

Student Name: **Jessica Berger**

Student ID Number: **2012885**

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Lecturer: Graham Howe

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Can an internationally exported laboratory instrument manufactured by an SME in South Wales achieve Net Zero by 2050?

Table of Contents

Research title :	Error! Bookmark not defined.
Introduction	3
Research problem	4
Context and objectives	4
Literature review.....	5
Policies	5
Case studies	6
Articles and other resources	6
Research Methodology	6
Timeline.....	8
Evaluation	8
Potential outcome and applications	8
Bibliography and References	9

Introduction

One of the most urgent challenges our world currently faces is that of climate change. According to the IWA 42:2022 guidelines, global temperature is already over 1 °C above pre-industrial levels. This is worrying as according to the Intergovernmental Panel on Climate Change (IPCC) report, we must limit this warming to 1.5 °C if we are to avoid the worst consequences of climate change.

It is understood and accepted that to prevent us reaching 1.5 °C we must achieve net zero global carbon dioxide emissions by 2050 or earlier, as well as cutting other greenhouse gases (GHG).

What does net zero mean?

As defined in the ISO guideline IWA 42:2022:

“net zero GHG:

condition in which human-caused residual GHG emissions are balanced by human-led removals over a specified period and within specified boundaries.

Note: Human-led removals include ecosystem restoration, direct air carbon capture and storage, reforestation and afforestation, enhanced weathering, biochar and other effective methods.”

Put in more simple terms, it means cutting the emissions to zero or as close as possible, with the remaining emissions being re-absorbed by forests and oceans, or by capture and storage.

How can net zero be achieved?

It requires a complete transformation in how we travel, consume products, and produce those products.

Herein lies the challenge for manufacturing businesses, especially those already established and used to working in a certain way – they have a corporate social responsibility (CSR) to act now, but how can they change the way they function to achieve net zero and what are the actions they must take?

Guidelines have been created by the ISO (International Organization for Standardization) which breaks this mammoth task into three areas:

“**Scope 1 emission** - direct GHG emission

greenhouse gas emission from sources owned or directly controlled by the organization.

Scope 2 emission - indirect GHG emission from purchased energy

greenhouse gas emission from the generation of purchased electricity, heat, cooling or steam consumed by the organization.

Scope 3 emission - indirect GHG emission

greenhouse gas emission that is a consequence of the organization's activities but arises from sources that are not owned or directly controlled by the organization. Scope 3 emissions include all attributable value chain GHG emissions not included in Scope 1 emissions or Scope 2 emissions.”

The value chain within scope 3 includes all activities associated with the operations, both upstream and downstream, of the product/organisation. Therefore, this includes end-users of the products or services as well as suppliers to the business.

Research problem

The research that is proposed in this paper explores practical ways in which a manufacturing business can make changes to enable them to reduce their greenhouse gas emissions, and whether these changes will be enough to achieve net zero by the 2050 deadline.

As will become evident in this proposal, the information freely available to manufacturing businesses on how they can specifically achieve net zero is lacking consistency between guidance policies, concise and informative actions, as well as a standardised methods for quantitative measurements. Far too much is still generalised or being capitalised on for sale by consultancy firms.

Context and objectives

For the context of this research the author will focus on Markes international with regards to scopes 1 and 2. For scope 3, due to the complexity and volume of activities within the value chain, the author will focus on Markes' bestselling product; TD100-xr.

Markes international are a small to medium sized enterprise (SME) with its manufacturing facility and main offices in Bridgend, South Wales. They have centres of excellence in Sacramento – California, Offenbach – Germany, Waterloo – Canada, and Shanghai – China; each of these offices sell directly to end customers in their local region.

However, Markes products are sold and installed globally, to do this their business model is to partner with other SME scientific sales channels, as well as large enterprises such as Agilent Technologies and Thermo Fisher Scientific.

Some of the challenges faced by Markes international in starting their journey to net zero:

- Personnel resourcing and lack of internal knowledge,
- Funding for implementing radical changes to processes,
- Potential disruption to manufacturing,
- Perceptions from staff and the ability to change the paradigm,
- A business model that uses global resellers who are not only responsible for sales but also the service and upkeep of the products that they sell,
- Channel partners that require products to be shipped to a single warehouse before they take responsibility of shipping to their customers, which can mean shipping back to the country of origin,
- A linear economy to most of their products, including the TD100-xr, and a lack of circular economy in the design phase,
- High number of suppliers of component parts for each product requiring assessment.

