SYMBIOSIS
॥ वसुधैव कुटुम्बकम् ॥
INSTITUTE OF OPERATIONS MANAGEMENT

Six Sigma Project Report
Batch 2022-24

Alligo Horizon Pvt Ltd

Alligo Horizon Pvt. Ltd.
An ISO 9001:2015 Certified Co.

Title:

Optimizing Standard Operating Procedures through Six Sigma Methodologies for Enhanced Process Efficiency

Submitted By:

Rahul Sahu (014)
Sakshi Gupta (016)
Vidit Gupta (022)

Faculty Mentor:

Dr. Isha Sharma

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List of Abbreviations

SOP	Standard Operating Procedure
FIFO	First-in- first-out
LIFO	Last-in-first-out
QC	Quality Control

GUIDE FEEDBACK

SYMBIOSIS INSTITUTE OF OPERATIONS MANAGEMENT, NASHIK

GUIDE'S FEEDBACK & COMPLETION REPORT ON FINAL PROJECT

Student Names: Rahul Sahu, Sakshi Gupta, Vidit Gupta

Students PRN: 22020742014, 22020742016, 22020742022

Organization: Alligo Horizon Pvt Ltd.

Project Start Date: 15/01/2024 Project end date: 08/03/2024

1. Is the project work useful to the company:
   Yes / No

2. Any observed weakness or aspect on which the student should pay more attention to be more professional & effective. (Attach a sheet if needed)

3. Your suggestion to the institution.

4. Overall rating of the student's performance during project 18 out of 20 marks

5. Please mark your feedback about the student:

	Yes/ No	Your remarks (if any)
The student was disciplined and punctual in the company throughout the project period	Yes/ No	
You are satisfied with the quality (depth and breadth) of the analysis of the problem	Yes/ No	
The student was sincere and serious about his project	Yes / No	
The student had conceptual clarity and soundness about the project	Yes / No	
The student has made a project presentation to the concerned head/s.	Yes / No	
The student has submitted a project report to the concerned head/s.	Yes/ No	
The student doesn't owe any deliverables to company	Yes / No	

Rahul Sahu, Sakshi Gupta, and Vidit Gupta have completed their project satisfactorily in the above-mentioned time period. We wish them all the success.

Date: 12/03/2024

Name & Sign of Project Guide: Laxmikant Dashpute

Designation: Director - BD

Tel No:

Fax No:

Email: dir.BD@alligohorizon.com

COMPANY SEAL

ALLIGO HORIZON PVT. LTD. NASHIK

MBA Agri OM (2022-24) / SIX SIGMA FINAL PROJECT

LOG SHEET

SYMBIOSIS INSTITUTE OF OPERATIONS MANAGEMENT, NASHIK

SIX SIGMA PROJECT LOG SHEET

Organization: Alligo Horizon Pvt. Ltd.

Reporting Guide: Mr. Laxmikant Dashpute

Faculty Guide: Dr. Isha Sharma

Team Members: 1) Rahul Sahu
2) Sakshi Gupta
3) Vidit Gupta

Project Title: Optimization of Standard Operating Procedures (SOPs) through Six Sigma Methodologies at Alligo Horizon Pvt Ltd

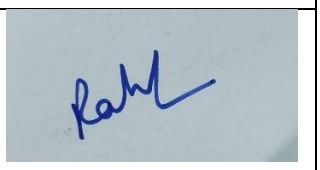
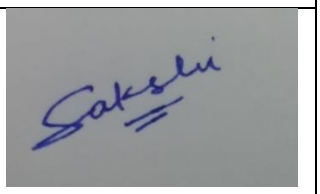
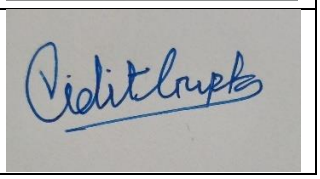
S.No.	Date	Task Completed	Guide's Signature	Remarks
1.	15/01/2024	Introduction meeting		
2.	23/01/2014	Project Charter approval, that is, problem statement, project scope, and project future scope discussion.		
3.	29/01/2024	Process flow discussion and the status of the project		
4.	2/02/2024	Existing SOP analysis to optimize and integrate as required		
5.	12/02/2024	The defined state of DMAIC completed to go with the further process		
6.	16/02/2024	Value stream mapping and frame discussion		
7.	22/02/2024	Different department SOPs are used to study and provide suggestions		
8.	28/02/2024	Suggestions and recommendations		The Project outcomes are good. I would suggest to more comprehensive analysis of the Problem Statement
9.	02/03/2024	Final presentation Discussion		

MBA Agri OM (2022-24) / SIX SIGMA FINAL PROJECT

DECLARATION BY STUDENTS

We the undersigned project members present and declare our Six Sigma project report for **Alligo Horizon Pvt Ltd** with title "**Optimizing Standard Operating Procedures through Six Sigma Methodologies for Enhanced Process Efficiency**" submitted by us to "Symbiosis Institute of Operations Management, Nasik" for the attainment of the prerequisite for competition of Master of Business Administration course. We received faculty guidance of Dr. Isha Sharma.

