Implementing Load Cells in Truck for Increased Safety and Efficiency

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Abstract - *The paper addresses the need to include safety and fuel efficient measures in existing heavy vehicles (load carrying vehicles) with integration of Load cells, storage, GPS module, OBD and digital inclinometer. In the modern world, human mistakes sometimes lead to catastrophic events leading to loss of life and infrastructure. One such instance, sometimes intentional, is the overloading of vehicles. While sometimes the perpetrator gets away with it, more often than not this has led to accidents and loss of life. Through this paper, we want to bring in focus the importance of Load cells to curb the effects of such practices. Since policing is not possible at all stages of transport, the implementation of load cells is of utmost importance. Load cells can also be interfaced with ECU for theft control measures and increased fuel efficiency.*

Key Words: load cells, storage, GPS module, OBD, digital inclinometer, ECU.

1. INTRODUCTION

One of the most important characteristics of industrial revolution is the development of transportation services. It can be considered the most important factor that led to Industrial revolution. What initially started through railways soon progressed through water and road ways. With the advent of better roads and vehicular resources, road transport soon became more economical and viable for transportation to places that are out-of-reach to Railways. This form of transportation has enabled globalization. In the ever-developing world, the methods of transport are improving day by day, increasing the safety of goods and vehicles. One such concept in the evolution of safety of goods and the driver is implementation of Load Cells. Load cells not only ensure the safety of the vehicle, it can also help in enhancing the vehicle performance.

Fig – 1: Overloaded truck

2. SAFE LOADING

Every manufacturer prescribes a maximum load that a truck can carry and this is approved by the government transport department. Most of the times we see overloaded trucks on the road. To curb such practices, we can use load cells beneath the loading area to determine the loaded weight of the truck. These load cells have to be interfaced with the ECU of the truck. If the output of the load cell is well within the limits prescribed, then the ECU should allow the engine to start or vice-versa. A fool proof technology has to be developed such that if there is no output from the load cell in case of lost connection or deliberately cutting the connection for overloading, the ECU should not allow the engine to start. The output from the load cell has to be taken every 30 seconds so that the truck is not overloaded after starting the engine. In case the truck is overloaded after the start of the engine, the ECU has to send signals to fuel injectors to cut-off fuel injection. The output data from the load cell has to be stored in a memory storage device which can be accessed later. A robust and easy to install type of load cells has to be developed so that the load cell will have longer life time and will be easy to replace in case of any failure in the device.

3. THEFT CONTROL

We have seen cases of mishandling or theft of cargo in trucks. All the cargo that were loaded at the loading area would not reach the final destination. To identify the time of unload/theft, we can use the output data from load cell

which is stored in the memory storage every 30 seconds once. To know the place of theft, a GPS module has to be incorporated and its data stored so that we can know where exactly the truck was travelling at that point of time. This type of data can be retrieved by using an OBD device.

4. FUEL EFFICIENCY

The output from the load cell can also be used to regulate the output power from engine. When the truck is not loaded, we can reduce the power output from the engine by reducing the pressure developed in the combustion chamber. The fuel injectors can be calibrated with the load cell to vary the diesel spray which in turn varies the pressure developed in the combustion chamber. Better fuel efficiencies can be achieved and the cost of transport will also reduce.

4.1 Ascending up a slope with no load

Every manufacturing company designs its truck for certain hill climbing capacity. When the truck is not loaded, the power output from the engine may not be sufficient to ascend up the slopes. In such cases, we can use a digital inclinometer interfaced with an ECU so that the output from the digital inclinometer can be used to manipulate power output from the engine. The power output from the engine can be programmed to be maximum when the angle of inclination is higher and vice versa.
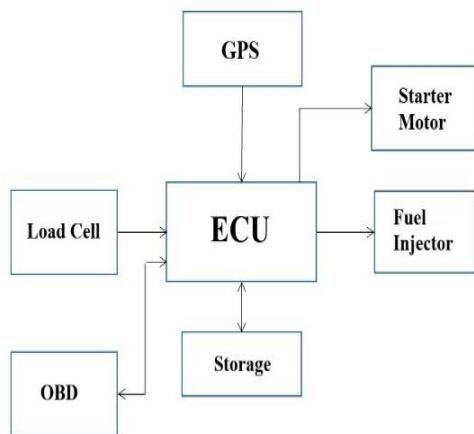

Fig- 2: Process diagram

5. CONCLUSIONS

The inclusion of Load Cells along with the proposed enhancements will not only increase the Safety Quotient, but also helps in keeping the system economical. Reduced and smart fuel injection increases the mileage capacity and reduces the fuel usage, anti-theft measures make sure the load is safe and. With more and more investments in the automation sector, these technologies will continue to improve over time and will result in less costing. There has to be a battery upgrade that should take into account the extra power required to run these installments. Once installed, the functioning of these devices is easy and can be understood even by a layman. The advent of Mechatronics has leapfrogged many aspects in Automobile Engineering and these inventions go a long way in enhancing the safety factor. It is more important now than ever to ensure safety of the goods and vehicle, and hence, these installments should be made mandatory across all load vehicles.

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