Waterloo Technical Society Minutes

February 12, 2014 Meeting

The February 12, 2014 WTS meeting was called to order by acting Vice President Jim Stevenson at 7:15 pm.

Three members introduced their guests. A total of 23 were in attendance. Three past presidents were recognized. Also three members with more than 50 years of membership were in attendance and were recognized for their attendance and longevity

Treasurer Ken Friend reported a previous balance of $965.61, three memberships and interest income of $30.12 and expenses of $65.00 resulting in a new balance of $930.73. We now have 10 honorary and 49 regular for a total of 59 members. Ken does a remarkable job of keeping our money and records straight.

There was no additional old business. No new business was introduced by the stoic members present.

Our guest speakers were Randy C. Rush and Dr. Adam J. Shuttleworth, both from the John Deere Product Engineering Center, Waterloo, Iowa. Their presentation was on the 7R series tractor with Final Tier IV engine emission, introduced to the market just weeks earlier.

The first R series tractor was the Waterloo Boy Model R produced in 1914 with 12 horsepower and sold for $835. Today's 7R tractor has 210 to 290 horsepower and sells for $220,000 to $250,000.

Tractors still have to fit within 1914 row spacings, so the power density has increased to keep up with customer needs. To meet the 90% particulate and 80% NOx (nitrous oxides) and HC (hydrocarbons) reductions legislated for Tier IV emissions, changes to the intake and exhaust gas systems on engines had to be fitted within the same tractor volume. This was accomplished by changes in design methodology, using computer simulations, and adding post-combustion gas treatment. Diesel Exhaust Fluid (DEF) (32.5% urea and 67.5% water) is used to treat the exhaust gases to comply with EPA Tier IV regulations.

Transmission options were introduced to improve performance while saving fuel. The total fuel plus DEF consumption was maintained at the fuel consumption level of the Tier III tractors. The e23 transmission is mechanically more fuel efficient than the Infinitely Variable Transmission (IVT) which has a hydrostatic module that consumes some power. The e23 has 23 speeds forward and 11 in reverse. With computer assisted monitoring the tractor with e23 transmissions are able to shift seamlessly under varying load conditions.

Other changes to the tractor were requested by customers, converted to specification, and used to attract sales. These changes included increased horsepower, laminated glass to reduce noise, seat swiveling up to 40 degrees to watch implements, and LED lighting to enable longer field-work hours.

Major changes were made to the Command Arm to simplify operator controls and add a 10 inch touch screen for set-up and operator monitoring.

The program was three years from scope to product in customer hands. This was accomplished by using computer modeling. Modeling programs like KULI for heat balancing and FAST for system interactions enabled the design team to virtually change configurations and then verify in test cells. Topology, using computer modeling to meet stress targets within a specified design volume, enables a minimum size configuration to meet design needs. From this basic configuration, manufacturing engineers develop processes to make a feasible part. This methodology saves time, money and revision costs. Some of the modeling programs take days to converge on a solution, but the results speak for themselves.

Many questions were asked about all aspects of the new tractor, engine design, transmission efficiency, control technology, operator comfort, computer modeling and design methods. Many favorable comments were made by members who really enjoyed the presentation by Randy and Adam.

Meeting adjourned at 8:45 pm.

Respectfully submitted,

Jim Stevenson