

Improving Malta's recycling performance through targeted management decisions at the Sant' Antnin Waste Treatment Plant Material Recovery Facility- Rudimentary Sorting Line

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Introduction

Drastic operational improvements don't necessarily need to break the bank. Re-engineering operations, motivating and responsabilising the workforce, and energetic leadership, can lead to sharp increases in production (Uhrin, Bruque-Cámara & Moyano-Fuentes, 2017). One may even argue that this is an essential pre-requisite to any capex injection strategy. Knowing that you are making the most out of your existent setup is very important before investing important capital in improving it. The potential of short-term gains is also evident from the examination of the following case study.

In a world limited by resources, the recovery of materials from waste is a key principle within the EU *acquis*, and a basic requirement for sound environmental management and fundamental to sustainable development (Narayana, 2009). Across the years, Malta has lagged behind (Bezzina & Dimech, 2011; Environment and Resources Authority [ERA], 2019) and the incapacitation of its main plant due to fires in 2017 has severely impinged on its performance. This has led to various repercussions, including a demotivated sector. Rewiring the system in a vibrant manner has

been crucial to lay the foundations for the largest-ever investment in Malta's waste management infrastructure, standing at 500 million Euro, which is intended to turn the island into a circular economy powerhouse.

The focus of this article is on the recovery of recyclable materials. It examines how, prior to the fruition of multimillion euro investments, through a very aggressive strategy, short term significant gains have been obtained, laying the foundations for a very prospective future.



Sant' Antnin Waste Treatment Plant (SAWTP)

The SAWTP in Marsascula consists of a waste management facility designed for the management of mixed recyclables (Green/Grey Bag), where a Material Recovery Facility - Rudimental Sorting Line (MRF-RSL) is intended to recover materials for recycling from the collection of sorted wastes from households.

It was originally intended as a complete waste management complex, with an MRF and a setup that could produce electricity from organic matter found in the black

bags (mixed waste collection). Following the 2017 fires, operations were severely impacted, and the Centre was used as storage for various materials, mainly glass.

The current MRF-RSL is made up from the following equipment:

- Bag Opener
- Incline Conveyor
- Sorting Conveyor
- Platform with bunkers
- 75T Baler

Material is loaded into the bag opener, following which the bag

opener opens the bags and, through the incline conveyor, the material is transported to the sorting conveyor. Operatives are stationed at the sorting conveyor, where each operative collects designated material and drops it into a segregated bunker. Once enough material is in the bunker is deposited, the material is transferred to the baler, and is baled accordingly.



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Revitalizing operations

The MRF-RSL started operating during July 2020 and has been operating for the past 10 months. During this period, several improvements were introduced to improve both the output and efficiency of the facility.

During the first phase of operations, an extensive exercise was carried out to obtain accurate processing data, which covered plant availability, material processed, collected recyclables, and number of operatives available. The processing data was vital to monitor the facility performance and measure the improvements being introduced. The next phase after data collection was the selection of the key performance indicators (KPIs). The main two KPIs selected were the **Material Processed**, and the **Collected Recyclables**. Records of both KPIs for the whole ten months are illustrated in *Figures 1 and 2*. *Figure 1* depicts the average KPI per day of each month, whereas *Figure 2* shows the total KPI of each month.

