

Smart Monitoring

In order to help industries producing high quality products at low cost, FGM Smart Monitoring System is designed. This system is used to help managers to make decisions at the both small and large scales by automatically identifying objects, livestock, equipment.... needs and taking online data from their performance status.

In this system, data extraction is done without human intervention, thanks to the help of IoT, artificial intelligence, digital twins, simulation and augmented reality. As a result, various components of an industrial environment are connected to produce valuable data to make decisions quickly and to increase productivity (low-cost products, lower energy consumption, faster thruptut along with higher quality). This helps industry owners to see future accurately and making wise decisions proactively.

FGM Smart Monitoring Components

The system tasks are: collection, transmission, analysis and display of asset data and is composed of the following five parts:

- ✓ Smart tag (data collection & transmission)
- ✓ Gateway/Scanner (data transmission to server)
- ✓ Server/Cloud (data storage)
- ✓ FGM platform (analysis and decision making)

FGM Smart Monitoring Benefits

- ✓ Efficient and effective use of available resources
- ✓ Reduces energy consumption and pollution
- ✓ Increases product quality
- ✓ Assigning short-term goals according to current and past trends
- ✓ Increasing operational capability and decision making based on real-time data
- ✓ No need to change/alter equipment for implementation



FGM Smart Tag

The most important part of the FGM Smart Monitoring System is collecting data from different assets in an environment and transferring it to the gateway/server. This task is done by FGM Smart Tags. Smart tags are designed to meet different industries requirements. Smart tag is a unique and patented product of FGM that installs on various assets to gather its information.

Smart tag can be installed on products, spare parts, electro motors, conveyers, trucks, livestock and personnel. The data produced by the smart tags are analyzed by FGM platform to predict the current and future condition of the asset.

Smart Tag General Specifications

- ✓ Compatibility with any equipment
- ✓ Available in different sizes and shapes to fit different applications
- ✓ Plug and work device without complexity
- ✓ Possibility of allocating different sensors
- ✓ Ability to communicate wirelessly
- ✓ No wiring is required
- ✓ Possibility of local data processing to reduce communication overhead

Types of Smart Tags & Their Differences

Depending on the needs, budget, and feasibility of implementation, smart tags are available in two main groups of passive (no battery) and active (with battery) tags.

Specifications	Passive	Active
Communication Range	Max 10m	Unlimited
Data Transfer Means	Scanner	Sim card/Scanner/Gateway
Assigning Unique ID	Yes	Yes
Various Packaging	Yes	Yes
Sensor Variety	Limited	Flexible
Tracking Capability	Depends on the scanner	Yes
Power Source	None	Battery
Thickness	Thin	Few mm to cm
Self-Configuring Network Capability	No	Yes

Scanners/Gateways

Scanners are used to read passive tags and transfer their data directly (sim card) to a server or to a gate way. Operators can move with scanners between assets (products, equipment, livestock, warehouses...) and read the asset information. The scanners can read the passive tags at most 8m away.

Gateways are used to transfer the data from smart tags with limited boards and scanners to server.

