

The machine vision project checklist

Everything you need to know before starting a machine vision project

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Introduction

In this guide, we take you through the entire process of a machine vision project with JLI vision - from the first idea until the system is inspecting items on your production line.

We'll answer questions like:

- » What are the most important phases of a project?
- » What happens along the way?
- » What do we need from you?
- » What should you consider?
- » What is a typical timeline for a machine vision project?

The purpose of the guide is to give you an overview of how a machine vision project unfolds, so you know what to expect and which questions to ask yourself to ensure that you end up with the right solution.

Phase 1

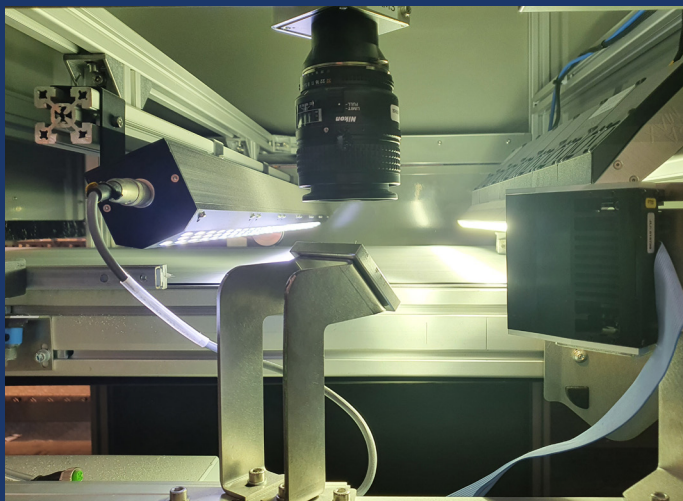
PROJECT CLARIFICATION

It usually starts with a problem. Critical faults on produced items, a fault rate too high, or an inefficient manual inspection process. From the problem springs the need for an effective solution and the idea of using machine vision to automate the process.

We are happy to help in the initial phase, contributing with our many years of experience with vision solutions for different industries.

Sometimes the solution is straightforward so that you can easily build something that works with simple equipment, and then we can quickly help you in the right direction.

Other times, it is a complex issue that requires a customized solution. If so, the next step is determining whether there is a good business case or not. We can help you figure out if there is a solid return on investment in carrying out a machine vision project.



What should you consider?

In the initial phase, we will always ask a series of questions to identify the problem and the solution to it. You can address these questions in advance:

- » What is the size of the object to be inspected in all dimensions?
- » How many different objects are produced on the line?
- » Orientation - can we get the part presented the same way each time?
- » Surface variations - is it glossy or matte? What colors are being produced?
- » Are there vibrations on the production facility? Dust? High and low temperature? Big temperature variations?
- » What is the speed of the conveyor belt? (max./min.)
- » How many objects pass per minute?
- » How small or large are the defects we need to find?
- » Is the system for statistical purposes only, or should it be able to reject or guide?
- » What are the timing requirements from inspection to reject?
- » Is the vision system going to communicate with and guide robots or other equipment?
- » Where can the cameras be installed safely? And how much space is there around the production line to install a vision system?
- » What are the requirements regarding accuracy? Is it medical devices where absolutely no defects can pass, or are a few minor faults acceptable?
- » How many false rejects are acceptable?

WEEK 1

PHASE 1

Week 6

Week 12

Week 18

Week 24

TIMELINE

This above timeline is only indicative, but this is what it often looks like when things go smoothly. The specific timeline for a machine vision project will always depend on how fast you can collect the samples needed, the time spent to prepare a URS, etc.

THE MACHINE VISION PROJECT CHECKLIST

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Phase 2 COLLECT SAMPLES

If we conclude in phase 1 that it makes sense to move forward with a machine vision solution, we have to get our hands on the specific items that we are to inspect.

In this phase, we will ask for a series of samples. It can be a challenge to obtain these, but it is crucial for us in order to move forward with the project.

