

# MACHINE INTELLIGENCE IN HEAVY DUTY MACHINES

How Machine Intelligence  
increases **reliability**,  
**safety** and **productivity** in  
the heavy duty industry

# MACHINE INTELLIGENCE IN HEAVY DUTY MACHINES

When your business relies on uninterrupted operation of specialised rigs, machines or vehicles, your top considerations are **reliability**, **safety**, and **productivity**. Reliability includes both operational and performance reliability. Operational reliability guarantees your machine is ready for use every day without downtime or unplanned costs while performance reliability guarantees your machine is operating as expected and can be trusted. Performance reliability enables the safety of assets and operators because you can expect your machines to function as designed.

## Human element in heavy duty industry

The human element in work sites remain a concern as the heavy-duty industry continues to struggle with the shortage of skilled operators. Relying only on work instructions provides a considerable amount of risk as these do not account for all working conditions experienced daily. Operators are required to improvise based on operator experience and skill level. The industry is adopting machine intelligence to tackle risk associated with human element at work sites.

Machine intelligence is the complete process that includes machines converting sensor data into structured information, processed by predefined machine programs that leads to machine learning, problem solving, decision making and action. Machine intelligence includes sensors for sensory data, on board computers or machine control units for processing these data and actuators for effecting the actions.

## Predefined machine programs increase safety at the work site

The predefined machine programs include set parameters that define safe and unsafe conditions of the machine. Therefore, allowing the machine to determine an unsafe state. The machine control unit on board the machine can make decisions and take actions independent of the operator when an unsafe condition is detected. This mitigates the risk of having unskilled labour operating complex machines in challenging environments.

The minimum requirement for machine intelligence is sensor data. Sensors determine the current state of the machine and monitor its environment. Sensors provide input to the machine control unit.

The concept of machine intelligence is common in multiple application spaces including construction, agricultural, forestry, platform lifts and warehousing. A forest and a warehouse may not have anything in common in terms of operating environments, but they have controls and safety parameters in relation to the function that the machine is trying to perform.

### BENEFITS FOR MACHINE INTELLIGENCE

Machine is ready for use without downtime or unplanned costs

Machine is operating as expected and can be trusted

Miniize risk of having uskilled labour operating machines

Logs & Performance Data

## Practical examples on how this can be done

### 1. Worklift in a warehouse

First, let’s consider a forklift vehicle in a warehouse environment. What do we know about the conditions to expect? The vehicle should only operate in the warehouse or go into the loading bay to load up the wagons for dispatch. Forklift loads are usually in different shapes and forms. Hence, the surface should be relatively smooth and even.

A sensor can be installed on the main chassis of the vehicle to monitor the inclination, mechanical shock and vibration of the vehicle. The raw data from the sensor is processed to determine if it is on an uneven or unsteady surface.

When such surfaces are detected, the machine control unit can make a decision to (1) send a warning message to the operator, (2) reduce the speed of the vehicle to prevent the load from falling off. This occurrence can be registered in the machine memory for event logs and performance data. This is potentially of benefit for owners of fleet rental vehicles. The operators of rentals may only be partially trained, or unskilled. If an accident occurs, the event log can be reviewed to determine if the vehicle was used inappropriately.

Maintaining the same theme of levelling and stability, another application where this is a key requirement is platform lifts and rigs. Using the same logic as the warehouse scenario, we want to know the operating condition and state of two parts simultaneously – namely the chassis and the raised platform. Knowing the position of one is a good start but knowing the position of both is much better.

Again, we can use the rental vehicle as an example of inexperienced operators using the rigs. To be able to activate the scissor extension, the first safety check would be from the chassis position to ensure it is located and stable on a flat surface. If it detects it is parked on an incline, the extension can be disabled. Should the

system clear the check and allow the platform to rise, a secondary detection device can monitor the tilt and stability of the platform for the operator by measuring any sway in 3D motion. These two sensors provide input directly to the machine control unit to keep it within safe working conditions irrespective of the operator’s skill level.

Not limited to safety benefits alone, the machine intelligence can be applied to improve productivity especially for repetitive tasks.

### 2. Excavator

Let’s consider an excavator this time. The chassis position and state is still the first measure for operator safety and comfort, but by integrating sensing elements to the extensions and points of articulation, we can accurately determine the bucket position relative to the chassis.

Knowing the exact position of the bucket, you can automate repetitive tasks such as bucket load and dump. It is also possible to restrict movements where precision is needed such as cutting a 15° slope. This allows an unskilled operator to perform a skilled operation.

Machine intelligence does not mean we lose the human element to these functions but complement it. By monitoring and controlling how the vehicles function, we offer a safer, more reliable and more efficient relationship with our vehicle.





# EG ELECTRONICS

**Business Unit Commercial Vehicles offer electro- and electromechanical components and solutions to OEM manufacturers and their sub-contractors globally.**

We distribute and source standard components as well as develop, assembly and qualify customized development of solutions from selected manufacturers. We have our own manufacturing unit in Sweden and Poland,

With our long experience, we take an active part in our customers business and propose a full concept as a solution and service, including for example product selection, sourcing, new developments, quality assurance, and worldwide customized logistics.