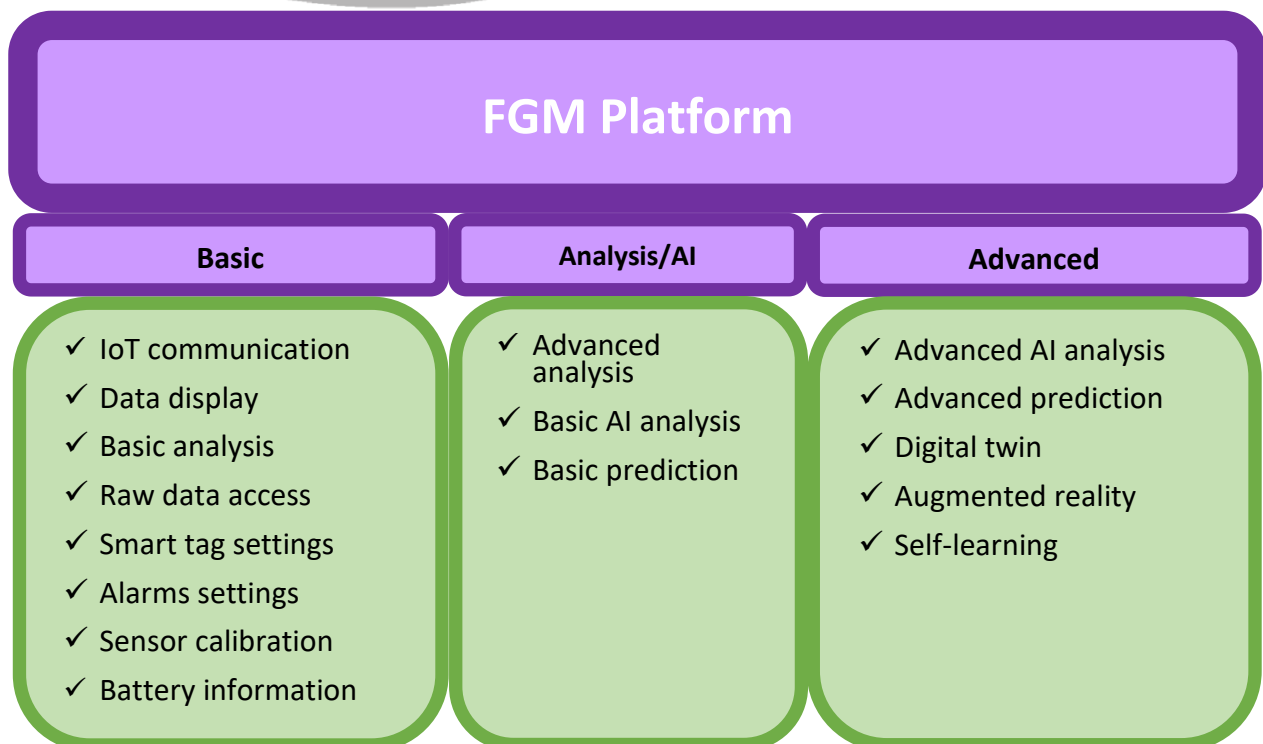
Scanner Types

- ✓ Scanner as an extension to cell phone
- ✓ Portable simple/smart scanner with display
- ✓ Fixed scanner
- ✓ Gate scanner (for trucks and large loads)



FGM Platform: Analysis/Prediction/Display

The Fourth Industrial Revolution has integrated artificial intelligent and IoT to manage industrial assets. FGM platform is designed to persuade this goal. The platform analyzes the data stored on the server from the smart tags and help the industry owners to manage their business proactively. The platform is composed of three modules: basic, analysis & AI, advanced.

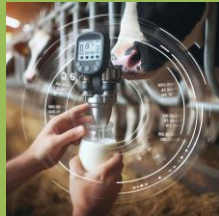


Smart Livestock Farming

FGM Smart Monitoring System will help the livestock industry to monitor animal's health and behavior such as activity level, food and water intake, milking, estrus... as well as background history and tracking.

The daily report, is available on the farmer's cell phone screen. It will help ranchers to reduce livestock raising costs up to 43%, methane emissions up to 30%, theft by 45% and cattle void by 10%.

This system will also increase the health of meat by eliminating the entrance of sick livestock into the food cycle and increase the quality of meat due to proper motility and feeding of livestock.



**Location, Milking,
Counting, Weighing**



**Identifying
originality**



**Access to pedigree
and livestock files**

Advantages of Smart Livestock Farming



Prevent theft



**Estrus time, calving
and pregnancy**



Water and food intake



**Livestock health and
disease report**

Ear E-Tag

The ear e-tag is installed on the livestock ear. In addition to electronic identification, it is equipped with different sensors (temperature, vibration, GPS...). Its data exchange rate is up to 20 meters.



Injection Microchip

Injection microchip, also known as the animal RFID, is an identification tool assigning a unique electronic ID to livestock, poultry and fish. Electronic identifiers are the first step in intelligent animal husbandry. Their reading range is less than 10 cm and they don't need battery.



E-Bolus

E-Bolus is an intelligent tool devoured by animal. This tool is applicable only for livestock with rumen (cattle, sheep, camels, whole and rams).

Bolus has more capabilities in compared to the other elements introduced here. It is equipped with GPS/ temperature/ PH/ accelerometer sensors to show estrus, activity level, food and water intake and health condition. It can be equipped with a SIM card or Lora wan for communication means. As it is in vivo, it is the only element capable of measuring internal parameters.