The recommendations and proposed study are original and developed by taking into consideration the project data, feedback and reference material provided to us by KPMG. The submitted project is our own work and not been copied and the reference and citations for the referred source has been duly acknowledged.

S. No.	Name	PRN	Signature
1	Rahul Sahu	22020742014	
2	Sakshi Gupta	22020742016	
3	Vidit Gupta	22020742022	

Acknowledgement

We take this opportunity to extend our sincere thanks to Alligo Horizon Pvt Ltd Nashik for offering us this project to earn exposure and garner knowledge in the field of Six Sigma.

We wish to extend our sincere and heartfelt gratitude to our Industry Project guide, Mr. L Dashpute, for their constant encouragement and guidance during the course of our Project, without whose help and constant inspiration this project would not have been a success. Her way of explaining practical aspects of the project were phenomenal.

We thank our SIOM faculty guide Dr. Isha Sharma, from the bottom of our hearts for being there with us during the course of our project.

We are also thankful to Dr. Vandana Sonwaney (Director SIOM) for giving us such a wonderful opportunity to gain industry exposure.

We can say with conviction that we have immensely benefited from this prestigious association with Alligo Horizon Pvt Ltd.

Thank You All!!

Rahul Sahu – 014

Sakshi Gupta – 016

Vidit Gupta – 022

Introduction:

About Six Sigma:

Six Sigma is a transformative methodology that has revolutionized the way organizations approach quality management and process improvement. Rooted in a relentless pursuit of perfection, Six Sigma represents a powerful framework for achieving operational excellence, driving innovation, and enhancing customer satisfaction.

At its core, Six Sigma embodies a profound commitment to quality and efficiency, aiming to minimize defects, errors, and variations in processes to an extraordinary degree. Originating from Motorola in the 1980s and later refined and popularized by industry giants like General Electric, Six Sigma has become a globally recognized standard for excellence in numerous sectors spanning manufacturing, healthcare, finance, telecommunications, and beyond.
The essence of Six Sigma lies in its rigorous data-driven approach, which leverages statistical methods and analytical tools to uncover inefficiencies, identify root causes of problems, and implement targeted solutions. By meticulously measuring and analyzing process performance, organizations gain invaluable insights into areas for improvement, enabling them to make informed decisions and drive meaningful change.

Central to the Six Sigma methodology is the DMAIC framework: Define, Measure, Analyze, Improve, and Control. This structured approach provides a systematic roadmap for process improvement, guiding teams through the stages of defining project goals, quantifying performance metrics, diagnosing underlying issues, implementing solutions, and establishing controls to sustain improvements over time.

Moreover, Six Sigma emphasizes the importance of leadership commitment and organizational alignment in fostering a culture of continuous improvement. Strong leadership sponsorship ensures resource allocation, priority setting, and strategic alignment, while active engagement from cross-functional teams promotes collaboration, innovation, and ownership of improvement initiatives.

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By embracing Six Sigma principles and methodologies, organizations can unlock a multitude of benefits, including:

Enhanced Quality: Six Sigma enables organizations to achieve unprecedented levels of quality by systematically identifying and eliminating defects and variations in processes,

products, and services.

Improved Efficiency: By streamlining processes and reducing waste, Six Sigma drives greater efficiency and productivity, leading to cost savings and enhanced competitiveness.

Enhanced Customer Satisfaction: Six Sigma places a strong emphasis on understanding and meeting customer needs, resulting in products and services that consistently exceed customer expectations and foster long-term loyalty.

Data-Driven Decision Making: Six Sigma equips organizations with the tools and techniques needed to make evidence-based decisions, minimizing guesswork and maximizing the effectiveness of improvement efforts.

Sustainable Results: Through its focus on rigorous measurement, analysis, and control, Six Sigma empowers organizations to achieve sustainable improvements that endure over time, delivering lasting value to stakeholders.

