The first step in automation.

The Statement of Work

Jon Colier, Mechanical Engineer

mna
INSIGHTS

INTRODUCTION

The first step in automation.

No matter the scale of your manufacturing operation, there comes a point at which automating your production process makes sense to grow your business. You know how your product goes together and works - you just need someone to design a machine to do it more quickly, more cost effectively, or with higher quality output.

The first step in creating custom machinery is developing a Statement of Work.

A Statement of Work communicates exactly what you expect from the automation provider. A well written SOW will serve as the guiding document throughout the development of the machine.

The timing of SOW preparation is critical. It is important to develop the document before interviewing vendors. This ensures that all suppliers are using the same criteria to develop concepts and proposals.

What is in a Statement of Work? Here are some typical subjects to consider:

- Product definition
- Process definition
- Production rate
- Labor resources
- Facilities
- Quality inspection requirements
- Integration with existing processes
- Preferred component manufacturers
- Design standards
- Factory acceptance test

MNA has been designing custom machinery for almost 50 years - we work with companies that range from start-ups to international organizations. Every project begins with a Statement of Work.

STATEMENT OF WORK

Items to include in a SOW.

Product Definition

In order to design a system to suit your production needs, vendors need to know detailed information about your product and its constituent components. Individual components, drawings with tolerances, material specifications, etc. If any of this is proprietary information, a non-disclosure agreement should be jointly signed.

Process Definition

Closely related to product definition is process definition. What does it take to convert the raw components into a completed item? This can inform the function/process of the new automated system. For instance, techniques, process parameters, test parameters, physical challenges, known hazards, etc.

Production Rate

An essential factor for the automation design is the speed at which it needs to operate. The SOW should clearly state how many parts per minute / hour / shift that you want the equipment to produce.

The final payback of an investment can be determined by the increase in parts produced, as well as the decrease in labor and material cost.

Labor Resources

How many operators are expected to run the system? Also consider ancillary tasks such as refilling hoppers, removing filled containers, topping off and packing out.

Facility

It is important to consider where the equipment will be installed. Some items to consider:

- Available space; footprint and available height.
- Environment: conditioned or not? Humidity? Temperature? Clean room?
- Utilities: electrical (voltage, amperage and number of phases). Compressed air - availble pressure and flow.

Quality Inspection Requirements

What constitutes a good product?

Does the machine need to inspect and verify product quality?

At what points in the process is inspection required?

Spot checking or 100% inspection?

Does the inspection data need to be logged?

Integration with Existing Processes

The proposed system can be stand alone or integrated with existing equipment or systems. It is important to have information about upstream, downstream or factory-wide hardware or controls with which to interface.

Important mechanical considerations might be height of an infeed conveyor or speed/rate of parts' arrival. Important controls information might include I/O handshaking requirements, safety system coordination or data sharing.

Preferred Component Manufacturers

Your facility may have standardized on certain component manufacturers or platforms. Providing this information in the SOW is important as it guides the system scope, from proposal to construction.

Common elements include:

- PLC/HMI platform
- Pneumatic & electrical component suppliers
- Hydraulic component suppliers
- Safety system
- Power transmission components

Design Standards

These are guiding specifications and standards that are requirements for the design of production equipment in your facility.

Examples may include:

- Internal standards for compliance that differ from local, regional or national standards.

- UL certification or CE marking.
- PLC or HMI modes, templates and/or standards.
- Mechanical standards, such as metric/standard, material finishes.

Factory Acceptance Test

The conclusion of the design and building of an automation system is the run-off, or the "Factory Acceptance Test (FAT)". This includes the actual running of the machine at the supplier facility.

The FAT is a mutually agreed upon checklist to document that the system conforms to the SOW.

Some elements common to a FAT document include:

- Duration or number of parts for a simulated a production run.
- Anticipated machine uptime during production run.
- Confirming that the machine meets acceptable ergonomic norms.
- Verification of safety system design and function.
- Fault simulation, recovery and logging (if required).
- Demonstrate setup and/or changeover procedures.

Defining the FAT ahead of time will ensure that everyone has the same goals in mind, and that there is a definite beginning and end to the process. A similar test may occur after the machine is installed at your facility, typically called a "Site Acceptance Test".

CONCLUSION

Getting started.

There is a lot of design work and communication that goes into developing a new system, and that starts with a well-defined SOW. Clearly conveying the goals and expectations contained within the SOW results in a more efficient project execution and a better final outcome. The following pages show an example of a well-defined SOW - it clearly outlines goals and expections, and does so in thorough, practical manner.

Starting with a Statement of Work is the best way to ensure that you will be satisfied with the automation system that you receive (at MNA we guarantee it).

With MNA, first consult is free.

