# IPLOCA

# ANTI-COLLISION SYSTEM MAN/MACHINE

# SAIPEM

# 1    BUSINESS PROFILE

Saipem is an advanced technological and engineering platform for the design, construction and operation of safe and sustainable complex infrastructure and plants. Saipem has always been oriented towards technological innovation and is currently committed, alongside its clients, on the frontline of energy transition with increasingly digitalised tools, technologies and processes that were devised from the outset with environmental sustainability in mind. It is listed on the Milan stock exchange and operates in over 70 countries around the world with 32 thousand employees from 130 different nationalities.

# 2    FINDINGS

Forklifts are extensively used in our industry for material handling and are often operated in congested areas where other workers are simultaneously performing other tasks. Due to the characteristics of the equipment, the operators must deal with blind spots, obstructions limiting the visibility on the working area, environmental factors affecting driver's perception of the surroundings.

The administrative controls commonly required to manage the risks (e.g. use of flagmen, etc.), other than exposing additional personnel to the risks of mobile equipment, are inevitably subject to the human factor.

Following the lessons learned from past incidents, Saipem decided to implement a pilot project consisting in the installation of a non-tag based proximity warning systems able to identify, through artificial intelligence, different types of obstacles and measure related distances, transferring the information to the operators via monitor.

Forklifts and moving construction equipment are historically one of the main causes of fatalities in the energy industry.

Contractors have experienced serious accident in the recent years related to the use of forklifts which struck nearby workers due to the blind spots of the vehicle: the tower mast is always obstructing the visibility of the operator while moving forward, while the dimensions of the rear part of the equipment are affecting the visuals while moving backwards.

Considering the above, Saipem decided to scout the market to identify a suitable technological solution which could improve the situation awareness of heavy equipment operators.

# 3    SOLUTIONS

The available solutions in the market can be divided into two categories:

- tag-based systems, that use the RFID technology to identify the position of the workers equipped with a tag and returning the information to the operator. This solution offers a reliable pedestrian detection, but it is limited by the possession of a wearable. Since fabrication yards are commonly working on variable workload, with high turn-over of workers, and considering that it could be difficult to manage third parties, vendors, visitors, subcontractors accessing the site, it was decided to discard all the tag-based systems available on the market.

- non tag-based systems, that use cameras connected to data processing units which, through specific algorithms, are able to identify obstacles and to distinguish between the human shape and other objects. In this case wearables are not required and the system would be ready to be used shortly after the first installation.

## 4  IMPLEMENTATION

The second solution was selected and implemented on all the forklifts handling loads heavier than 30 t (which are having the biggest dimensions) used in one of the saipem worksite.

The purpose was to improve the situation awareness of the drivers, integrating the current safety practices that will be still fully enforced while operating heavy equipment.

The system is composed of one or more stereoscopic sensor heads (cameras), a processing unit and monitors/alarms. It is not directly interfaced with the command or control devices of the machinery.

The monitor installed in the control cabin is able to display in real time the position of the obstacles with respect to the vehicle. It shows the image of the surrounding environment and turns red when it encounters an obstacle.

A triangle would appear on the screen and an audible alarm would be triggered when the system recognizes a worker nearby the vehicle instead of a static obstacle.

The detection area can be customized based on the specific needs of the worksite, and it is generally composed of two separate sub-zones:

- An "obstacle" zone, where any obstacle, pedestrian or not, triggers an alarm

- A "pedestrian" zone, where only pedestrians trigger an alarm.

This separation is expected to reduce the 'nuisance' from alarms that could impair the effectiveness of the detection: constant warnings are likely to be ignored by the operators and could possibly cause mental fatigue and loss of concentration.

Being a system based on detection sensors and artificial intelligence, it could be subject to particular limitations. For example, it could not be able to detect personnel in squatting or laying position, or specific objects such as gas cylinders and poles may cause false detections. The purpose of the pilot project was also to verify the reliability of the system in the specific operating conditions.
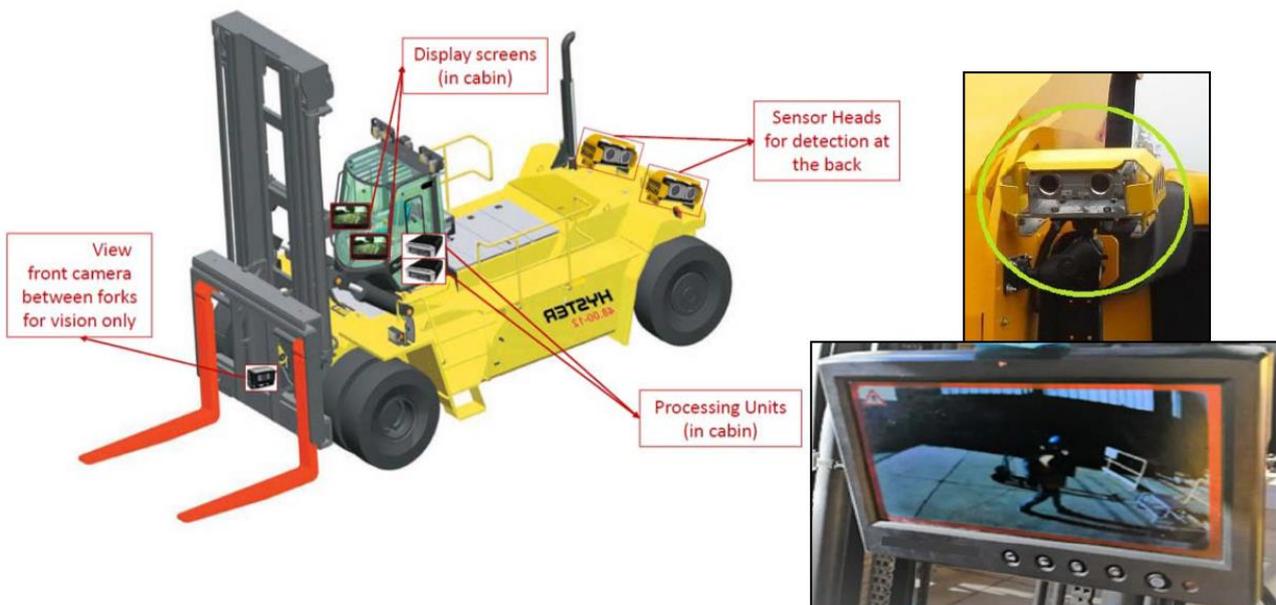


Several familiarization and training sessions were planned with the support of the vendor which helped for a smooth implementation of this solution.

## 5    ACHIEVEMENTS

The pilot test was successfully completed, and site management, employees and clients appreciated the solution. The support of the vendor was essential for the implementation on the site.

## 6    LONG TERM PLANNING

The result of this test pilot done in one of the Saipem Yard was positive and the implementation of the anticollision man – machine system is planned to be implemented in other worksites for the upcoming years. The installation of the system will be based on a risk analysis.