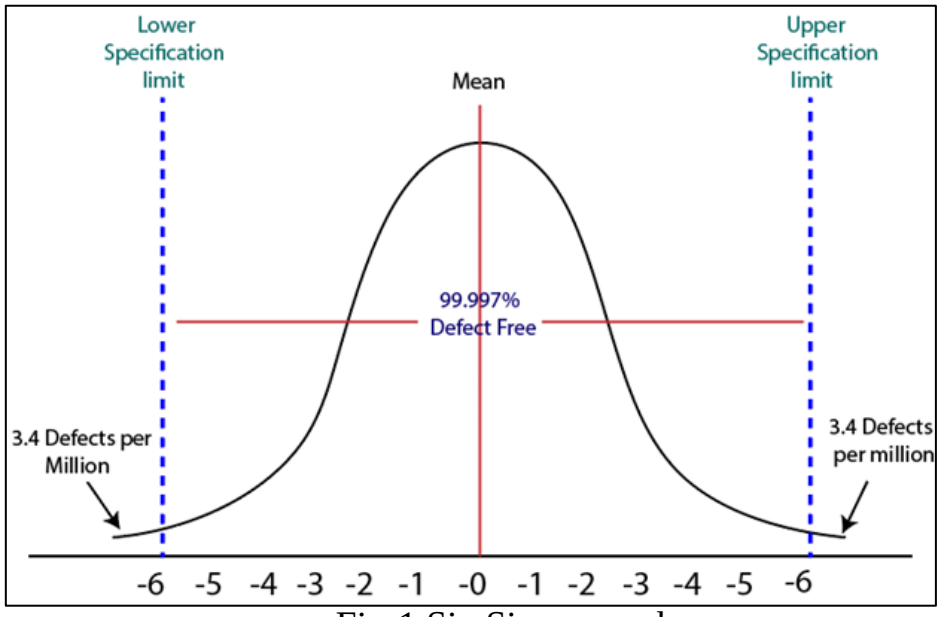

Fig-1 Six Sigma graph

DMAIC Process:

DMAIC is an acronym that stands for Define, Measure, Analyze, Improve, and Control. It is a structured methodology used in Six Sigma and other process improvement initiatives to guide teams through the phases of a project aimed at improving processes, products, or services. Each phase of DMAIC is carefully designed to ensure systematic problem-solving

and continuous improvement. It represents the five phases that make up the process:

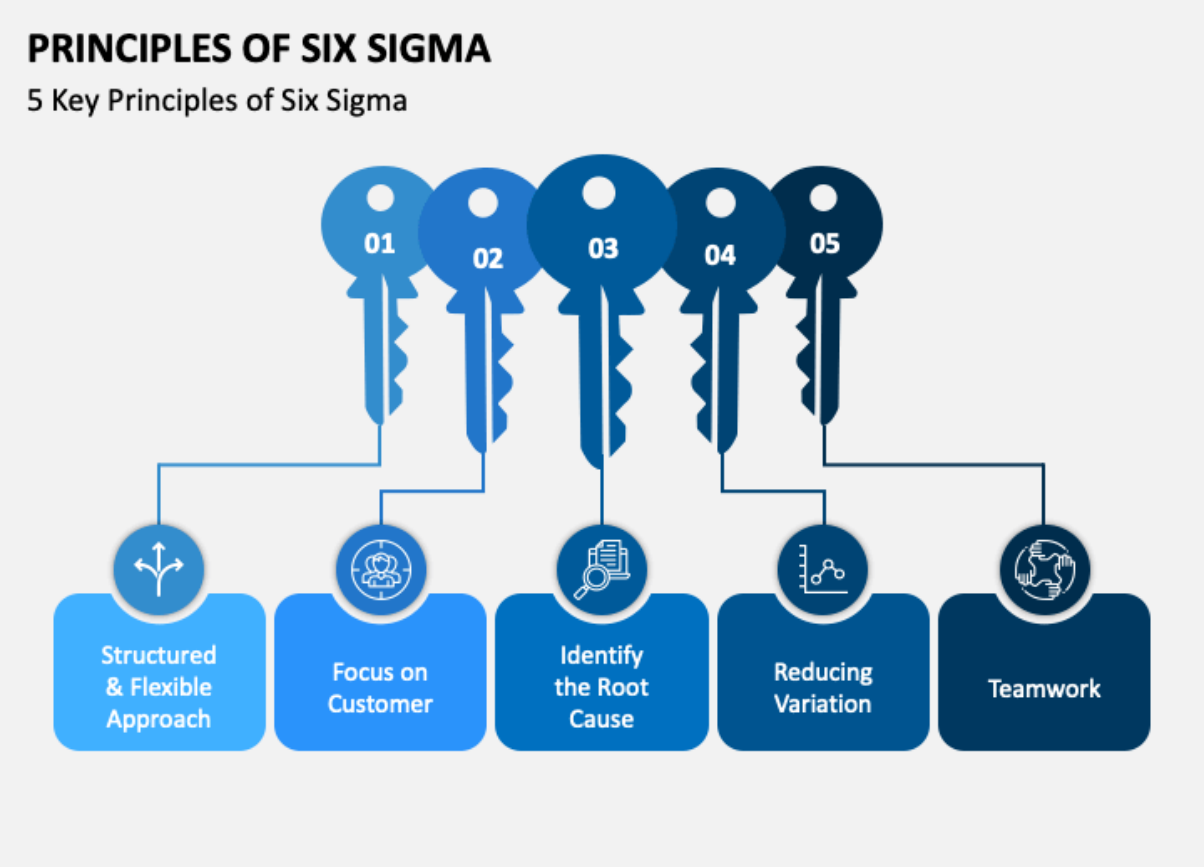

Fig-2 Principles of Six Sigma

1. **Define:** Establishing clear objectives, problem areas, and customer requirements is paramount for any improvement initiative. This is achieved through the creation of a project charter, outlining the project's focus, scope, and goals, alongside gathering insights from the voice of the customer to understand their needs and preferences. Additionally, utilizing tools like value stream mapping offers a comprehensive view of the process, identifying areas that require attention to meet customer expectations.

2. **Measure:** Once objectives are defined, the next step involves measuring the performance of the process. This is accomplished through various methods such as process mapping to document activities, capability analysis to assess process efficiency, and Pareto charts to prioritize issues based on their frequency of occurrence.

3. **Analyze:** Analysis of the process is crucial for uncovering the root causes of variation and poor performance. Techniques like root cause analysis (RCA), failure mode and

effects analysis (FMEA), and multi-vari charts aid in identifying underlying issues that contribute to defects or inefficiencies.

4. **Improve:** With a clear understanding of the problem areas, the focus shifts towards improving process performance by addressing root causes. Tools such as design of experiments (DOE) are employed to tackle complex problems with multiple influencing factors, while kaizen events facilitate rapid improvement by harnessing the insights and motivation of frontline workers.

5. **Control:** Finally, controlling the improved process and ensuring sustained performance is essential for long-term success. This involves implementing control plans to maintain process improvements, utilizing statistical process control (SPC) for ongoing monitoring, implementing strategies like 5S to create visually organized workplaces, and incorporating mistake-proofing techniques (poka-yoke) to prevent errors from occurring or immediately detect them when they do.

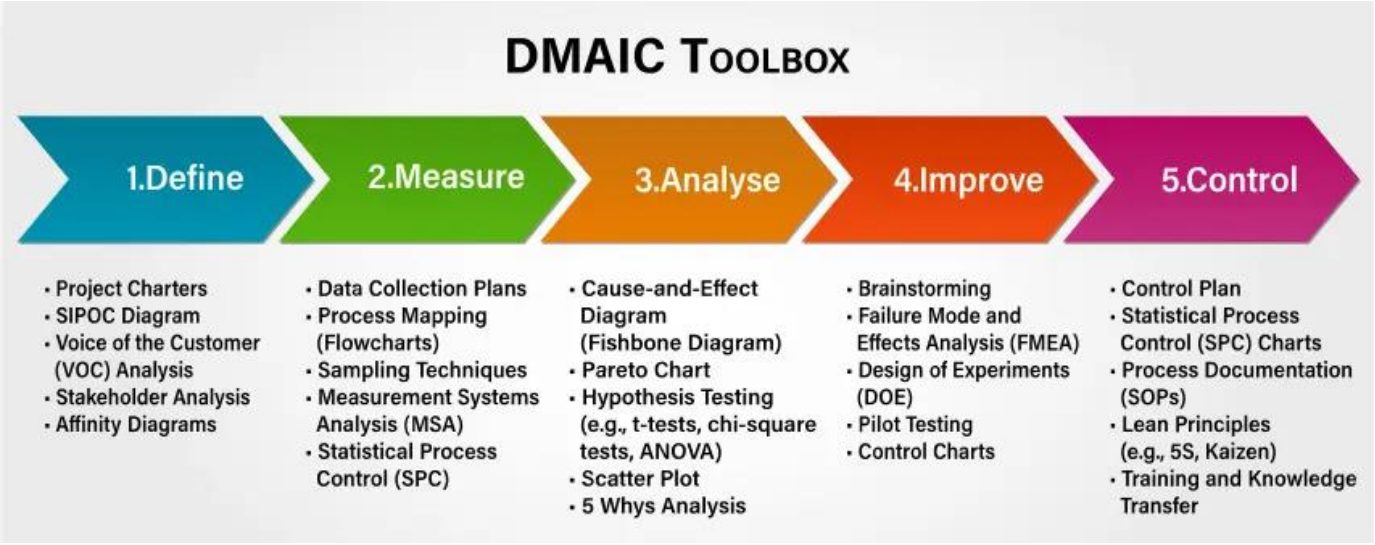

Fig- 3 DMAIC Toolbox

Company Profile:

The ethos of Horizon Group is deeply rooted in its commitment to embracing and surmounting challenges, continually expanding its horizons. Guided by a dedication to incessant innovation across technology, research, and production, we aspire to enrich every facet of nature, be it plants, animals, or human beings.