We at MNA have been designing custom equipment for almost 50 years, and we are more than happy to work with you in developing a functional Statement of Work for your production and automation needs. Whether you have an ambitious vision that will create an entirely new market, or are continuing a legacy of manufacturing success, we're here to help you create it. Just make sure to call us early in the process. It's free - you stand only to gain.

inquiry@mnadesign.com | 770.428.0000

910 Mountain Industrial Drive NW
Marietta, GA 30060

mnadesign.com

STATEMENT OF WORK

Sample SOW

Sample SOW

Below and on the following pages is an example of how you might structure a simple yet successful Statement of work.

<Machine Name>

Sample Statement of Work

<Identification Number>
<Rev number>
03/30/2021

Contacts:
<client contact 1 - name, email and phone #>
<client contact 2 - name, email and phone #>

Table of Contents

Objective

COMPANY is seeking to procure or build a MACHINE. This MACHINE will….DESCRIPTION.

Brief description of process.

Existing examples of Machine in existence?

Scope

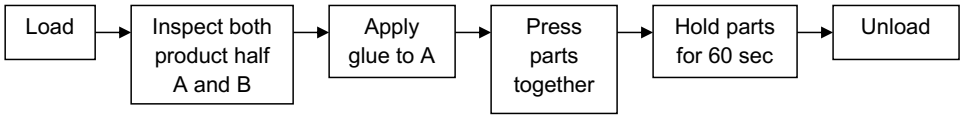
Describes the activities that are expected of the equipment provider.

Disciplines that the equipment will require (mechanical/electrical engineering, fabricated parts, safety system design, parts' procurement, programming, etc).

Turnkey system or collaborative development?

Integration with upstream and downstream processes? Supplier's responsibility for said integration.

Block diagram and/or flowchart may be useful to aid with this section. Example:



Broad description of major mechanical and electrical systems, if known.

Definitions

The following table defines terms and abbreviations that are relevant to this document.

Table 1 – SOW Definitions

Acronym	Definition
HMI	Human Machine Interface
PLC	Program Logic Controller
SOW	Statement of Work (this document)
SAT	Site Acceptance Test
FAT	Factory Acceptance Test
AB	Allen Bradley
RS	Rockwell Software

Table 1 – SOW Definitions

Acronym	Definition
EOAT	End of Arm Tooling
BOM	Bill of Material
OSHA	Occupational Health and Safety Administration
NEC	National Electrical Code

System REQUIREMENTS

This section describes all deliverables that are to be agreed upon between client and machine builder.

Components (inputs) to automation. Expected output(s).

Dimensioned and toleranced drawings of all components, pre- and post-processing.

Physical and chemical properties of components.

Safety considerations of said components.

Format, orientation, arrangement, or groupings where relevant.

Process Takt time.

Expected uptime.

Product mix and quantities for each work order.

Expected changeover time between WOs.

Number of operators, their responsibilities and how they are expected to interact with system/machine.

Ergonomic considerations.

Specific health & safety requirements.

Required PLC or HMI functions, modes, annunciation, data logging, fault behavior, template use, or other standards.

Software and firmware to be used. Preferred versions.

FAT requirements.

Documentation requirements.

Shipping, insurance, and export requirements.

Conformance/qualification requirements (e.g. NFPA, ANSI, OSHA, NEC, CE, etc.)

Installation requirements.

SAT requirements.

Hardware Requirements

Required subsystems that must be used in the automation (e.g. a major process component that is preferred/required)

Preferred or required manufacturers or components to be used.

Required spare controls overhead – e.g. spare I/O, terminals, panel space.

Software Requirements

Note: in all cases, state version or year, where applicable:

• Project Planning	Microsoft Project (*.mpp)
• Setup, Operation and Maintenance Manuals	Microsoft Word(*.doc)
• Process and Instrumentation Diagram (P&ID)	AutoCAD (*.dxf)
• Control Schematics	AutoCAD (*.dxf)
• Control Panel Assembly Drawings	AutoCAD (*.dxf)
• Equipment Assembly Drawings and Component Drawings	Solidworks (*.sldprt,*.sldasm,*.slddrw)

Interface Requirements

Connectivity requirements – ethernet, remote login, registers for external data sharing.

Installation Requirements

Is installation required?

Will client have involvement in installation?

Will start-up assistance be required?

Is the system provider cleared/qualified to work at client' facility?

SAT –formal acceptance test at client site? If so, what comprises acceptance test?

Will operator/maintenance/engineering personnel require training?

Performance Requirements

Included in Requirements, i.e. –

Format, orientation, arrangement, or groupings where relevant.

Process Takt time.

Expected uptime.

Expected changeover time between WOs.

Dimensioned and toleranced drawings for finished product or operation.

Environmental/Location Requirements

Temperature and humidity ranges for location.

Dust/contaminants.

Vibration.

Noise limits (per OSHA)

Operational/Maintenance Support Requirements

This includes all documentation outlined in Software Requirements.

Additionally, what on-site or remote assistance is expected from the provider?

