MiTek Design and Enterprise Challenge (Group 32)

Design Brief - Create a system that can track the key stages of a production process in real time

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Customer Requirement

The system must be capable of tracking the system from raw materials over to final loading and delivery to customers. Such a system must withstand and be accurate in highly automated production lines and through intensive labour driven assembly lines. At the heart of the system must be a solution created to continue improving efficiency and highlight flaws in the manufacturing process.

How it works

The system uses a RFID tag through smart barcodes capable of tracking a product or batch in the case of manufacturing to identify at what stage along the production line the batch is at. This system requires a small scanner to scan the tags (1 per batch) and upload them into the system on a server where it is visible to track whilst in production. These radio waves on the RFID chips transmit data from the tag to a reader, which then transmits the information to an RFID computer program. Each chip has a unique I.D meaning there is no room for error in the system as it traces only a certain chip. Interference form other devices e.g. mobiles, radios and software do not interfere.

The RFID tags used in this case are passive tags gaining power supply from am electro-magnetic field induced by the reader. This means the system is protected from power outages and does not require maintenance in terms of replacing batteries and monitoring battery charge.
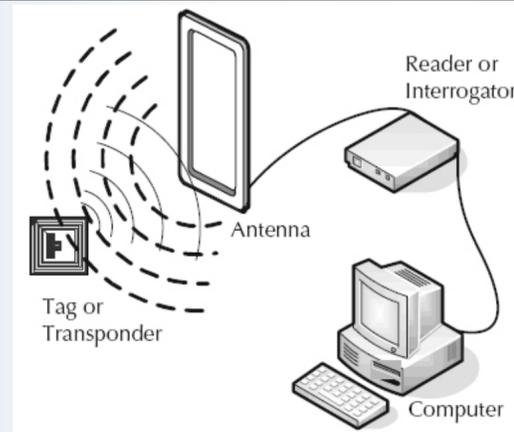
Our Solution

To eliminate the issues the client has of tracking items and updating customers such as delivery schedules. The process is centred on improving customer satisfaction and increasing transparency.

We have decided to integrate a full solution consisting of an incremental manufacturing process based on Radio Frequency Identification Device (RFID) tracking. This solution covers the complete process form start to finish offering a comprehensive and sustainable fix for the future.

Stock Control and Savings

This new system reduces wastage for companies in terms of raw material consumption reduction. It will allow companies to order at the right time due to stock control and transparent systems.

Data Storage and processing

We will be storing data in a MySQL database, running on AWS servers. MySQL offers the best documentation, and is open-source, meaning licenses to use the product are free. AWS has been voted one of the best cloud solutions on the market, and offers an almost 100% uptime guarantee.

We will be processing the data via an API, which will be written in Express JS. Node is a very versatile framework for projects, and Express features plenty of documentation. To access the data, it will be returned in **JSON** format, which most modern applications can understand. This means that a portable device could handle the data the same way a website or desktop application could. An example of the data that will be returned is below.

```
GET        http://localhost:3000/api/batches/b00001

Pretty   Raw   Preview   JSON

1  {
2     "status_code": 200,
3     "data": {
4        "batch_id": "b00001",
5        "start_time": 1514896470,
6        "finish_time": 1514900580,
7        "time_taken": 4110,
8        "facility_id": "f002",
9        "location": {
10           "post_code": "HD1 2DH",
11           "town": "Huddersfield"
12        },
13        "supervisor": {
14           "employee_id": "e001",
15           "first_name": "Charles",
16           "last_name": "Babbage",
17           "email": "c.babbage@example.com",
18           "contact": "07812345678"
19        }
20     }
21  }
```

Sustainability and Versatility

These I.D tags will be re-used for different batches overtime making them sustainable as this reduces waste and minimises cost for the business. Furthermore, the tags can be programmed to be tracked on the same RFID radio wave signal as before or be assigned a brand
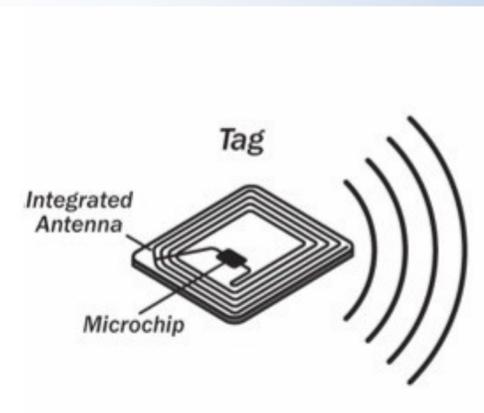
Cost to implement

The cost of RFID chips varies heavily. It can range from 10p to £50 depending on the type of chip required. The ones we will require are far to the cheaper end of that range with no consequences to performance. This means the chips will likely cost less than £1 per production batch. RFID tag reader £165. OPL 9815 sensor transmitter £200.

Sensor sends "ping" as production of item begins to end production stating estimated time product will arrive completed through all stages.

Raw Material in

Stage 1 (Material selection) — Sensor 1

GPS 1

GPS 2

Stage 2 (Cut) — Sensor 2

Stage 3 (Make) — Sensor 3

GPS 3

GPS 4

Stage 4 (Load) — Sensor 4

End Product

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