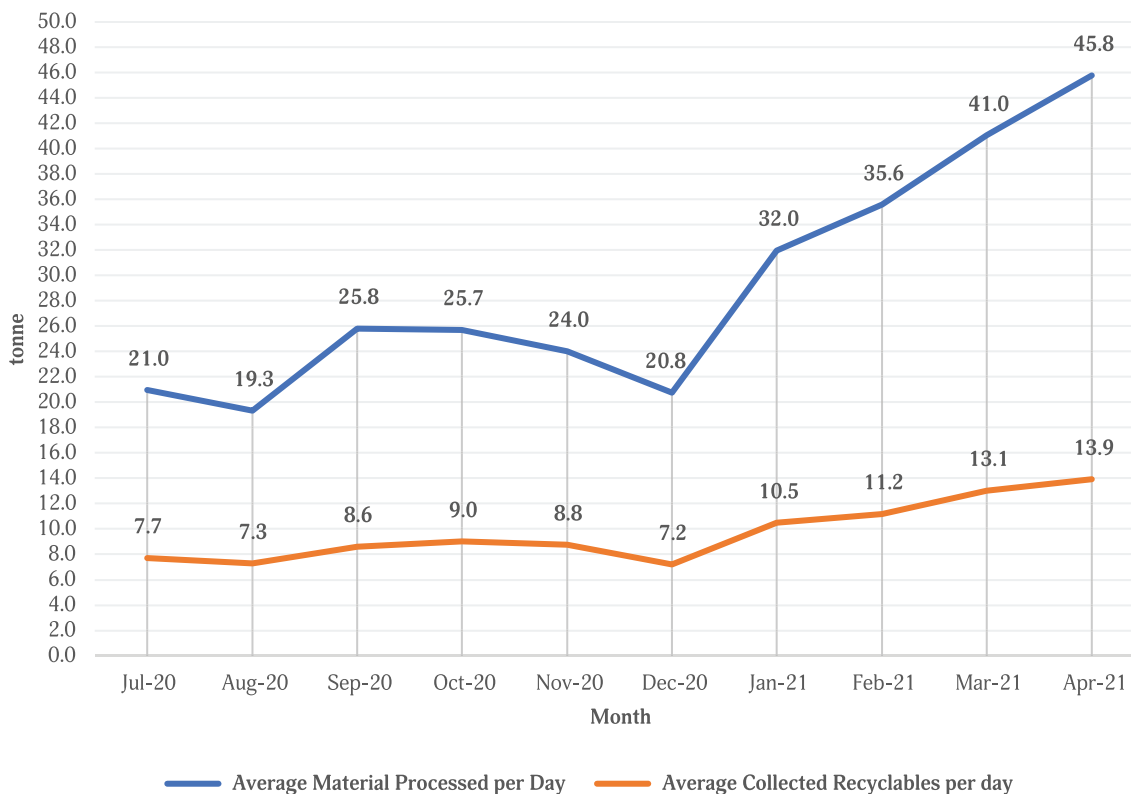


Figure 1: Average Material Processed and Collected per Day

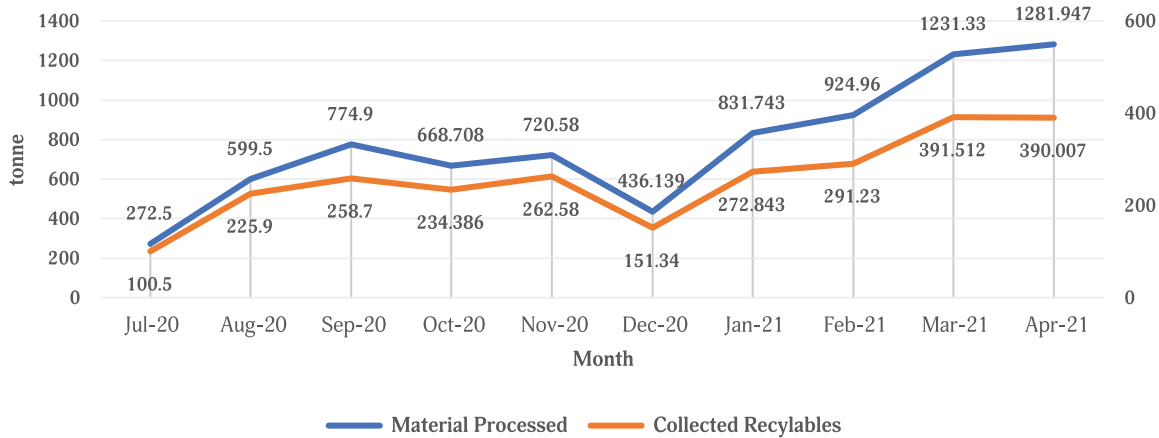


Figure 2: Material Processed and Collected per Month

As presented in *Figure 2*, during July, August and September, the monthly material output and the collected recyclables (KPIs) increased consecutively each month. For October, November, and December, both KPIs decreased. From January onwards, an increase was recorded for each consecutive month.

Furthermore, the KPIs of the month of July were taken as a baseline and the KPIs of the following months were compared to the baseline as illustrated in *Figure 3*. During the first six months, the KPI of material processed varied from +23% to -8%, and the KPI for collected recyclables varied from +17% to -7%. From January onwards, both KPIs increased consecutively in April, achieving an increase of **+118% in material processed** and an increase of **+80% in collected recyclables**.