You will need to provide us with both some good and some bad examples so we can assess the differences.

What should you consider?

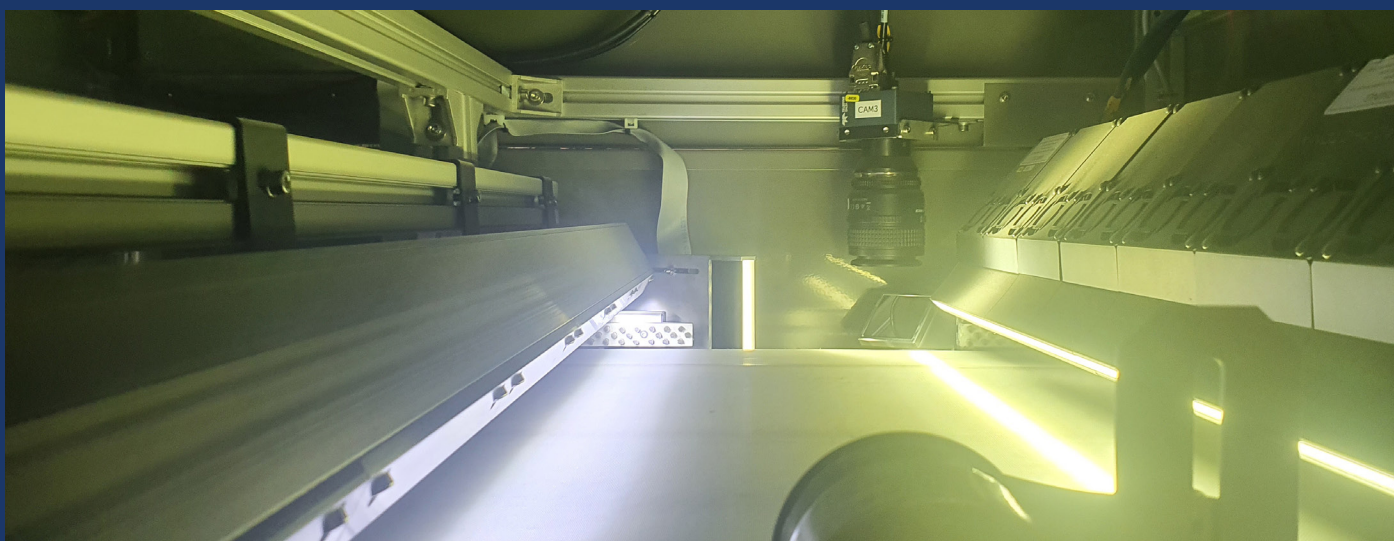
Focus on finding samples, where it can be difficult to determine whether they are good or not. We look for these “marginal faults” because they determine the required sensitivity of the system - which in turn impacts the price of the system.

Phase 3 CREATE CONCEPT

Once we have the samples we need, we get to work in our laboratory and start making test setups with different cameras, optics, and light sources to see how we can build a system that meets your needs.

The test phase gives us an answer as to whether we can solve the challenge, which fortunately is most often the case.

The next step is making a preliminary investigation, which results in a full concept for the system. Oftentimes the preliminary investigation can be done quickly and free of charge, but in cases with high complexity the preliminary investigation can be a paid pre-project anywhere between € 5.000 and € 25.000, but as the work done in the preliminary investigation is a necessary step towards the final solution, this does not affect the final price for the system.



THE MACHINE VISION PROJECT CHECKLIST

Everything you need to know before starting a machine vision project

Phase 4

CREATE THE USER REQUIREMENT SPECIFICATION

When the concept is created we need to align on the requirements of the system.

In this phase, we will ask you for a User Requirement Specification (URS). This document contains all the requirements the system has to meet. This document is crucial because it helps both you and us determine whether the system is a success or not.

