Service Repair Time Database and 41% cost savings from digital labour times and digital service manual creation

Summary

CAD-IT's Service Repair Times Database (SRTD) solution supports a 'digital authoring' methodology for service manuals. This strategy allows a single author to act as the originator for the repair method, the associated labour time, and the associated text and illustrations for the repair. These can be created and published by the author working from CAD and without reference to a prototype or production model. CAD-IT's 'digital authoring' methodology transforms processes for the creation of service repair manuals and labour times, and cost savings for service manual authoring to the order of 40% are a reasonable expectation.

SRTD includes extensive configuration management capabilities so that product content and associated labour time information can be derived for a particular product model intuitively and without complication. SRTD also supports Simplified Technical English and, used together with Cortona 3D RapidManual, facilitates the combined creation of 3D interactive service manual information and labour times, reusable for the time-effective creation of related training content in Cortona 3D RapidLearning.

Introduction

CADCAMCAE has been used by automotive manufacturers for decades to design their products. From component design, the application has spread from component engineers across to crash teams who virtually simulate impacts, to manufacturing, who build the cars on a virtual production line to make sure the build process is ergonomically sound.

Digital Authoring at Jaguar Land Rover

In 2006, working with CAD-IT, Jaguar Land Rover Service Operations began to explore the possibility of using synthetic algorithms (similar to MTM, MODAPTS or MEKBY) to predict labour times for a service method derived from the 3D CAD environment rather than a physical vehicle. These times are used to regulate warranty payments to dealers for in-warranty repairs. With prototype vehicles (traditionally used to create technical literature) costing upwards of US$150,000 the potential to save money was huge.

CAD-IT engineers were brought into the Jaguar Land Rover technical publications team to run a pilot on the Freelander 2 workshop manual. Working alongside the authoring team, over 700 digitally-derived procedures and warranty times were created at the same time as the traditionally authored work. The only equipment required by the CAD-IT team was a CAD station, unlike the rest of the authoring team, who needed two prototype vehicles (diesel and petrol variants), vehicle lifts, a dedicated illustrator and digital camera to photograph each step of the repair process, a full suite of workshop tools and a computer each to write up the method.

Initial Results

An immediate benefit was that all of the images used in the Workshop Manual were produced directly from the CAD data. Therefore there was no need for a digital camera or a dedicated illustrator. Authors simply took snapshots of the CAD data as they were working, and at the end of each study annotated the images.

There were also significant benefits in relation to the use of prototype vehicles. Although physical verification is still necessary for some procedures, digital methods reduce the reliance on prototype vehicles, freeing up workshop space and also guaranteeing that the latest data is being used for analysis. By planning the authoring of procedures effectively, the studies that do require physical verification can be scheduled at the end of the design and test cycle, when the vehicles are more readily available, and much cheaper.

The Freelander 2 work also demonstrated that projects can be completed in a significantly shorter timescale. When using prototypes to develop workshop manual procedures, only two authors can work on a vehicle at any one time, so jobs are effectively queued until other procedures are developed. In relation to this, another benefit is that every variant of a vehicle can be analysed, so trim level, hand-of-drive, fuel type, transmission and market specific models can all be checked for differences, simply by loading different sets of digital data. A team working with the support of CAD data can be as large as required, hence reducing the lead time for the production of the workshop manual.

Dependable Digital Labour Times

The labour times created using the CAD-IT 'digital' methodology were also shown to be fully reliable. The comparison of the digitally-derived methods against those produced using the physical prototypes showed a highest deviation of 7%, with an average deviation of less than 1%. This sort of deviation would be expected if two authors carried out the same procedure on a vehicle, hence proving that digital methods were accurate enough to play a major role in all future Jaguar Land Rover Workshop Manuals. This method, devised by CAD-IT, has been used on all subsequent Jaguar Land Rove vehicle programmes, and led to significant success foe Jaguar's ground-breaking XF model by ensuring the early delivery of the vehicle's portfolio of insurance data, directly contributing to this vehicle's best-in-class insurance rating.

Aston Martin Lagonda

CAD-IT took the 'digital service manual' a step further with Aston Martin Lagonda in 2009. Here CAD-IT were tasked with updating the V12 Vantage and DBS Volante service manuals.