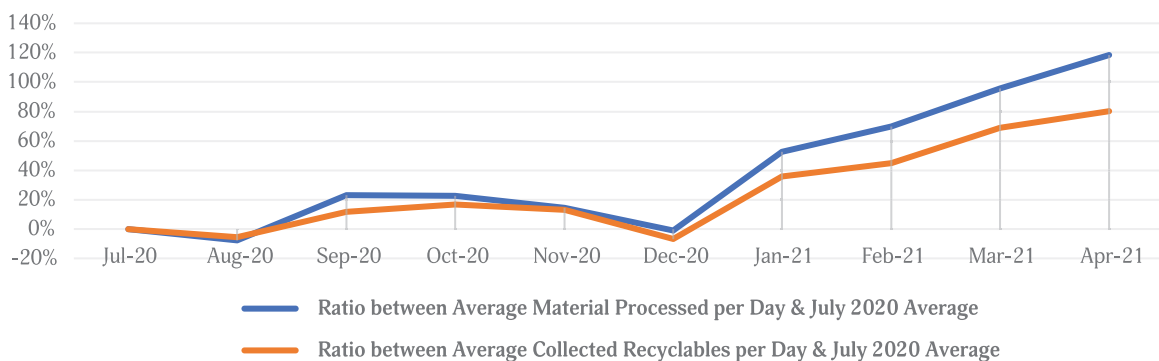


Figure 3: Ratio between Average Material Processed and Collected per Day from July 2020





The positive results that were obtained from January onwards were due to the following improvements:

1. Better communication between management and employees

Studies show that effective communication between management and employees improves mutual trust and respect, fosters a better understanding in the organisation, and leads to higher performance (Ukko et al., 2007). Out of the office and onto the shop floor, management needs to be close to operations to understand day-to-day dynamics, including difficulties faced by workers. This is a crucial element in motivating workers and ensuring that their suggestions – often well-founded - are taken on board and implemented.

2. Improving the work environment

Such improvements included better ventilation, water misters to avoid dust propagation, and even the introduction of music. Studying workforce ergonomics and identifying the best equipment to safeguard workers' health and safety was also crucial. This includes obvious items such as adequate gloves and other protective equipment, and also the introduction of ergonomic floor mats to make the long standing hours more bearable.

3. Improving plant availability

This is easier said than done. The plant unfortunately still receives an unpredictable flow of waste that significantly impinges on operations. From recent tests it is clear that the amount of unwanted material on the

line is around 34%. This does not just affect the rate of total recovery, but also leads to systematic clogging and downtime. Addressing this matter is proving to be a crucial element in the setup's operation.

A root-cause analysis exercise was carried out, and two of the main issues were that 1) the bag opener would end up without material during transfer of grey/green bag to the receiving area, and 2) blockages due to oversized cardboard. To mitigate the first issue, material was transferred prior to commencement of operational hours, and during operational hours, a single open-top container was being transferred at intervals to provide enough time to relocate the material handler, unload the material and relocate the material handler back in place without having the bag opener without material.

The second issue was mitigated by the removal of all cardboard from the line, with important gains being registered. This pricy recyclable is being recovered prior to the line, resulting into four main benefits: 1) limiting the risk of soiling cardboard, 2) eliminating cardboard-related clogging, and 3) removing significantly large material that covers other recyclable. Moreover, with the cardboard removal process, other large objects - mainly rejects such as electric water heaters, and so on - were removed, and thereby improved the overall recovery rate.

4. Optimizing material processed flow versus material recovered rate

Following various trials and projections, the best recovery rate operational setup was identified. The optimization strategy also follows developments in the recycling markets to ensure that the line is

producing the materials that are most needed and that have the highest chance of recoverability according to fluctuating dynamics, related to what could be described as a rather unstable market.

5. Increasing plant redundancy and preventive maintenance

This is another key area that allows improved operations, as it reduces unexpected variables such as unplanned disruptions. Scheduled maintenance is crucial to avoid poor labor utilization and downward production trends.

6. Continuous performance measurement

This is very important to ensure that any decline in operational performance is picked up early on, potentially as close to real-time as possible, in order for management to be able to take the necessary corrective action. Such measurement also gives valuable information for decision-making in relation to - but not limited to - capital expenditure (CAPEX), operating expenditure (OPEX), and the potential sale of recyclables contracts.



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Contribution of operation towards attainment of National and EU targets and circular economy

Currently, the SAWTP MRF-RSL is the only approved waste management facility that can accept co-mingled recyclable waste. The operation of this facility and the above discussed improvements are contributing towards the attainment of the Water Framework Directive (WFD) targets and the Packaging and Packaging Waste Directive (PPPW) targets. Malta will in the near future continue to improve its performance as the ECOHIVE project starts bearing fruit. ECOHIVE is the largest-ever investment in the waste management sector that will propel Malta towards a circular economy (see <https://www.ecohive.com.mt/> for more details).

Conclusion

This brief overview of management fine-tuning demonstrates how tangible results within an industrial setup that largely depends on the organisation of manpower and the fine tuning of equipment outlay can yield substantial gains quickly.

Moreover, exhausting potential improvements that can be attained from already-deployed resources should be an essential prerequisite prior to any major investment strategy. This guarantees that any costly expansion is well-targeted, and that decisions made are fully-informed ones.



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