Executive Summary of the Centramatic dynamic wheel balancer fuel savings

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By: Steve Milliren, ESI

Introduction

Each year, more than 240 billion miles are logged by heavy semi-trucks in the United States. The freight and goods hauled by these trucks are a key component to our growing economy.

Most of these trucks and trailers are running on tires which are out of balance. The reason for this is two-fold, 1) the trucking companies prefer to keep the trucks rolling and not to take them out of service for balancing, and 2) the traditional method, **using weights attached to the wheel** for balancing a tire and wheel will not improve the overall wheel assembly balance as the brake assembly also contains imbalance which is not compensated for **using the traditional method** balancing process. It has not been deemed common practice due to these inefficiencies.

A proven and durable solution is available today from a Texas-based company known as Centramatic. Centramatic customers have reported fuel savings, as well as tire-life extension, and better road handling. While those benefits are each compelling, this report will focus only on fuel savings. It will explain in simple physics, why the savings occur, and how the well-balanced tires and wheel ends consume less fuel.

There is a category for “tire rolling resistance” in the EPA/Smart Way program, we will focus on the decreased rolling resistance of a well-balanced set of tires.

As the following charts show, the energy required to motivate a semi-truck with balanced tires is significantly less than one which has tires out of balance. As an example, a rig running at a 57.6 mph average speed will consume 2.11% less fuel than an identical rig that is running on imbalanced tires/wheel ends. Moreover, often there are temporary imbalances induced by ice, snow, mud, etc. Most consumers choose to keep their personal vehicle (car, pickup or SUV) tires balanced due to durability, safety and comfort, so it is a simple and well-known solution. The 2.11% fuel savings can be calculated and illustrated quite simply.

***Since the average long-haul driver logs about 2,170 hours per year, the energy equivalent annualized is easy to illustrate. The average truck consumes approximately 71.5 gallons per day, a 2.11% savings equals 1.5 gallons daily. That is roughly $5.00 every day. The annualized fuel savings is 406 gallons of fuel or about $1,312 per year, per truck. It is not just the savings in the cost of fuel, but the reduction of greenhouse gases. This reduction is directly proportional to the fuel savings. The emissions from 406 gallons of fuel, times the 3,522,485 Class 8 trucks on the the road equates to over 10,754,546 TONS of CO_2 not produced and harming our atmosphere. It also saves a noxious 294,934 lbs of CH_4 and 168,533,533 lbs of NO_2 not being released as well.**

But how does the Centramatic Balancing System do this? In short, **Less Rolling Resistance**.

The animations from ESI's SimulationX product show a side-by-side physics-based video of a balanced tire, verse an unbalanced tire. Clearly, the **Tire's Footprint** (tire in contact with road) is oscillating on the out of balanced tire, and the balanced tire has a constant **Foot Print**. The energy waste is partially heat from the sidewalls flexing, but also from the suspension dampeners heating up as they slow down the bouncing effect. Additionally, the **Tire Footprint** of an extremely out of balance tire can literally cycle between zero square inches of contact, to more than 128 square inches of contact as the masses push the tire back down to the road.

As the **Tire's Footprint** grows, so does the bulge in the forward section of the tire. The effect is the same as climbing a slight hill and even more energy is wasted.

The predictions that ESI had made match approximately with the fuel savings reported for years by Centramatic customers. There are other applications of the dynamic wheel balancer for RV's, pickup trucks, and even motorcycles.

After reading and understanding the attached technical report, it will become clear that rolling resistance is decreased using the dynamic wheel balancer. For this reason, the EPA/Smart Way Program would be serving its taxpayers well by adding a dynamic wheel balancing category as a section of Low Rolling Resistance.

* Figures based upon Fuel at $3.25/Gallon, 125,000 miles per year, 6.5 miles per gallon.
* For the purposes of this study, we will refer to tires, wheels, drums and all the rotating mass as wheel ends.