



## Project plan

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## **2 BACKGROUND INFORMATION**

Duracell is a global leader in high-performance batteries. It's a dynamic company committed to innovation, quality, and lower environmental impact.

The branch in Aarschot employs over 450 people and has an IT department working to automate processes and make them efficient with the use of AI, and make a business analysis of collected data to name a few tasks of it.

## 3 ASSIGNMENT

### 3.1 Reason

The project is focused on one specific machine that is used with harsh materials to press them into a small ring, also called a pellet, that is later combined into a battery.

Right now, there's a lot of data being collected about the machine: processes that are happening, its state and measures. However, all this raw data is unusable as it's not cleaned properly and the amount of it that is collected is too much to comprehend or make any conclusions based on it.

Due to the harsh materials that are used in the machine, occasionally the process of rolldown needs to be done, where the press gets lowered. At the moment, this process is production-based. People who have been working with machines for some time decided an average of how often rolldown needs to be done. After a certain number of pellets have been pressed, rolldown is done. However, it's not the most efficient option because time depends on materials being used, various conditions such as temperature and humidity, and machine faults and downtimes. This production-based process costs the company both time and money.

### 3.2 Objectives

- Data cleaning.  
I was given a data frame containing measures of various stations and parts of the machine through time and an additional data frame that showed the status of the machine through time.  
Data will be cleaned using Python, specifically the pandas library. That includes removing duplicates, changing indexes of a data frame to be a date with a frequency of one second and filling NAs with values from rows before because the data came from the iHistorian database which fills values only when an entry is updated.
- Setting up a virtual machine environment.  
To continue working without running into memory issues, a virtual machine was needed. The connection between Azure virtual machine, local machine and Jupyter Notebook server will need to be set up.
- Data visualisation.  
Exploration of data to see how it behaves and whether it seems to be correct. Making graphs in Python and PowerBI to see the range of data for measures, how it changes through time, correlation and any other trends that will be worth noting and exploring.
- AI model.  
To predict the most efficient time to do rolldown based on various measures, an unsupervised machine learning algorithm will be used to write a model and makes the prediction.
- Possible extras.  
Implementing the project on machines at the plant. Later on, the project would be implemented in the USA too.

### 3.3 Business case

After data cleaning and visualisations, visualised data will be used to see which measures are important to predict the rolldown process and to see how the machine

behaves. This material will be used in meetings about the project within IT department and meetings with production if needed.

The virtual machine setup will allow the project to be accessed by anyone involved in a project and will help transfer the project to work on to team members both in Aarschot and USA.

The rolldown process will be predicted by the machine learning model. Even a 5% increase in efficiency to predict the time of rolldown will save the company around 30 thousand euros a year.

## 4 PLANNING

Phase	Documents to submit	Meetings
Data cleaning (28/02/2023 – 10/03/2023)	First week update to the internship mentor	Project progress overview with mentor 03/03/2023  Meeting with mentor and project manager 09/03/2023  Meeting with internship coordinator at the internship 09/03/2023
Setting up VM and data visualisation (13/03/2023 – 22/05/2023)	Project plan to internship coordinator  Explanation of project files to the internship mentor  Final project plan and realization evidence for final review to internship coordinator	Presentation of plan of approach 30/03/2023  2 <sup>nd</sup> meeting on campus 21/04/2023  Project status updates with mentor and project manages 25/04/2023, 28/04/2023, 09/05/2023, 11/05/2023, 22/05/2023
Preparation for AI model and transferring of project, extra time for finalisation ( 24/05/2023 – 02/06/2023)	All final project files and documentation  Project handover	Production meeting 01/06/2023  Project handover 02/06/2023

### 4.1 Risk analysis

The project will be transferred to be continued to work on and implement on the machine and globally at other plants, which means that documentation explaining each project file and what it contains and is used for is necessary. In notebook files code cells should also have explanations.

The virtual machine environment needs to be set up properly, so other people can log in and access it easily. Password needs to be noted and passed by.

When it comes to implementation globally, it will be important to make sure systems are synchronised and there are no conflicts or different systems that could affect the implementation of a project.

## **4.2 Communication**

- Daily meetings. Meeting every day with my mentor on-site or via teams to share progress and ask questions.
- Progress meetings. After every important part meeting with my mentor, project manager and any other party involved. Before that meeting, I send in any documents with explanations, files with graphs or code or present them during the meeting to show the progress that's been made, share my observations, and discuss further steps.
- Communication with the internship coordinator from Thomas More. Sending in weekly reports, 2 meetings about the project plan, sending project plan and a possibility to send other documents that will need to be uploaded and contact if needed.