Waterloo Technical Society Minutes

April 9, 2014 Meeting

The April 9, 2014 Waterloo Technical Society (WTS) meeting was called to order by President Gary Dorhout at 7:10 pm.

A total of 48 were in attendance which included 8 guests. Treasurer Ken Friend reported a previous balance of $900.84 with income of $0.12 from interest, $30.00 from memberships and expenses of two speaker meals totaling $30.00 leaving a new balance of $900.96. Membership rose by 3 with 10 honorary plus 52 regular members for a total of 62 members.

No old business was discussed.

New business. David Greene, former WTS President and currently Grout Museum board member, requested that the WTS support a traveling exhibit organized by the Rothschild Patent Model Collection organization. The exhibit has models submitted with patents for some early inventions. Beginning with the original Patent Act of 1790, an inventor was required to submit an actual working model of his invention. Patent models were to be no more than 12 inches square, with paperwork and diagrams explaining the item's purpose, construction and operation. Models were required until the late 1880s when, primarily because of space considerations, it was deemed unnecessary.

The brochure lists 58 articles and patents. Among those listed are napkin holders, washing machine, clothes pounder, clothes drier, sewing machines, cradle improvements, improved swing, traveling trunk, life boats, earth scrapers, platform scales, pipe wrenches, bread toaster, suspenders improvement, manufacture of wall paper, bullet improvements and breech-loading fire arms.

President Dorhout asked the membership to consider a $250 donation to the Grout Museum to support the exhibit. Discussion and vote are to occur at the May 2014 meeting.

Our guest speakers were Todd Whiting, Pete Williams and Ray Thompson. Their topic was Drag Racing Technology.

Todd Whiting opened his presentation with a check for $100 to challenge WTS to recruit 10 new members who may not join if a membership were to be required. This would represent almost a 20% increase in paid members were this to be successful (10/52).

Todd introduced John Day who in 1955 at age 18 was the first to race his car at Waterloo Tunis Speedway. The speedway was remembered by many of the members. It closed sometime in the early 1980s. There are now three raceways in northeast Iowa. Cedar Falls Raceway (1965), Tri-State in Earlville, and the Eddyville Raceway.

A drag race is defined as two vehicles, at a standing start, racing over a measured distance. The purse is awarded after the final pair of vehicles race. Winners of each round advance to the next round until

only two vehicles are left in the final round to determine the winner. The Alabama race is so popular that there are 9 rounds needed to determine the winner. The purse is $100,000 or more.

No one really knows the origin of the name "Drag Race" but it is believed to be a derivative of the expression "racing down the main drag" which is the primary street traveled in a town. The first drag strip was created in 1950 in Santa Ana, CA with a $1,000 investment. Two major organizations regulate the sport: NHRA and IHRA. The National Hot Rod Association (NHRA), formed in April 1953 in Pomona, CA followed by the International Hot Rod Association (IHRA) in 1970 as the sport grew. There are many other groups today; American Drag Racing League (ADRL), Outlaw, Nostalgia Drag Racing League (NDRL), and Western Fuel Altereds (WFA) to name a few. Automobiles were the first vehicles to race, but now the sport also includes drag boats and snowmobiles. The Prince of Qatar is racing and promoting the sport in his country. With his wealth from petroleum funding his interest and his prestige as a Prince, the sport is very popular in Qatar and its region.

The NHRA has two major levels: Professional and Sportsman. The Professional level is further broken into four classes with corporate sponsors. Twenty-four races are held in 21 cities in the USA each year. The format is heads up start two. This means that the vehicles start from the same location, two at a time. The Sportsman level has 200 classes, no sponsors at hundreds of locations around the country. It uses a handicap system so the slower car is spotted a distance from the start that is proportional to the handicap. Races finish very close to a tie, so the first vehicle to break an infrared beam is determined the winner.

Pete Williams introduced himself as a kid to racing. He was running a machine at John Deere and heard that a popular racer was looking for a mechanic. He left his job and went to California to join the race team. He wasn't worried about money because he was having too much fun. Pete was a real adventurer and still has that spirit in his speech. Pete described the "funny car" vehicle. In order to reduce time through improved vehicle performance, the rear axle on a stock car was moved forward, putting it just rear of the driver's seat. Exhaust was piped vertically to add downward force to the axle.

Speed is achieved by providing horsepower from engines to light-weight chassis. The horsepower is achieved by rapidly supplying fuel under pressure to the engine cylinder then igniting this fuel and repeating the cycle as fast as possible. Races last just seconds. A funny car will burn 30 gal/min when racing. To get this flow, fuel is introduced under boosted pressure to an annular ring in the venturi just above the spark in the cylinder. Pete worked to provide this inventive method. Prior to his locating the fuel ring above the spark the engines would experience burnout when the fuel drowned the spark causing the cylinder to freeze and destroy the engine. Pete also worked on other innovations in his 50+ years in the sport. Gasoline was replaced with nitromethane up to 90% of the fuel with methanol comprising the other 10%. To get fuel to burn takes air. Gasoline requires 14.7 parts of air per 1 part fuel; methanol 6.5, and nitro only 1.7. Nitromethane fuel costs $18.00 per gallon and funny cars use 10 gallons per run. The funny car engine can be no larger than 500 cubic inches, a size fixed over 30 years ago. Today these engines provide 7000 Hp at 7500 rpm using 60 psi fuel boost pressure and emit 150 decibels of noise. An engine in 1970 cost $5,000; today it's $100,000. To make a small fortune in drag racing start with a very large fortune.

With all the power and rotation of the rear wheels it is hard to keep the front wheels on the ground (Newton's second law) so Pete's team pioneered the placement of the exhaust to move some of the pipes forward behind the front wheels and the pipes bent upward. With this vectored exhaust up to 1000 lbs. of downward force could be generated. This resulted in greater traction for the rear wheels.

Ray Thompson contrasted dragster and tractor designs. Many design considerations are the same. For instance, both vehicles want horsepower to provide traction. Both require safety as the primary concern, both for operators as well as those nearby. Both want to achieve high levels of reliability and consistency. Some problems the dragster encounters are:

- Engine starting: high compression ratios (14:1) result in slow cranking speeds increasing starting time.
- Kick back: this occurs when the engine wants to run backward. Timing is critical
- Traction: vertical force needs to be applied to the drive axle through the tires to the surface
- Tire shake: a behavior of a tire under heavy load with high torque resulting in the tire wall deforming and the vehicle gripping and releasing or the vehicle shaking. Ray showed a video of tires deforming when starting the race. Tractor tires deform in a similar manner when pulling a heavy load.
- Power: horsepower cannot be measured directly, so it is calculated from these formulas, each specific to the vehicle, tractor or dragster.

$$HP_{Tractor} = \frac{Drawbar\ Pull\ x\ Speed}{375}$$

$$HP_{Dragster} = \frac{Speed^3}{234} x\ Weight$$

- Power is computed by measuring the rotational speed of the driveshaft and its torque by measuring the strain on the shaft while it rotates.
- Unique to dragsters are the wheelie bars that limit the rotation of the vehicle when starting the race. Using high-speed video Ray was able to demonstrate how wheelie bars pulse the rear axle during the race. This increases travel time resulting in lost races.

Ray walked the audience through some graphical illustrations of measuring and recording these properties and explained how designs could be altered to improved racing performance.

Meeting adjourned at 8:35 pm followed by a tour of Todd's facility on Lincoln Street, Cedar Falls where members could view the technology first hand.

Respectfully submitted,

Jim Stevenson