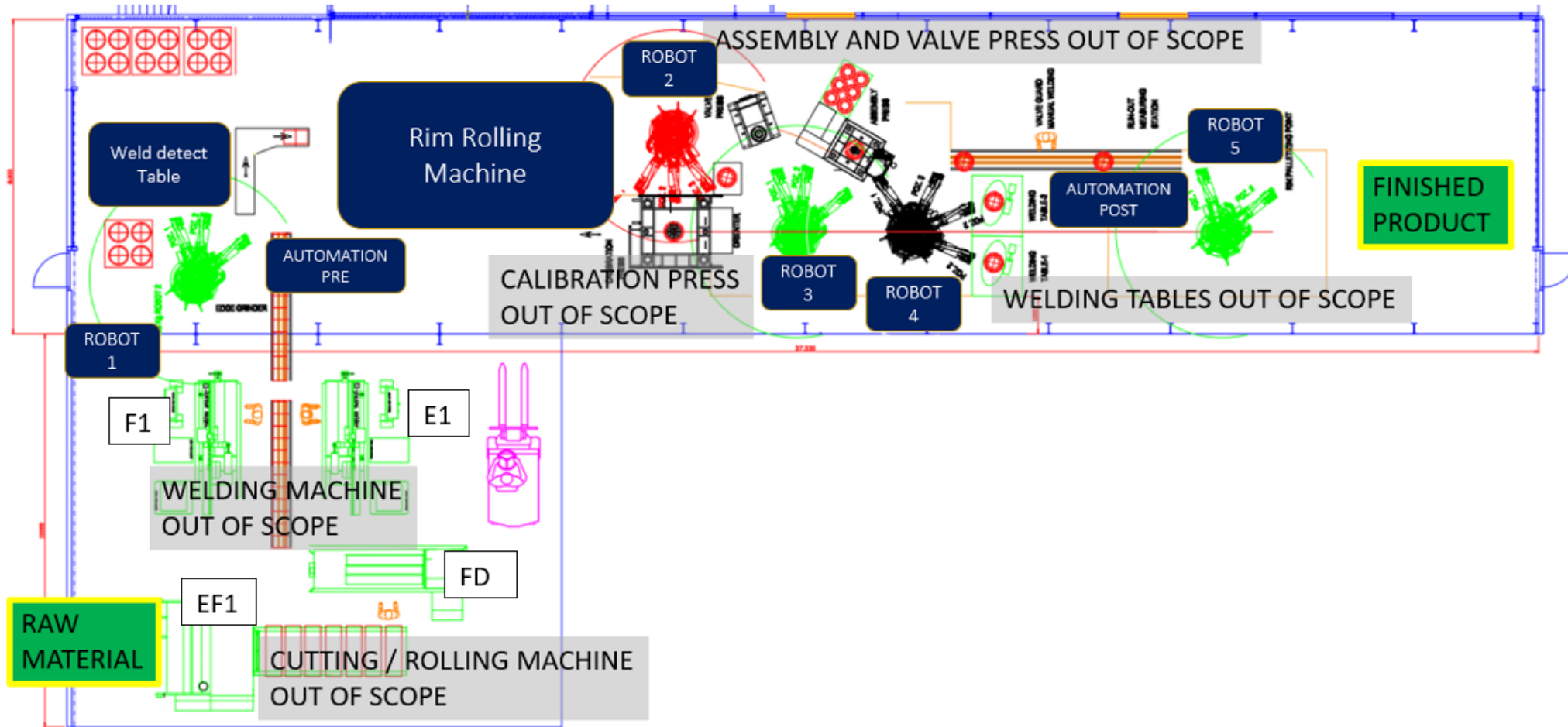


Figure 3: New production layout