Since our inception in 1997, with our headquarters nestled in Nashik, Maharashtra, India, we have steadfastly pursued excellence in our endeavors. Our state-of-the-art manufacturing facility, situated in Dindori, Maharashtra, stands as a testament to our unwavering dedication to serving our clients' needs with utmost precision and efficiency. Our operations span across three distinct divisions, each meticulously crafted to deliver unparalleled value to our clientele.

At Horizon Group, we ardently embrace the philosophy of sustainable development for the betterment of society at large. Our focus is directed towards items of human consumption, driven by a vision where the food we consume not only nourishes but also enhances immunity and overall well-being. Whether vegetarian or non-vegetarian, we aspire for our food to serve as a potent source of nutrition and wellness, effectively functioning as medicine in its own right.

Success Story of Alligo Horizon:

1998-2000

Expansion of Product Range

Expanded Product range and applications in Electroplating Chemicals, Food Chemicals etc.

1997

Establishment of Horizon Enterprise

Establishment of a Proprietary firm Horizon Enterprise. Focused on trace elements to Poultry feed manufacturing groups

2008

Establishment of Horizon Agrotech

Established Horizon Agrotech to promote sulphates, chelates and various processing aids to Agro Industry on B2B platform. Soon we are known as one stop solutions in agro chemical industry.

2002-2008

Export of Fresh Fruits

Engaged in exporting Fresh fruits and Onions to European and Gulf countries.

2010

Certified Organic Inputs (Indocert , Aoca)

To expand our portfolio on organic front founded Alligo Agrovet Pvt. Ltd. With extensive research and production capacity we bought effective and innovative organic range for our existing and new clients

2009

Started Jobwork

Started job work for reputed companies and groups.

2014

Patented Products

Two patents were filed for organic Fungicide and Larvicide.

2013

Participated In International Exhibitions

Started participating in International Exhibition to target International Market.

2016

ISO Certified

The company is now ISO 9001: 2008 Certified and achieving set goal hedge ISO Standards

Established Dharti Foundation to endeavour social responsibility where suicide farmer`s kids' education and welfare is taken care

2015

License for Micronutrients and water soluble fertilizers

2019

Introduce Phero Lures in Indian Market

Introduce Phero Lures in Indian Market. Acquire Orgakart – Online shopping portal for certified organic inputs

2018

Organic Leader-IFOAM

Director Vivek Kapadnis Appointed as Organic leader ,IFOAM

Alligo Horizon Products:

Water Soluble fertilizers	
Sr. No.	**Product Name**
1	Calcium Nitrate Granular
2	NPK-19:19:19
3	Potassium Sulphate Powder (00:00:50)
4	Mono Potassium Phosphate (00:52:34)
5	Mono Ammonium Phosphate (12:61:00)
6	Potassium Nitrate (13:00:45)
7	Potassium Schoenite
8	N PK (13:40:13)

PGP Products	
Sr. No.	**Product Name**
1	SODIUM NITRO PHENOLATE
2	Bio-Nac NATCA Indian /Imp
3	Brassinolide Powder
4	Cytokine
5	IBA - Indole Butyric Acid
6	IAA (Indole Acetic Acid)
7	Da-6
8	PLANT GROWTH PROMOTER - PGP POWDER

Formulated Products	
Sr. No.	**Product Name**
1	Grogen 200
2	Stress Out
3	AQUA - T
4	Aqua - S
5	Ninja Formulated
6	Eraser formulated
7	Qprax

Micronutrients & other Products	
Sr. No.	**Product Name**
1	Zinc Sulphate Hepta
2	Ferrous Sulphate Hepta
3	Zinc Sulphate Monohydrate 33%
4	Potassium Humate Shiny Flakes
5	Super potassium F humate flakes 18 %
6	Amino Acid 80
7	Fulvic Acid
8	Manganese Sulphate
9	Magnesium Sulphate
10	Magnesium Sulphate Anhydrous - Dried
11	Di Sodium Octa Borate Imp/Indian
12	Sea Weed Extract Powder
13	EDTA Zinc 12%
14	Copper Sulphate Powder

