GROUND SUPPORT Magazine

Surprising Support For Luggage Tractors

A highly modified Ford 4.9L hydrogen fueled engine is bridging the gap between today's needs and tomorrow's.

By Tom Daly

THE ORIGIN OF THE PROBLEM

It raised its head in mid-2004, when a number of airline maintenance shops were surprised to find that an old mainstay of the luggage tractor business, the Ford F300 inline six cylinder engine, was no longer available. The engine had actually been discontinued eight years earlier, but as is common in the automotive engine business, Ford had put more than 40,000 F300s in inventory for future needs. In June of 2004, the last had shipped out of Ford's warehouse.

The search for an alternative did not have much urgency because of the decline in airline traffic and revenues. After all, much of the tractor fleet was sitting idle. Tractors with run-out engines were parked, and others used. The large inventory in Ford's warehouse also lulled many who would have otherwise been alarmed, but the supply was finite and the time for concern had arrived.

A few shops tried a conversion to Ford's 4.2 liter V-6 which bolts directly to the same C-6 transmission. These conversions were only marginally successful. The V-6 is wider and the conversion is labor intensive, requiring extensive sheet metal modifications (keeping in mind that some of this "sheet metal" is as much as an inch thick). Routine maintenance is awkward, at best. One has to recognize that the industry standard luggage tractor was built around a single engine/transmission combination. Many discussions were had with Ford personnel, but the decision to discontinue the engine was not to be reversed and the tooling for the engine would not be made available to third parties.

Airlines have had a life cycle issue with the tractor for many years. The engines wear out long before the tractor frame and body. Over the life of a tractor, its estimated that the engine might be replaced as many as six times. The tractors may idle for hours, and heads are known to crack in about 20 percent of cases.

ANOTHER INDUSTRIAL CONCERN NOTED THE PROBLEM

Shortly after the last engine shipped, a little known company introduced a hydrogen fueled 4.9 liter engine. The engine was based on the same F300 block used by tractors, but everything else was different. HEC picked the engine because the sturdy block could absorb the sharp power spike delivered by hydrogen combustion. The engine was machined to much tighter tolerances and used .030-in oversized pistons and very tight oil control.

Now, it seemed that the airlines and HEC had a common problem. No longer could they obtain new F300 engines.

Different than most replacement engines, this HEC model to replace Ford F300, ships with complete sheet metal, including a center-sump oil pan, a high flow water pump and a v-belt front dampner.

With millions of the engines in use, remanufacturing them seemed to be the obvious choice, but the option had drawbacks. Entering the Hydrogen Age dependent on a steadily declining supply of old engines which could only be rebuilt so many times seemed too risky. Fortunately, HEC was already in the engine re-design business.

It was a short trip to the design table to see what would be necessary to guarantee a supply of critical parts. Most parts were relatively easy to source, but heads and blocks were a challenge. HEC had already forged a relationship with a supplier who agreed to cast new 4.9L (F300) heads modified to eliminate known issues. The head was heavier, but only in automotive and airborne

applications are engine weights of serious concern.

DISTRIBUTORS ASK FOR HELP

About this time, the industrial engine distribution chain became aware of HEC's developments and began asking if the company had any interest in supplying gasoline fueled engines for luggage tractors. In reply, HEC delivered an engine in three weeks, asking if this was what was needed. To no one's surprise, there were a few differences in engines, but all were easily remedied. Instead of fuel injected engines, they needed to be normally aspirated. Rear sump pans gave way to center sump pans (and dipsticks). Provision had to be made for a gasoline mechanical fuel pump because HEC's initial dry-fuel design did not need one. Lastly, the damper had to be changed from serpentine to v-belt. Very little else needed changing.

Arrangements are now complete to obtain new engine blocks that have been upgraded for industrial applications such as luggage tractors. Acceptance and durability testing is about to begin and HEC expects to be shipping engines with the new blocks by late January 2006. Engine sheet metal sourcing was no problem. Until the new blocks arrive and 100 percent new engines can be sold, the company will remanufacture to the new tighter specs using new components such as cams, rods, pistons, valves, etc. These remanufactured engines can be equipped with new heads if the buyer chooses.

The obvious benefit for the airlines is that they now have a source of engines that exactly fits the luggage tractors in inventory. There are no conversion costs to squeeze maintenance budgets and no training is needed for their maintenance teams. During the redesign, HEC eliminated the few remaining durability and performance issues of the F300. The new engines are marketed under the name "OXX Power."

WHY NO ONE PICKED UP THE BALL

In retrospect it seemed odd that no industrial supplier of gasoline engines emerged in years past, unlike their diesel counterparts. A short trip down history lane provided some insight. The majority of the engines used at an airport for applications like luggage tractors, de-icing equipment, baggage loaders and pickup trucks all had their origin as automotive engines. As such, the manufacturers of those engines kept their priorities aligned with their automotive mandates. Parts and engine availability took second seat to car manufacture.

It is no secret that automakers estimate it takes $1 billion to tool up a new engine. So, it would take an enormous market to justify such an investment and industrial applications are rarely of a size to warrant the effort. It would take the fledgling Hydrogen Age to do that. With the promise of huge potential, HEC was founded to design an engine that was pollution-free and able to wring performance from hydrogen fuel.

MAKING THE FUTURE, TODAY

What is surprising is how this development would support tractors. Pollution-free concepts are not new. A little more than 10 years ago, fuel cell companies promised a clean energy solution for GSE (now 10 years away), and battery powered tractors have also grown in popularity despite long recharge times and questions about battery disposal. Recent announcements from auto companies would have you believe that their hydrogen- fueled vehicles are around the corner.

There are several factors that will delay engine availability from these sources. First, there is a long approval process for anything new at auto manufacturers. Experts estimate it will be 4–8 years before such vehicles may be purchased even though the auto company may have an engine design today. Engine testing of current designs, supplier selection, production design, more engine testing, vehicle integration and vehicle-engine testing all must be done before it is possible to offer it to the public. After the mad rush for these vehicles is over, or production surpasses demand, engines may be made available for industrial applications like GSE.

A SURPRISE IN RESULTS

This is where HEC can help move ground support equipment from being a lagging adopter of this technology to leading the way. Since HEC's original design was for an engine that used hydrogen as a fuel, they realized they could configure an engine that would easily convert from gasoline to hydrogen. This they have done. A standard F300 for GSE application is normally aspirated — and HEC does offer it. The reconfigurable design is fuel injected. Not only will the fuel injected engine produce fewer pollutants than the normally aspirated, it can be converted to use hydrogen by changing the fueling system. As soon as hydrogen is available at the airport (and airport operations knows which airports are targeted), those luggage tractors that have HEC reconfigurable engines can be changed over on-site. The reconfigurable engine is only slightly more expensive than the standard engine, which makes it attractive. For those applications wanting to use liquid propane and other alternative dry fuels in the interim, the HEC design accommodates them with minimal complication compared to other LP proposed solutions that have not been workable.

Not only is there surprising support for luggage tractors, there is also a bright clean future for them.

The HEC 4.9 liter can be installed on airport vehicles because it's the identical engine, with the same form-factor and bolt pattern as the original.

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