Among other things, the URS must contain measurement accuracy, sorting accuracy, the speed of the production line, a description of the surroundings, e.g. natural light, temperature, and vibrations.

A URS also includes the “golden samples” - good samples as well as samples with marginal faults - that we agree should be used to determine if the system is working properly.

We are happy to help make your URS. You can draw on our experience to ensure that you get all the important aspects included. Alternatively, we do the URS, as it is a necessary prerequisite for moving forward with the project.

What should you consider?
Do not underestimate the importance of a thorough URS.

Although it may seem cumbersome, getting all the requirement specifications in place at an early stage is important to avoid change requests later in the project.



THE MACHINE VISION PROJECT CHECKLIST

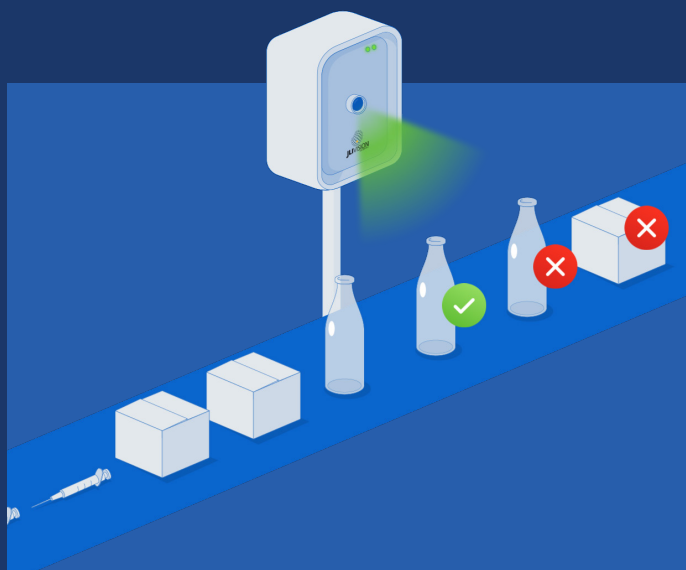
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Phase 5 OFFER A TURNKEY SYSTEM

Once the URS is in place, we can present a final budget for a turnkey system, where we take care of all aspects of the project.

It is our responsibility that the system works as agreed, and we always guarantee the quality of it.

That is why all systems are delivered with a functional guarantee. No cure, no pay.



Phase 6 DEVELOPMENT AND PRODUCTION

After the contract has been signed, we start the actual development and production phase.

We procure the necessary hardware, develop algorithms and build the system. Often the machine vision system is part of a larger installation, and when we work as a subcontractor to the machine supplier, in this phase we have a dialogue with them about how the system should be made to fit the production line. We often need fixtures or similar from the machine supplier to dimension the system correctly.

This phase ends with a Factory Acceptance Test (FAT), either in our laboratory or at the machine supplier.

We test the system point by point according to the URS. The FAT ensures that the system works as it should before we send it for installation on your production line.

In some cases, a FAT is quite simple, whereas in the medical industry, for example, it is a very comprehensive process due to the extensive safety measures in that industry.



THE MACHINE VISION PROJECT CHECKLIST

Everything you need to know before starting a machine vision project

Phase 7 INSTALLATION AND TRAINING

After a successful FAT, we send the system to your production facility. The installation itself can be done in several ways. Preferably we travel along and do the installation on-site ourselves, so we can follow the project all the way and see the system work in the right environment.

However, it is also possible to carry out the installation remotely, where we can then instruct others in setting up the system.

Since we provide a turnkey solution, our typical requirements for installation are simply four holes in the floor, a 230V outlet, and an internet connection.