Tender & AH	
Sr. No.	**Product Name**
1	Ferrous Sulphate Dry
2	Humic Acid Powder
3	Citric Acid Anhydrous
4	Sodium Sulphate
5	Dextrose Monohydrate
6	Vitamin E

Fig-4 Alligo Products List

Fig- 5 Alligo products

Six Sigma in Agriculture Chemical Manufacturing Industry:

As per the agriculture chemical industry classification benchmark, this industry sector includes the following subsectors –

Commodity Chemicals – Producers and distributors of simple chemical products that are primarily used to formulate more complex chemicals or products, including plastics and rubber in their raw form, fiberglass and synthetic fibers.

Specialty Chemicals – Producers and distributors of finished chemicals for industries or end users, including dyes, cellular polymers, coatings, special plastics and other chemicals for specialized applications. Includes makers of colorings, flavors and fragrances, fertilizers, pesticides, chemicals used to make drugs, paint in its pigment form and glass in its unfinished form.

Applications in fertilizer industry – Not many people are aware that the one of the most potent Six Sigma techniques named as Design of Experiments (covered in detail in our Black Belt training program) was first used in agriculture.

In the 1920s, Fisher created the statistical approach to Design of Experiments (DOE), and the data analysis tool – Analysis of Variance (ANOVA), while working at Great Britain's Rothamsted Agricultural Experimental Station.

Design of Experiments was first used in a major way outside agriculture in the late 1940s and early 1950s. Today the statistical approach to design of experiments is used in many areas like manufacturing and R&D, sales and marketing, and service.

One of the fundamental concepts in Six Sigma is – One should identify the critical controllable input factors and then find the best combination of those for desirable output. In agriculture, the quality and volumes of crop can be influenced by the use of best combination of factors such as crop rotation pattern, spacing between seeds, fertiliser selection etc.

Last few decades have witnessed a phenomenal increase in the fertilizer consumption in many countries. As a result farmers and governments have stepped up efforts to expand farm

production to feed the growing populations and increase agricultural exports. The major aim of these countries is to expand the agricultural output at a rapid pace as well as to improve the overall quality of the produce. Six Sigma has a number of applications in Fertilizers Industry which is an industry growing at a rapid pace across the world. IMC Global, one of the Leading Fertilizer companies across the world has adopted Six Sigma and is using it extensively to deliver high quality of products & services to its customers. Six Sigma is used across the organization to improve and streamline procedures with an objective to yield high quality produce. The company believes in “feed the land that feeds the world”.

Six Sigma tools like ANOVA and DoE have huge applicability in Fertilizer Industry. Using these tools, the impact of type and quantity of fertilizer variants on Crop Yield can be studied. In India it will be critical to increase the produce/unit of land since the demand for food is going up considerably. Moreover, the quality of produce is also increasingly becoming a central theme with more and more people getting health conscious. This is the right time to utilize the benefits of Six Sigma in the Fertilizer Industry.

Implementing Six Sigma principles in an agricultural chemical manufacturing company can yield significant benefits, enhancing product quality, efficiency, and customer satisfaction. Here's how Six Sigma can be applied in such a context:

1. **Quality Improvement**: Six Sigma emphasizes the reduction of defects and variations in processes. In an agricultural chemical manufacturing company, this translates to ensuring that products meet strict quality standards, free from impurities or inconsistencies. By implementing rigorous quality control measures and utilizing statistical tools for process optimization, the company can minimize defects and ensure consistent product quality.

2. **Process Optimization**: Six Sigma encourages the systematic analysis and optimization of processes to improve efficiency and productivity. In agricultural chemical manufacturing, this may involve streamlining production processes, optimizing raw material usage, and reducing waste. Through techniques such as process mapping, value stream analysis, and lean principles, the company can identify bottlenecks, eliminate non-value-added activities, and enhance overall process efficiency.

3. **Customer Satisfaction**: Understanding and meeting customer needs are central to Six Sigma principles. In the agricultural sector, customers may include farmers, agricultural distributors, and other stakeholders. By conducting thorough market research and gathering customer feedback, the company can identify key requirements and tailor its products to meet customer expectations. This could involve developing new formulations, improving packaging, or providing additional services such as technical support or training.

4. **Supply Chain Optimization**: Six Sigma encourages collaboration and continuous improvement across the entire supply chain. For an agricultural chemical manufacturing company, this means optimizing supplier relationships, ensuring timely delivery of raw materials, and minimizing inventory costs. By implementing supply chain management techniques such as just-in-time (JIT) inventory systems and supplier quality management, the company can improve overall supply chain efficiency and reduce costs.

