Simplify the Manufacturing Floor: Consolidating One-Off Testers into a Single Universal Test Platform

As an engineering test manager, one of your main challenges is maintaining the organization and productivity of your manufacturing test environment. Yet sometimes you find yourself on a manufacturing floor littered with oddball machines and half-working parts – a never-ending clutter creep that's getting out of control. Major pain points can include:

Underutilized Capital: You have a lot of excess equipment and components on hand, many of which may be obsolete or unnecessary.

Lack of Flexibility: The existing testers all operate as independent silos of functionality, so there's no easy way to test additional, future products.

One-off and Proprietary Technology: Test engineers keep building one-off test machines for every new project, but there's no documentation and all their design knowledge is lost if they ever leave the company.

Floor Space: There's practically nowhere to walk, much less add another system to test the latest product. Storage space is lacking, and testers are inconvenient to access.

So, what's the answer? We need to somehow consolidate these multiple, dissimilar test stands into an intelligently structured system that will save space, money, and time. However, many times companies don't have the bandwidth or expertise to make it happen, so the problem gets pushed further down the priority list until the situation becomes intolerable.

With five decades of experience in the test industry, Ball Systems understands this thorny predicament, so we developed a simple approach in response – a refined methodology to create one test system to test all of your products. Essentially, combine the functionality of multiple testers into one universal system that can test multiple products. We've helped numerous clients – spanning across aerospace and defense, automotive, consumer appliance, and commercial and industrial markets – solve this very issue with our custom, universal test platform development process. And based on our expertise and best practices, we've identified four criteria that are necessary for creating a successful universal production test solution.

1. OPENNESS

One of our clients came to us with an existing board tester that was still limping along for them, but it was pieced together using older technology that badly needed updating. Unfortunately, their current supplier had built a closed architecture, so the client had no access to the source code and drawings to make any changes. They were trapped into having to pay high costs to the supplier. They had no choice.

Lesson learned: an open architecture is the only way to go. A proprietary system locks you into a single vendor, without the ability to take advantage of technologies from other manufacturers. Plus, without the source code and drawings, your engineers will have a harder time trying to modify test sequences or introduce new products to the tester themselves or modernize the system in the future. At Ball Systems, we believe strongly in transparency and open communication. When a project is completed, we provide not only the deployed system, but also all the source code and detailed documentation so that you can modify everything, from the inside out. Openness gives you true freedom of ownership to take whatever next steps you choose.

2. CUSTOMIZABILITY AND SCALABILITY

One size does not fit all, especially when it comes to specialized applications in the test and manufacturing world. For example, one of our customers came to us without any prior equipment and wanted to build a new test system capable of validating an entire family of products. One of the key requirements was the ability to customize the machine to test future products that would be added to the product line.

For maximum flexibility and scalability, we believe in using standard commercial-off-the-shelf (COTS) tools and industry standards wherever possible. COTS technology saves on engineering time and costs, allows you to best in class and/or the most cost-effective technology solution, and is easier to maintain and upgrade for future expansion. And industry standards ensure that products from different suppliers can communicate and interact together.

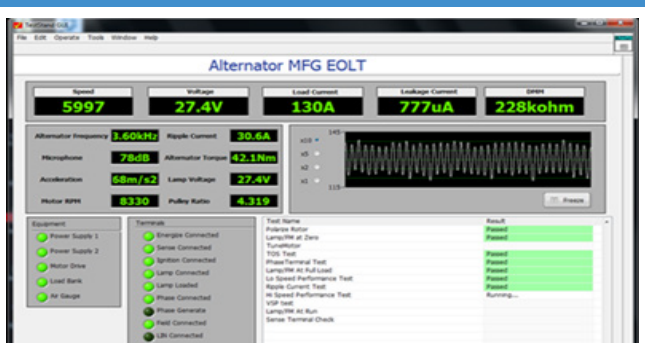
During the equipment selection process, we carefully consider the design specifications of the system and then choose the COTS hardware and software most suited for the project. To provide premium quality and cost efficiency, we have strategically partnered with best-in-class suppliers – such as National Instruments, Keysight Technologies, Pickering, Virginia Panel Corporation (VPC), and many others. Rather than shoehorn our clients into any one brand, we make our technology selection based only on what's the best match for the customer needs. And in cases where the project requires functionality that can't be implemented entirely with off-the-shelf components, Ball Systems also has the ability to design and build custom assemblies, printed circuit assemblies (PCAs), switches, gearing, and more.

Every test application is unique, so we choose the best technology and functionality needed for your specific project by using COTS equipment.

3. TIME SAVINGS

Time is money and having a universal test platform that can save you time both in the short- and long-term is worth its weight in gold (figuratively speaking). If your team is tied up with other projects, finding a test systems integrator can significantly help with upfront time savings. At Ball Systems, our seasoned staff of multidisciplinary engineers handles all design and development completely in-house, simplifying your project management (compared to hiring and coordinating multiple contractors). With 50+ years of building automated test systems, we have the ability to create a completely custom-built design per your exact needs, but on a much faster production schedule. We leverage the in-depth knowledge of our veteran engineers and reuse software and schematic libraries to quickly deliver completed test platforms on spec.