As a manufacturer that serves the scientific industry, it is highly important for them to become a leader in sustainability. More than 50% of their products are sold into environmental research and analysis applications, where they are seeing ever increasing demand for their environmental policies as part of tender processes.

Therefore, an objective of this research is to address each of the challenges and find a means to overcome them. In addition to providing actions and changes that will contribute to the reduction of GHGs across the 3 scopes and can be measured.

Literature review

Policies

To date, there are no standardised policies on how to achieve net zero. This is a new and emerging area of study as a result of the climate crisis.

Governments and policy makers are in the process of creating directives however due to the ever-increasing knowledge through current research, they are only able to provide guidelines.

These are generalised and do not provide enough details for specific sectors of industry.

For example, the ISO have freely released net zero guidelines (IWA 42:2022) which provide readers with high-level principles and recommendations to allow for a common approach. This document is the product of a collaboration of >1,200 experts from over 100 countries, of which >130 are from the United Kingdom.

Nevertheless, they state themselves that:

“This document does not provide guidance on carbon neutrality for organizations or for products and services.”

The guidelines are quite extensive and include sections on “Establishing levels and boundaries for net zero”, “Planning actions to be taken”, “Target setting”, and “Content of mitigation plans”,— however, in each of these they leave it up to the individual to interpret and choose the best method for themselves. For example:

“All organizations should determine:

a) the baseline from which to measure GHG emissions reduction progress, with an explanation of why the baseline has been chosen and how changes in conditions since the baseline will be accounted for, to appropriately represent changes in GHG emissions performance;”

Their sections on “Actions to address Scope 1 and Scope 2 emissions” and “Actions to address Scope 3 and other emissions” do provide improved insights into what businesses can do, but again it is left up to the reader to interpret and try to decide which will be the most effective for their company.

The UK government have also provided guidance in their Net Zero Strategy - Build Back Greener which was released in October 2021. This publication lays out the governments Ten Point Plan back when Boris Johnson was prime minister.

This plan is also far too generalised focusing on nuclear and renewable energy, changing public transport to be more “green”, developing “greener buildings”, and protecting the natural environment. It does not provide sufficient instructions and directive for industry.

Similarly, the Welsh government have also set out a “working together to reach net zero” plan which states their pledges but does not provide clear directives.

Case studies

It has been difficult to find case studies that provide insights into a business that is similar to Marks international, therefore studies have been chosen that highlight changes that companies have made to begin their journey to net-zero and/or challenges they have encountered:

- Carbon Management behind the Ambitious Pledge of Net Zero Carbon Emission—A Case Study of PepsiCo – Qian, 2022
- How do small changes enable the shift to net-zero? a techno-environmental-economic analysis – Haddad, 2022
- How Meaningful Are Modest Carbon Emissions Reductions Targets? The Case of Sumitomo Electrical Group’s Short-Term Targets towards Longer-Term Net Zero – Warzywoda, 2022

Articles and other resources

In addition to case studies, articles and other resources that have been identified that will enable the understanding of the topic of net-zero include:

- Are the European manufacturing and energy sectors on track for achieving net-zero emissions in 2050? An empirical analysis – Vieira, 2021
- Digital transformation and the circular economy: Creating a competitive advantage from the transition towards Net Zero Manufacturing – Okorie, 2023
- Intergovernmental Panel on Climate Change's latest report
- COP26 in Glasgow reports
- Manuals and guides from Science based targets.org (SBTi)
- Learning from Failure and Success: The Challenges for Circular Economy Implementation in SMEs in an Emerging Economy – Cantu, 2021
- SMEs and the Circular Economy: From Policy to Difficulties Encountered During Implementation – Ghenta, 2018
- Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers – Rizos, 2016
- Sustainability in the Circular Economy: Insights and Dynamics of Designing Circular Business Models – Awan, 2022
- Managerial practices for designing circular economy business models: The case of an Italian SME in the office supply industry – Unal, 2019

Research Methodology

The majority of the research that will be undertaken in this study will be qualitative, unlike quantitative research which uses numbers and graphs:

Qualitative research is expressed in words. It is used to understand concepts, thoughts or experiences. This type of research enables you to gather in-depth insights on topics that are not well understood (scibbr)

The research will combine a mixed method approach in order to fully understand the requirements and gain insights into how other businesses are approaching their journey to net zero. This will entail:

