



Case Study: Inspect Software Takes On Mission-Critical Challenges at DRS Laurel Technologies



The Bradley M2/M3 A3 Fighting Vehicle

Refurbishing any modern vehicle can be a daunting task. It becomes all the more so when the vehicle is a Bradley Fighting Vehicle, designed to take America's finest into harm's way. Yet this is the very challenge facing United States Department of Defense (DOD) manufacturer DRS Laurel Technologies in Johnstown, Pennsylvania, a division of DRS Technologies.

The Challenge

A long-time business partner and major defense contractor asked DRS Laurel Technologies to become an active partner in the DOD Bradley RESET program. The program's mission is to refurbish and return Bradley Fighting Vehicles to active service in Iraq and Afghanistan. Under this arrangement

DRS Laurel Technologies is responsible for inspecting, repairing and certifying over 100 different cables (wiring harnesses) located throughout the hull and turret of each vehicle. These wiring harnesses support a host of systems including engine and vehicle controls, vision enhancement, target acquisition, battlefield position and tactical information.

Some of the specific challenges include:

- Eliminating communications breakdown with the factory floor, especially for special customer requests.
- Accounting for and reconciling reassigned parts.
- Accurately identifying parts that need repair.
- Tracking repair information (what was repaired, or not repaired, who made the repair, when and where).
- Meeting the customer requirements that the cables be packed in a specific order, in specific boxes, and subsequently being able to locate the box that contains the specific cable.
- Providing instructions to maintain revision levels.
- Providing instructions for dealing with defects found on specific mission critical cables, or on cables that are too inexpensive to repair (and should be scrapped).
- Providing tracking information that details from which vehicles cables were taken to ships complete sets.

The Inspect Software Solution

To meet the data-intensive challenges required by the RESET program, DRS Laurel Technologies implemented ASI DataMyte Inspect visual inspection software.

"The system provides a major improvement in communication," said Bob Sewalish, DRS Laurel Technologies quality engineer. "There is no question about what needs to be done. It's not like somebody putting a tag on a cable that says, 'Do this list of things,' then having the tagged cable go down to the repair area, only to have the repair person ask, 'What did you mean by this? Where is that at? I cannot find this!' That does not happen. The communication part of the system is phenomenal."

At the heart of the system is a visual record for each cable processed. Here's how Inspect software is integrated into the wire harness refurbishment process.

Cable Prep. Cable prep begins with the initial vehicle teardown at business partner's location. Cables are removed from a vehicle and crated, with that vehicle's serial number assigned to each crate and then delivered to the DSE work area. The DSE team member prints out a complete set of labels based on the vehicle's serial number. Then the process of cleaning the harness and attaching the appropriate label to each cable begins. The cables are scanned to record the vehicle's serial and cable numbers, initiating the visual record for that specific part. (See Figure 1.)



Figure 1. Visual record is created

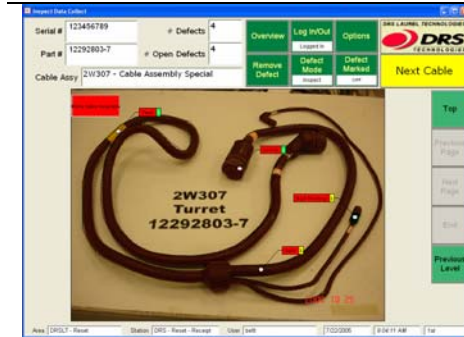


Figure 2. Red flags indicate repair locations.

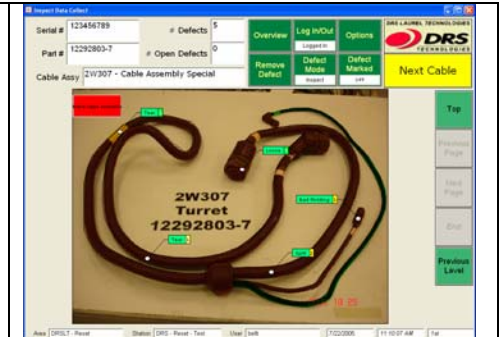


Figure 3. Green flags indicate finished repairs.

The data is transmitted to the DRS Laurel Technologies Johnstown facility server. The scanning process is repeated by recording the receipt, cleaning and shipping information for each cable. Any remaining unused labels are then scanned and recorded as not received. Prior to shipment, there is a complete reconciliation of all the cables for that specific vehicle. "If our partner says they delivered 98 cables to the DRS Laurel Technologies workstation, but we are only shipping 95, we need to account for those missing cables. The Inspect transactions record coupled with status and shipping reports, helps us do just that," Sewalish said.

Incoming Receiving & Inspection. The Johnstown receiving inspector opens the incoming container and scans each cable to display the visual record for the cable. The inspector uses this visual record to identify locations of needed repairs. The red markup flags indicate the repair needed at a specific location. (See Figure 2.)

Once the inspection is complete and the visual image marked up, the inspector places the cable in a tote for routing. Cables requiring no repair move to the electrical test area. Cables to be repaired or scrapped are routed accordingly. Scanning each cable confirms receipt and alerts the inspector if any unscheduled items are received. The inspector can also retrieve numerous reports to aid the reconciliation of the shipments between the partner's location and DRS Laurel Technologies' facilities.