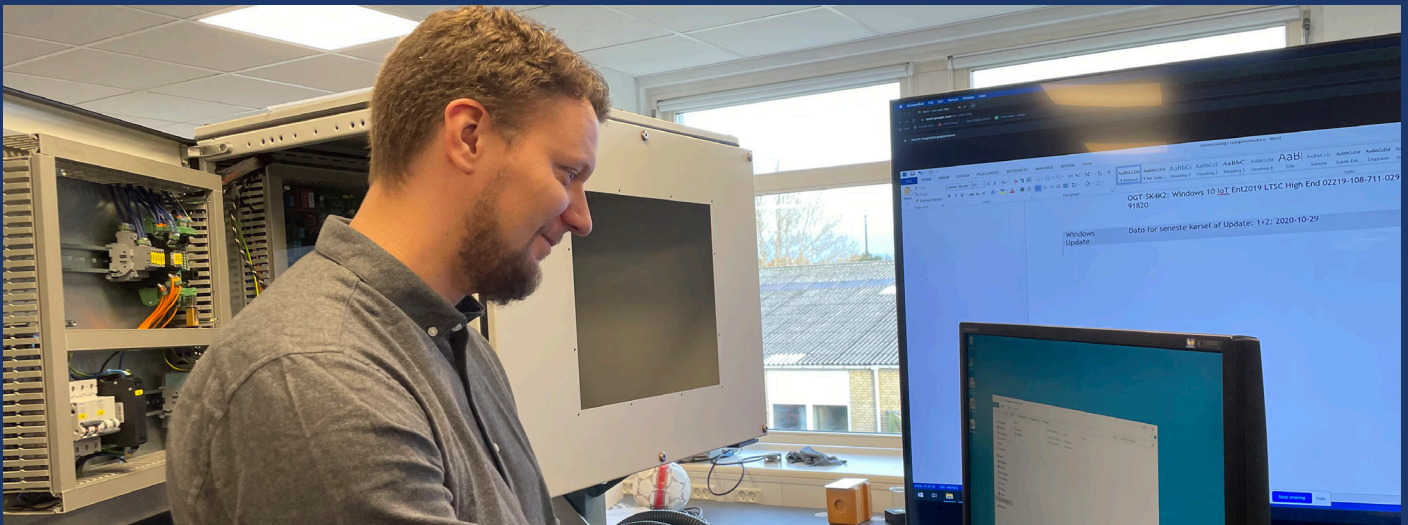
After installation, we perform a Site acceptance Test (SAT), which is a review of the same points as in the FAT, but in the right production environment. This way we can also take unexpected elements into account that prevent the system from working.

What should you consider?

If there is a need for it, we are happy to conduct training sessions in the use of the new system, so we make sure you are off to a good start.

To ensure a successful installation, you should appoint a project manager with the mandate to make decisions once the system meets the agreed standard and delivers as intended.

Since a certain run-in period should be expected - often around one week - it is of course also important to plan the installation with the daily production flow in mind. On production lines running with 24-7 production, the installation will often be placed in one of the planned shutdowns.