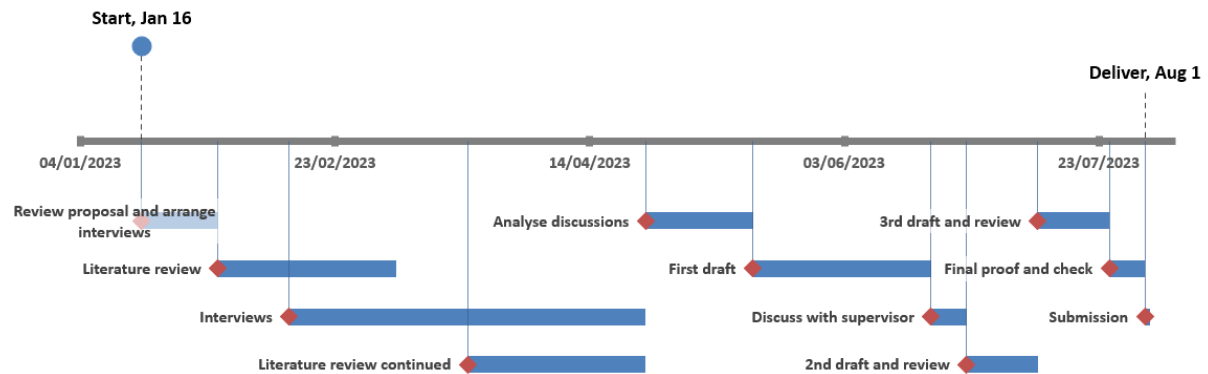
- a critical analysis of the current policy guidelines as set out by ISO (IWA 42:2022), UK government (net zero strategy: build back greener), and Welsh government (All Wales Plan 2021-25: Working together to reach net zero).
 - How these policies differ and an exploration into why – do local agendas influence their approach.
- Further evaluation of the case studies that have been identified so far as well as additional case studies that can be found on companies that either claim to have achieved net zero already or who have pledged to do so.
 - Who produced the case study and what was their agenda behind creating it,
 - What actions have they taken and have these been successful in reducing their GHG emissions.
 - How have these been measured and is the data reliable.
- Semi-structured interviews with stake holders and employees within Markes international to understand their perceptions and ideas.
 - How do these differ between the different departments
- Semi-structured interviews with external professionals, key opinion leaders and consultancy firms.
 - Understand what perception of achieving net zero means and how they believe it should be approached
 - Examples of people and companies that will be contacted include:
 - Stu Meades – Energy and sustainability consultant, director at greener edge
 - My Green labs – offer paid for assessment and scoring of products and labs
 - EvoVadis – paid for assessment and scoring of products and business
 - Eoin Bailey – UK Innovation Manager – Celsa Steel
 - Agilent Technologies – manufacturer and reseller of laboratory instruments, large enterprise with revenue of 6.32 billion USD in 2021
 - Thermo Scientific – manufacturer and reseller of laboratory instruments, large enterprise with revenue of 39.21 billion USD in 2021

To assess if the actions identified in this study will enable Markes international to achieve net zero, a quantitative approach will be required. To do this it is the intention of the author to use the free carbon foot printing tool from Ecologi. A calculation of the initial carbon footprint will be made at the beginning of the study and then at regular stages throughout, suggested monthly, to determine if any changes made have resulted in a positive effect on the footprint.

If however, through the research, a more appropriate and accurate means of measuring Markes international's GHG emissions then this will be adopted.

Timeline

The following is a suggested timeline, which contains extended times to account for possible delays due to other commitments, including working full time, several product launches within Markes international planned for 2023, full time single parent, and needing time off to prevent burn out.



Start	End	Duration (days)	Task
16/01/2023	30/01/2023	15	Review proposal and arrange interviews
31/01/2023	06/03/2023	35	Literature review
14/02/2023	24/04/2023	70	Interviews
21/03/2023	24/04/2023	35	Literature review continued
25/04/2023	15/05/2023	21	Analyse discussions
16/05/2023	19/06/2023	35	First draft
20/06/2023	26/06/2023	7	Discuss with supervisor
27/06/2023	10/07/2023	14	2nd draft and review
11/07/2023	24/07/2023	14	3rd draft and review
25/07/2023	31/07/2023	7	Final proof and check
01/08/2023	01/08/2023	1	Submission

Evaluation

Potential outcome and applications

Given the urgency of the climate crisis and the need to take action now, it is the authors intent to influence the adoption of identified actions within Markes international as soon as possible. The author is a product manager who has been with the business for over 10 years and therefore has the ability and support of colleagues to make changes.

On a wider scale, this study could potentially assist other SME manufacturing businesses to understand the requirements for achieving Net Zero, steps that can be taken to reducing their GHG emissions, suitable methods for quantitatively measuring and monitoring their emissions, and assessing if they too can achieve the goal of net zero by 2050.

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