5. **Risk Management**: Six Sigma provides tools and methodologies for identifying and mitigating risks. In the agricultural chemical industry, this could involve managing regulatory compliance, addressing environmental concerns, and ensuring product safety. By conducting risk assessments, implementing robust quality control processes, and adhering to industry standards and regulations, the company can minimize risks associated with product manufacturing and distribution.

6. **Continuous Improvement Culture**: Finally, Six Sigma promotes a culture of continuous improvement and learning. By fostering a mindset of innovation and adaptation, the company can remain agile and responsive to changing market conditions and customer needs. Encouraging employee involvement, providing training and development opportunities, and recognizing and rewarding successful improvement initiatives can help embed a culture of continuous improvement throughout the organization.

Overall, implementing Six Sigma principles in an agricultural chemical manufacturing company can lead to improved product quality, streamlined processes, enhanced customer satisfaction, and sustainable business growth. By embracing Six Sigma methodologies and tools, the company can achieve operational excellence and maintain a competitive edge in the dynamic agricultural industry.

DEFINE:

In the context of creating a Standard Operating Procedure (SOP), the Define phase, being the initial stage in the Six Sigma improvement process, is crucial for its success. As the name implies, its primary focus is on delineating the problem and setting clear objectives for the project. Typically, the Define phase spans approximately 2 to 3 weeks, during which various tasks are undertaken to establish the project's framework. This phase encompasses several concepts and techniques within Six Sigma, all aimed at defining the project's scope and direction. Its significance lies in laying the groundwork for the subsequent stages of the DMAIC process. During the Define phase, the team typically performs the following activities:

1. **Define the problem or opportunity**: The team identifies the issue or opportunity that needs to be addressed. They define the problem statement, which clearly states the issue and its impact on the organization.
2. **Define project scope and goals**: The team define the scope of the project and sets goals that are specific, measurable, achievable, relevant and time-bound.
3. **Identify stakeholders**: The team identifies the stakeholders who will be affected by the project and their expectations.
4. **Develop a project charter**: The team prepares a project charter that documents the problem statement, project scope, goals, objectives, and team roles and responsibilities.
5. **Analyze the Standard Operating Procedure (SOP) :** The team analyzed SOP & identifies the problems or the process which were not following by the work force.

The Define phase holds significant importance as it provides the essential direction for the entire project. Without a comprehensive grasp of the problem, scope, and objectives, the project team's ability to effectively measure, analyze, and improve the process is compromised. Additionally, the Define phase serves to validate that the team is addressing the correct issue and that their endeavors are harmonized with the requirements of the organization and its stakeholders.

Problem Statement:

- The current standard operating procedures (SOPs) at Alligo Horizon Pvt Ltd need review for better operational efficiency and integration within different departments.
- The project aims to optimize these SOPs through Six Sigma methodologies to streamline processes, reduce waste, and enhance overall operational performance.

Project Charter:

A project charter is a document that formally authorizes the start of the project. It is a high-level overview of the project, outlining its objectives, scope, timeline, deliverables, and key stakeholders. The project charter typically includes the following information:

1. Project Purpose: A brief description of the project's goals and objectives.
2. Project Scope: A definition of what is and isn't included in the project.
3. Deliverables: The expected outcomes of the project.
4. Timeline: A high-level overview of the project's schedule and key milestones
5. Budget: The estimated cost of the project (if applicable)
6. Key stakeholders: The individuals and groups who have a vested interest in the project's outcome.
7. Risk and assumptions: A list of potential risks to the project's success and any assumptions made during the planning process.
8. Project manager and team: The person or team responsible for managing and executing the project.

Project Charter

Optimization of Standard Operating Procedures (SOPs) through Six Sigma Methodologies at Alligo Horizon Pvt Ltd

Project Objective	Problem Statement
To optimize existing Standard Operating Procedures (SOPs) through the application of Six Sigma methodologies. To enhance process efficiency by identifying and eliminating root causes of defects. To reduce defects in product or service delivery through improved SOPs. To establish a culture of continuous improvement within Alligo Horizon Pvt Ltd.	The current standard operating procedures (SOPs) at Alligo Horizon Pvt Ltd need review for better operational efficiency and integration within different departments. The project aims to optimize these SOPs through Six Sigma methodologies to streamline processes, reduce waste, and enhance overall operational performance.
Project Risk	**Project Team**
Resistance to Change: Resistance from employees to adopt new SOPs. Resource Constraints: Limited resources for implementing new SOPs. Operational Disruption: Potential disruptions during the implementation phase.	Sakshi Gupta Vidit Gupta Rahul Sahu

