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Eye on Electronics

The following are edited excerpts from an article written by Mike Dale, and were originally published in Motor Magazine.

A hotel I stayed at recently in Arizona coincidentally happened also to be hosting a meeting of Ford Model T owners. Looking at these cars, it was fascinating to see how far we've come technologically since they were being made. In the case of lighting systems, things today are very different than they were just ten short years ago. What's more, the pace of that change is picking up, with newer ways of lighting the road on the horizon.

As headlight systems go today, there are three major types—incandescent sealed beam, halogen bulb and high-intensity discharge (HID). A sealed beam works by passing an electrical current through a tungsten filament, heating it to the point where it gives off light (about 2300°C). At those temperatures, the filament, if exposed to the oxygen in the air, would quickly burn out. To prevent this, a sealed glass bulb is built around the filament and the air is pumped out. Then an inert gas such as argon is pumped back in to help transfer the heat of the filament to the housing. The light created by the heated filament is then reflected and concentrated by the mirror inside the glass housing so that the useful light winds up pointing where it's supposed to go.

While these bulbs worked well for a long time, there are design problems that make

them no longer suitable for use in today's cars. The first is that for the amount of light they put on the road, they consume a lot of power. Carmakers are already at or near the limit of what alternators can produce; and cannot afford inefficient bulbs. Another problem is that a sealed beam is heavy. The bulb is also wasteful of resources because every time you need to replace it, you throw away not only the bad element, but the reflector and shell, as well.

Probably the biggest knock against the standard sealed beam headlight is the combination of poor performance and styling limitations. There are estimates that as many as 30% of all nighttime crashes might be avoided if drivers had better visibility, especially in curves and on fog-bound highways. Conventional sealed beams perform poorly in foggy situations and do much better at lighting the road straight ahead than in a turn.

The first big improvement over the traditional sealed beam was the introduction of the halogen headlight. One thing to know is that halogen is not a single type of gas, but a class of gases. There are actually four elements in the periodic table with similar characteristics (chlorine, fluorine, bromine and iodine). Together they're called the halogens.

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