Using a refined digital method a team of four authors were able to create over 550 procedures and 2,500 graphics in just three months. This success made CAD-IT the logical team to support Aston Martin's delivery of the service manual for the World's most elegant four-door sports car, the Aston Martin Rapide, **this time going much further than before by authoring the manual for the entire vehicle from digital data only**: with the manufacturing of the car happening over a thousand miles away in Graz, Austria, there was no opportunity to reference prototypes.

Service Repair Times Database

These engagements with Aston Martin also required a tool to compose and disseminate the data for service manuals. The solution needed to deliver publishable procedures, compile digital labour times and integrate labour time data information in a way that accounted for times varying by vehicle configuration, and to include quality assurance features and export capabilities to a various formats. Because the subject matter experts were the CAD-IT team, the processes and know-how deployed at the client were all readily available and documented for USE* IT developers to work with. The implemented solution, Service Repair Times Database (SRTD) provided four key elements:

- an authoring Interface that allows users to create granular service procedures, adding new procedures and procedural steps, and including already-written procedures as sub-procedures within a service repair operation. Authors can upload images to support the steps in the procedures, can nominate vehicle variants specific to one procedure or another, and add admonitions and notes to any given procedural step.

    Labour time can be attributed to each element either as 'hard' stopwatch times, or using synthetic coding for work actions such as MODAPTS, MTM, DBA or MEKBY. The system features an

advanced calculation engine that sums up the procedure time, and also adds time for included procedures. The information can be exported in either XML or Excel format, to load into a customer warranty system or use to create reports;

- because quality is key to success, SRTD has built-in tools to assist in the quality assurance process. A given user role can review written procedures and provide feedback to the authors. The feedback guides the author to where he or she needs to make a correction in the system, so that quickly he or she can quickly pick up any quality issue and resolve it;

- SRTD provides a browsing interface allowing any viewer anywhere to access all service repair procedures including images and all relevant information. This can also be embedded in other CAD-IT or client portal interfaces such as e-Portal. The browser includes a series of useful and informative innovations. For example, an, 'Is Used On', function clearly shows where any given service repair operation is included as a sub-procedure;

- in order for SRTD Portal to play a full part of any customer organisation, an inbuilt export function was deemed to be key for ensuring interoperability with other processes and systems. SRTD is built to export all of its data content into native HTML that can be deployed on any web server or printed to a CD/DVD media. It can also export procedures as PDF masters for printing to paper manuals. More important is the extensible support for XML, which can be fully customised to support any given DTD or XML schema such as DITA.

As with the previous projects, SRTD was used to construct the Rapide's 909 service manual procedures and 3,000 or so related images.

Aston Martin's '100% digital' service manual and its benefits

Support from CAD-IT has enabled Aston Martin to be among the global leaders in technical publications innovation, publishing a service manual and associated labour times with near zero dependence upon prototype or pre-production cars. With every warranty time supported by an efficiently-created workshop manual procedure, Aston Martin dealers are expected to increase their rate of Right First Time fixes.

On average at Aston Martin less than two hours authoring time was spent on each workshop manual procedure, including the composition of the repair method, the calculation of its labour time, and the creation of complementary text and graphical documentation elements. Across a range of customers where CAD-IT have deployed these 'digital authoring' methods cost savings for service manual authoring have typically amounted to 41%.

SRTD and Cortona 3D RapidAuthor

Another innovation in SRTD is to author all of the procedures in Simplified Technical English, an aerospace industry standard.

Going forward this means that technical repair instructions authored in SRTD can be read in Cortona 3D RapidManual to automatically generate 3D interactive service manuals. This content will in turn form a basis to deliver further cost savings and repair quality improvements through the reapplication of service manual data to support training materials delivery in Cortona 3D RapidLearning.

Since the simplified Technical English content in SRTD also forms the basis of synthetic repair time information, SRTD can also integrate repair time data with interactive 3D content available via SRTD browser, e-Portal, or exported to a client portal. Conversely, repair times can also be integrated into 3D interactive service manual content, and, as today, can be provided in any number of additional requisite formats to support MRO and warranty processing.