For long-term time savings, a modernized all-in-one product tester can greatly increase test bandwidth and allow users to quickly set up multiple tests in parallel. Since all functionality is integrated in one system (rather than spread across several, disparate machines), test processes and procedures are streamlined, increasing operational efficiency. Plus, the consistency in workflow and user experience makes it easier and faster to train new operators and support staff. Finally, a universal platform speeds up development of new products on the system, allowing for extensive hardware and software reuse.



Save hours of time and quickly complete tasks with a well-designed, intuitive user interface.

4. COST SAVINGS

While it may seem counterintuitive to spend money to save money, significant cost savings can come from consolidating many machines into a single, comprehensive product tester, capable of testing a whole suite of products and conducting multiple test runs at the same time. Not only does it decrease your equipment footprint and recover valuable floor space, but it also reduces your capital investment. As mentioned previously, a consolidated test platform improves overall efficiency and productivity, freeing up resources and bringing products to market faster. And maintenance-wise, it's less expensive to upkeep one test rig versus 20 different ones.

Considerations and Approach

In order to identify key areas for maximum improvement and savings, our planning process includes a checklist of considerations, such as:

- Determining customer pain points and needs (e.g., space issues, changeover times, automation)
- Reviewing customer preferences (e.g., desired suppliers, dimensions, takt times)
- Collecting the superset of requirements and synthesizing a list of full capabilities
- Refining and optimizing resource selection, switching of the resources, and mass interconnects
- Strategizing placement of custom components and corner case support (e.g., in the fixture versus tester)
- Specifying and creating software architecture
- Creating easily changeable fixture concept
- Considering self-test and calibration functionality

Of course, the key to all of these great benefits rests upon the premise that you have a well-built test system in the first place. When picking a systems integrator to design and construct a custom, all-in-one production tester, the lowest bid may not always yield the highest quality solution – and you might end up spending more money in the long run fixing unforeseen problems. Do your research to find the vendor with the technical expertise, reliability, and proven results you can count on to successfully complete the project at hand.

Case Study: Creating the Universal Alternator Test Platform

Ball Systems partnered with a Tier 1 automotive supplier to create a universal alternator tester, capable of evaluating more than 125 automotive alternators. Their existing setup was obsolete, and unfortunately its closed architecture made it impossible to update to keep up with new alternators and technology advancements.

Ball Systems created a flexible, scalable all-in-one test platform capable of validating more than 125 different types of light- and heavy-duty alternators at test times of less than 30 seconds each.

We sat down with their team to evaluate the wide spectrum of products they needed to test and discuss the system requirements. In order to verify alternator functionality and get a clean bill of health from manufacturing defects, the machine needed to test for shorts, opens, speed, torque, and many other parameters. During the test, the alternator would be spun up to multiple different speeds, and various electrical signals would be measured and given a pass/fail depending on whether those values fell within acceptable ranges. Some of the more advanced alternators required additional LIN and CAN communication during the test, which was also included in the tester functionality.

By leveraging our vast experiences with other customers and projects, we designed and developed the concept to best implement their objectives. This meant taking into consideration not only the technical specifications, but also their most important issues and pain points, such as floor space, test time, ease of changeover, capital equipment cost, and usability. In the end, we successfully accomplished their goals and delivered a universal alternator test platform capable of speeds up to 18,000 RPM and testing alternator outputs up to 500A. It also met each of our key criteria:

OPENNESS: All source code was provided, and their own engineers had the ability to modify any test sequences as needed.

FLEXIBILITY AND SCALABILITY: Unlike the custom PCBs used previously, we built our platform on COTS technology – such as NI PXI data acquisition and control hardware, NI LabVIEW and TestStand software, the drive motor, DC load, and power supplies. This made the parts easy to swap out for replacement and upgrades in the future.

TIME AND COST SAVINGS: Overall test time was reduced to less than 30 seconds per device under test (DUT). Plus, we installed a universal mounting and fixturing unit to speed up the DUT changeover process. The platform was much easier to repair and maintain, and the optimized user interface and wireless barcode scanner increased operator productivity.

SIMPLIFY YOUR FLOOR SPACE WITH A UNIVERSAL PRODUCT TESTER

Don’t let an overwhelming heap of outdated test machinery bring your manufacturing floor to a halt. Get an extra set of eyes from a test-industry expert like Ball Systems to help you figure out what your best options are, whether it means updating and consolidating existing machinery, or creating a new test solution from the ground up. Think of us as a nimble extension of your engineering team that comes with deep expertise in building reliable test systems, the ability to solve your toughest technical challenges, and who will get you up and running quickly, with minimal process overhead.

We’ve worked together with many customers to build custom universal manufacturing testers that increased their productivity, product quality, and their overall bottom line, and we can do the same for your business, too. For a free consultation to see if an all-in-one production test platform is right for you, speak with one of our veteran engineers today. Contact us today to see if we can help you simplify your manufacturing floor.

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