Benefits of Custom Vision Systems

When calculating costs for a vision system, your first inclination might be to ask about camera price. However, these fees are nominal in the larger context of a proper vision system integration. Consulting with an experienced vision system integrator will help you understand the full cost of implementing a vision system that guarantees greater capital efficiency and improved pass/fail rates.

Out-of-the-box vision systems are malleable and produce unreliable pass/fail data. Camera kits are cheap solutions, but you get what you pay for. These vision systems can quickly become uncalibrated, putting your company at risk of throwing away good product. The constant field service maintenance associated with such systems will quickly lead to higher long-term costs for your company.

Finding a vision system provider with custom engineered designs and solid fabrication techniques is an important first step to reducing future problems on any project. Systems from reputable providers are rigid, reliable and require far less maintenance and on-site know how after setup. By consulting with a vision system integrator first, you will have confidence in the validity of your pass/fail rates, improve product quality and save your company from unnecessary expenditures. Below are a list of factors that will affect the cost of your custom vision systems.
Machine Vision Cost Factors

1. **Speed of Inspection** – How fast do you need to inspect your product? Generally, a faster vision inspection system will cost more than a slower version. Specifically, this cost factor can be examined in two ways:

   a. **Part Rate** – How many parts per minute (PPM) are being inspected? 200 PPM is a simple inspection, meaning standard camera equipment and programming should suffice. Systems that inspect parts at 400-600 PPM require more advanced cameras with higher processing speeds, resulting in a greater capital cost. EPIC has designed and fabricated several custom machine vision systems that inspect at a part rate greater than 1,000 PPM.

   b. **Part Speed** – How fast are the parts moving past the camera? If parts move past the camera at a reasonable speed, then standard camera and lighting equipment can be used. If the parts are moving by quickly – say 100 miles-per-hour – the inspection will require brighter lights, a camera capable of recording more frames per second (FPS) and a powerful processor to complete each inspection without buffering between frames. A faster part speed results in higher capital cost.

2. **Part Control** – For a vision system to inspect properly, the parts must be presented to the camera in a repeatable fashion. If parts are not oriented in the same place and in the same way every time they pass the camera, a mechanism (part orienter, unscrambler, feeder bowl, etc.) will need to be implemented at an additional cost. If your manufacturing process already presents parts in a repeatable fashion, then you won’t need to incur this additional cost.

3. **Environment of Inspection** – Many vision systems can be fabricated using anodized aluminum parts that come at a lower relative cost. However, if your inspection takes place in a location with special safety requirements, your vision inspection system will also need to be designed and fabricated to meet those requirements. For example, if you’re company manufactures pharmaceuticals, medical devices, or food and beverage packaging, then you might need a vision system that is “wash down ready” with stainless steel brackets and a camera that is enclosed in a water proof case. Likewise, if your vision system is to be implemented in an environment with explosive gases, you might need to enclose it in explosion-proof casings. The more specialized the safety considerations, the higher your machine vision system cost will be.

4. **Complexity of Inspection** – If you’re inspecting something that is hard to see, then the inspection is going to be more complex and likely more expensive. For example, if you’re inspecting for microscopic defects that are imperceptible to the eye, then you’ll likely need to incur the cost of specialized equipment such as high-resolution cameras, optics and lenses. However, if the defect is large and easy to see with your own eyes, it’s likely that standard machine vision camera equipment and less programming hours will keep your costs lower.

5. **Stringency of Pass/Fail Rates** – What level of certainty do you require for your pass/fail rates? An experienced vision systems programmer can achieve 90+% accuracy of almost any vision inspection within a few hours of programming. However, while 90% is useful during proof of concept, that level of accuracy is not going to be enough during production. You don’t want to throw away 10% of potentially good product, right? To achieve 99.9% accuracy, you’ll need to invest in adequate programming time. Higher pass/fail accuracy equals higher costs for your vision system programming.
6. Complexity of Integration – Can your vision system inspection be integrated with one input/output on a standalone rig? With this setup, the integration is simple with the main costs being the camera, lights, lenses, design and programming.

More complex integrations tend to require a larger budget for engineering. An example of a complex integration might be one where several recipes are being communicated back and forth between the camera system at once. This might require additional costs for hardware and programming.

Another complex example would be a camera system that cannot be easily placed near a production line due to the initial setup or production line location. The more time it takes your integrator to measure and spec the machine vision system integration, the higher your costs will be.

7. Quantity of Cameras – How many cameras do you need? Additional equipment requires increased costs. However, what you might be forgetting are the engineering and programming costs associated with each camera setup. If you need 20 cameras to complete the same inspection under identical conditions (see table below), then you can leverage savings from the initial engineering and programming costs associated with the first camera system. However, if your inspection conditions differ across all 20 inspections, you’ll need to incur separate engineering and programming costs for each of the twenty systems:

<table>
<thead>
<tr>
<th>Video Inspection</th>
<th>Camera Costs</th>
<th>Programming Costs</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical inspections conditions across 20 different locations</td>
<td>(x20)</td>
<td>(x1)</td>
<td>Camera Costs (x20) + Programming Costs (x1)</td>
</tr>
<tr>
<td>Different inspection conditions across 20 different locations</td>
<td>(x20)</td>
<td>(x20)</td>
<td>Camera Costs (x20) + Programming Costs (x20)</td>
</tr>
</tbody>
</table>

“FINDING A VISION SYSTEMS ENGINEER IS AN IMPORTANT FIRST STEP TO REDUCING FUTURE PROBLEMS”

Initial Costs vs Rollout Costs

Now that you’ve reviewed the benefits and cost factors of customized vision systems, let’s discuss how you can leverage cost savings with EPIC’s Global Vision System Rollouts. With proper documentation during the engineering and design phases of your initial machine vision project, EPIC’s engineers can create a productized version of your machine vision system, fabricating multiple replicas based on the original design at a reduced cost. Below is a breakdown of “initial costs” that can be saved during fabrication of replica systems as well as the “rollout costs” that are associated with all machine vision systems.

Initial Costs

1. Concept – In the conceptual stage of your project, EPIC’s engineers will extract your project scope, share examples of similar vision systems and discuss multiple solution options with you and your team.

2. Front End Engineering – The primary objective of FEE is to provide feasibility and establish a proof of concept. During this phase, EPIC will help you select equipment, set a project timeline and offer a fixed bid quote for the project.
3. Vision System Inspection Design – During design, your system’s brackets are modeled in 3D CAD software, camera programming is completed and the electrical design for power and controls are prepared. All programming, mechanical and electrical design is completed in-house by EPIC’s vision engineers.

Rollout Costs

4. Fabrication – Fabrication of brackets, control panels and assembly of the full vision systems are completed in-house by EPIC’s craftsmen and vision specialists. Vision systems can be built to fit with existing factory equipment or as stand-alone systems.

5. System Integration – EPIC’s vision engineers design systems for the final location. They prepare for a wide range of scenarios, from operating temperatures to existing communication platforms.

6. Onsite Services – Full installation of your vision system means all hardware is installed, power & controls are integrated with the plant, and the vision software is working correctly. Upon installation, EPIC re-tests all equipment to ensure components work together as intended. Beyond installation, EPIC provides complete vision system start-up and checkout support.

To speak with a vision engineer about pricing a custom machine vision solution call (314)-347-0245