Repair. Totes of inspected cables are routed to the desired station. Each cable is pulled from its tote and scanned to display the visual record. The team member makes the needed repair and notes the completion of the repair. Each green flag indicates a completed repair at that location. (See Figure 3.)



Repairs being made to a cable set.

"With the visual image everything is highlighted that needs repair. It's all pictorial. Team members can look at the picture and compare it to the physical cable in their hand and know what to do with it. When the repair is complete, they click on it and mark it 'repaired.' Now we know who repaired it and when it was repaired. It's all recorded on a simple pictorial," Sewalish added.

Functional Electrical Test. Once again the team member takes a cable from a tote and scans the cable to pull up the visual record for that specific unit. The cable is tested and results noted. Cables are then routed to final inspection.

Final Inspection. The inspector scans the cable, reviews both the visual record and the physical cable, and completes the inspection. If the item passes, it moves to the shipment prep area. If the cable fails, it is either scrapped or additional repairs are noted on the visual record. The cables to be repaired or scrapped are routed accordingly.

Shipment Prep & Shipping. Once the cable passes final inspection it goes on to a holding rack, so it can be packed with other cables that make up a complete kit. The customer requires that the cables be packed in a specific order, in specific boxes. Once delivered, each box will make its way to a set location on the customer's production floor and the cable will be used in a specific order.

"When we go to pack the boxes again, we scan the cables for serial and part number information and also wand in the box number into the system. If customer has a question about a cable, we can tell them the exact box we placed the cable in," Sewalish explains.

Meets Special Requirements

In summary, this sequence paints an overall picture of how DRS Laurel Technologies uses the Inspect system to manage the refurbishment process. As with most projects there are special concerns or requirements that need to be addressed. Sewalish throws additional light on how the software addresses these areas:

"DRS Laurel Technologies put together an entire quality document for this program with work instructions on how we will make repairs, taking into account that different areas require special considerations. With Inspect special work instructions are embedded right on the screen. Instead of having people search out and read a document, the things that are critical to a cable are right there on the screen. It's very visual and it's very simple. It tells you exactly what to do!"



Cable data is scanned to update information prior to shipping

Other Uses

Here are some examples of other ways Inspect has proven useful:

- Cables can go through multiple revisions because there is a lot of variation from vehicle to vehicle. For example, a cable could be from a one-year-old vehicle or it could be from a 10-year-old vehicle. DRS has to make repairs as needed and certify the cables are as good as new one and at the same revision level as new ones. In special cases, they take the old cable and move it up to the current rev level. Those instructions are simply embedded in the pictorial for those specific cables.
- There is also a class of cables considered "Mission Critical" where anything other than minor blemishes must not be repaired. Inspect identifies these cables with a message in red: "Other than cleaning and testing, if any problem - DO NOT REPAIR - Mission Critical – Scrap." A similar message appears for another class of cables that are so inexpensive to purchase that you cannot afford to repair them. The system gives us the ability to pull a scrap list and send it down to our customer. The customer has other programs where vehicles are being dismantled and scrapped. Sometimes needed cable can be salvaged from these vehicles, and if there are no cables to salvage, an order can be placed for new ones.
- Being able to reconcile shipments and product movement is critical to the success of this project. Inspect keeps an accounting for everything DRS Laurel Technologies gets on a specific vehicle and what has happened to it – if it was repaired; sent back on this vehicle or if it was scrapped. Nothing gets lost or goes unaccounted for.
- Inspect also gives DRS Laurel Technologies the opportunity to audit scrapped cables on a periodic basis. Records are reviewed to verify the cable has been recorded as scrapped and reviewed for any salvageable components. Once any needed components are salvaged, the remaining portion of the cable is scrapped.

Real-Time Quality Data

The system has over 70 reports that are viewable via any standard web browser. Reports such as these are just a few clicks away:

- Reports of repairs by rank and class for all cables or a specific cable
- Graphic Reports – Concern Spectrum which summarizes repairs visually
- Work load analysis by station
- Scrapped cable reports
- Reports to aid audit and reconciliation
- Vehicle Cable Kit Shipment reports

Benefits

The Inspect software proved a valuable tool for DRS Laurel Technologies' stakeholders, from managers to repair staff. It has also helps meet day-to-day challenges that arise. DRS Laurel Technologies' Project Manager, Andy Fitzgerald, offers a real world example:

"I just got a call this morning from my customer, explaining they were seeing some nicks in portions of the cable from time to time and it was causing the wiring harness to short out. They went on to ask if we can put some additional sheathing over a specific portion of a cable. Sure, we can do that, but how do I convey that to each team member who will come in contact with that harness? If my staff relies on their memory you know that at some future date the request will fall through the cracks. With Inspect my Quality Engineer places a simple instruction box on the graphic each team member sees. That change means the request for additional sheathing has a much better chance of being done every time! And we have a happy customer.

"Inspect is a communication tool, not only to aid recording the incoming and final inspection, but also to allow repair personnel to click and confirm a specific repair is complete all the while using a simple graphic to communicate this information," Fitzgerald adds

DRS Laurel Technologies sees a bright future for the Inspect program and currently is investigating other possible applications for refurbishing programs and new production programs at the Johnstown facility.