Week 1

Week 6

Week 12

Week 18

WEEK 24
PHASE 7

THE MACHINE VISION PROJECT CHECKLIST

Everything you need to know before starting a machine vision project

Phase 8

OPERATION, MAINTENANCE, AND SERVICE

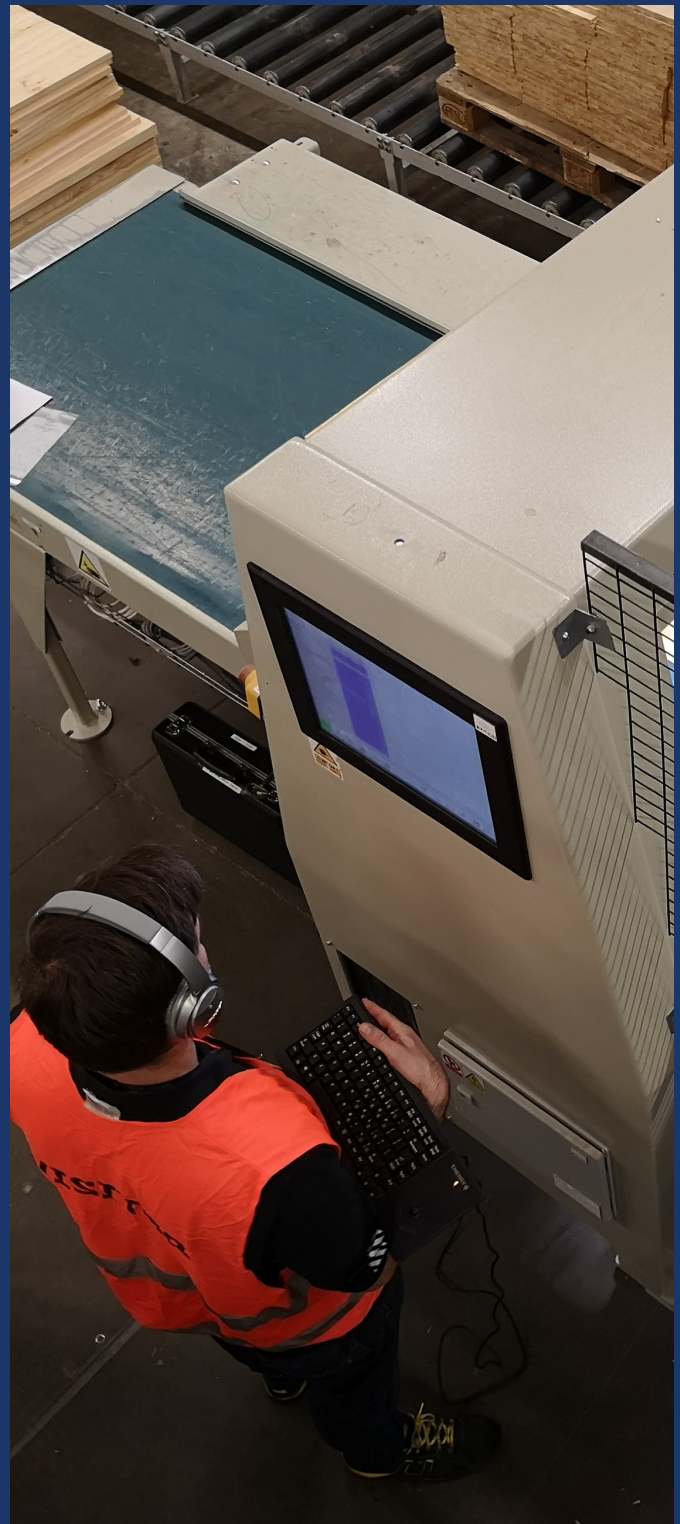
Once the vision system is operating, it is important to note all errors if any so that we can correct them.

Since the system is online, we also keep an eye on it. For the first week, we monitor performance daily, and then we move on to doing weekly checks to see if the system is working properly.

What should you consider?

With a service agreement, you have an assurance that the system will continue to run, so it is often a good idea to include this as part of the project.

The life expectancy of a machine vision system is 10-15 years. Due to hardware manufacturers changing their product ranges over time, it can be impossible to obtain new spare parts, therefore we can help you monitor end of life status for crucial spare parts, and find alternatives or give you a warning in time. Nevertheless, we have examples of installations that have run without problems for 25 years, so we assure that you end up with a very robust system.



Week 1

Week 6

Week 12

Week 18

WEEK 24
ONGOING

THE MACHINE VISION PROJECT CHECKLIST

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JLI vision - just perfect

JLI vision develops, manufactures, and installs advanced computer vision systems for industry and laboratories.

Our vision is to be a leading supplier of advanced vision systems worldwide.

To continuously explore and develop the possibilities of industrial machine vision with regards to our customers product quality, and production efficiency.

JLI has solved numerous application challenges in the past >30 years. We have explicit knowledge about which vision techniques will work in real-life. We only use state-of-the-art technology and software that can be adapted to nearly any application.

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