Smart Collar



Smart collars are placed on the neck, back or tail. Due to the proper size, it can have all the features of the bolus (except for PH and internal body temperature), with the advantage of replacable battery. As it is installed outside the body, it is vulnerable to damage.

Poultry Binding



It is installed on the foot/wing of poultry. It adjusts itself with the growth of chicken legs. The device assigns an E-ID to a poultry. It has a limited number of sensors (like temperature and gas). Its data exchange range is up to 50cm. It can be battery operated or not.

RFID Nails

This element is designed for wooden parts such as trees or birds' nest. It is similar to a poultry binding in terms of general characteristics. It can be battery operated or not.



Injection Gun



To inject microchips an injection tool is required. The injection gun facilitates the microchip injection for large herds. Microchips are placed in the magazine and loaded to gun. Injection gun has several advantages such as eliminating the need for disposable needles, increasing the speed of injection for a large number of livestock as well as complementary tasks.

Bolus Applicator



The bolus applicator is used to place the bolus in the throat of livestock.



Gateway-Scanner



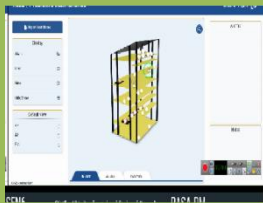
Data should be transferred to a server for post processing and display, once collected by bolus, collar, nail, or binder. This will require an intermediary system to send the collected data to the user (server). This is done by scanner and gateway. Scanners may enrich the data transfer by adding animal location, body temperature etc. before transmission. The scanner may additionally help the farmer to access the livestock file.



Smart Equipment

In large industries such as oil and gas, steel, petrochemical, cement and mining, main equipment and small components such as: sensors, motors, valves, heaters, fans, furnaces, tanks, pipes, etc. should work flawlessly to produce the desired product.

Many industries collect their data using human operators to fill their databases. This is very time-consuming and expensive. FGM intelligent monitoring systems helps industries such as mines, factories, airports or gas stations to continuously monitor temperature, vibration, oil pressure, humidity... in motors, gearboxes, pillbox, bearings, equipment casing, conveyor belts, etc. This data will also help operators to monitor working conditions, predict the right maintenance time, avoid unexpected downtime and ensure proper operation.



Software

Once the sensor data is received, the software analyzes the data and shows the engine operating conditions (history), how it was used, prediction of downtime and the alarms set by the operator.



Sensor

The sensor measures the equipment performance. The sensor measures temperature, vibration, magnetic field, noise, etc. and send it to server. It put a time stamp for each data and may do some local analysis.



Gateway

The gateway receives the sensor data and translate and transfer it to the server.



Human Resources and Smart Transportation

Transportation is an integral part of any factory or production unit. The proper management of transportation requires the use of intelligent systems to access drivers' information, continuous fleet control and goods condition. FGM's intelligent monitoring system will help industries to properly manage the status and loading location of the loaders, cranes and trucks.

FGM monitoring system also helps to monitor the condition of cargo and goods at the time of transportation and delivery. This system will also help organizations to monitor their personnel traffic, time of entrance and leaving time, health condition and mission status. Also they can communicate with the personnels.





Long Range active Tag

Readable even out of sight, simultaneous multi-tag reading, up to 10m reading range



Enhanced Short Range Passive Tag

Readable at indirect vision, single reading at a time, reading range up to 15 to 30 cm, reusable



Passive Normal Short-Range Tag

Readable only at direct vision, single reading at a time, reading range up to 50 cm



Active Tag with GPS

Readability from any distance (cargo truck), equipped with SIM card and GPS, ability to display the location and condition of goods



Passive Tag Scanners



Active Tag Scanners

Smart Warehousing

Main industries are loaded with vast equipment distribution all need spare parts and lubricant. Managing and monitoring the warehouses of raw materials, equipment and accessories is hard. There is a possibility of missing parts, improper storage of spares or outdated lubricant. Keeping the count of each item is not easy. Using a smart warehouse system will be very beneficial. FGM smart warehouse will help the producers in the following aspects:

- ✓ Monitoring the storage and transportation of containers
- ✓ Transparency of delivery between production line, warehouse and sales
- ✓ Automatic Weight and Registration
- ✓ Automatic Registration of Goods Entry and Exit
- ✓ Monitoring the storage conditions of goods
- ✓ Expiration time warning
- ✓ Reporting the location of goods in the warehouse



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