PROJECT MANAGER

Name	Role
Mr. Laxmikant Dashpute	Director - Business Development
Phone no.	e-mail address
8087477795	dirBD@alligohorizon.com
Start date	End Date
16-Jan-24	08-Mar-24

Stakeholder

Alligo Horizon Pvt Ltd	
Management	
Employees	
Customers	

Project Scope	Future Scope
The project will focus on analyzing current SOPs, identifying areas for improvement, implementing Six Sigma methodologies to optimize SOPs, and measuring the impact of these changes on process efficiency and defect reduction.	Implement advanced technologies like automation and data analytics for enhanced efficiency. Explore broader sustainability initiatives beyond current focus areas. Conduct ongoing training and development programs for sustained improvement.

	Consider expanding circular economy principles to other aspects of the company's operations. Collaborate with external partners for knowledge exchange and best practices.

Fig-6 : Project Charter

Measure Phase:

In the Measure phase of our Six Sigma project with Alligo Horizon Pvt Ltd, we focused on quantifying the current performance of the processes identified in the Define phase. This phase was crucial for establishing a baseline and identifying the extent of the problem. Here's how we structured this phase:

1. **Data Collection Plan:** We developed a plan to collect relevant data to measure the performance of the processes. This included determining what data needed to be collected, how it would be collected, and who would be responsible for data collection.
2. **Process Mapping:** We created detailed process maps for the processes under study. This helped us visualize the steps involved, identify potential areas of waste or inefficiency, and determine where to focus our measurement efforts.
3. **Data Collection:** We collected data on key process metrics identified in the Define phase. This included cycle times, defect rates, lead times, and other relevant measures. We ensured that the data was accurate, reliable, and representative of the process performance.
4. **Data Analysis:** We analyzed the collected data to understand the current state of the processes. We used statistical tools such as histograms, Pareto charts, and control charts to identify patterns, trends, and sources of variation.
5. **Baseline Performance:** We established a baseline performance for the processes based on the data collected. This served as a reference point for evaluating the impact of our improvement efforts.
6. **Documentation:** We documented all our findings, including data collection methods, analysis results, process maps, and any other relevant information. This documentation was essential for the next phases of the project.
7. **Review and Validation:** We reviewed the measurement results with our project team and stakeholders to validate the findings. We ensured that everyone was aligned on the current state of the processes before proceeding to the next phase.
8. **Risk Assessment:** We identified any risks or challenges associated with the measurement phase and developed mitigation strategies to address them.

Data Collected:

1.) We have collected available SOPs of different department which were

a. Pkg & dispatch
b. Store department SOP
c. SOP for the Marketing department
d. SOP for QC Department

2.) Sales data is collected for the past 3 months to get more insights related to the fast and slow moving products and other related insights.

Rank	Product name	Nov-2023	Dec-2023	Jan-2024	Feb-2024	Total sum of quantity	Average per month	Total Sum of Net Amount	Rank %	Net Value	Cumulative Net value	ABC Class	Deviation	Coefficient Variation	XYZ Class	ABC-XYZ
1	Calcium Nitrate Granular	267500	266375	6025	2600	542500	135625	15252500	1%	11%	11%	A	151633.8	112%	Z	AZ
2	NPK-19:19:19	48515	73725	127750	500	250490	62622.5	12786393.5	1%	10%	21%	A	52987.68	85%	Z	AZ
3	Mono Ammonium Phosphate (12:61:00)	52695	38525	5825	5700	102745	25686.25	8302920	2%	6%	27%	A	23722.18	92%	Z	AZ
4	Potassium Nitrate (13:00:45)	18395	44275	32900	175	95745	23936.25	8145696.5	2%	6%	33%	A	19055.32	80%	Y	AY
5	Mono Potassium Phosphate (00:52:34)	14580	31200	5175	4275	55230	13807.5	6421350	3%	5%	38%	A	12496.46	91%	Z	AZ
6	Vitamin E	0	3000	0	500	3500	875	5840000	3%	4%	42%	A	1436.141	164%	Z	AZ
7	Zinc Sulphate Monohydrate 33%	26150	4750	44300	6700	81900	20475	5800750	4%	4%	47%	A	18590.88	91%	Z	AZ
8	Potassium Schoenite	22950	40200	106000	0	169150	42287.5	5678000	4%	4%	51%	B	45555.14	108%	Z	BZ
9	Ferrous Sulphate Dry	25650	68100	97800	27650	219200	54800	5317450	5%	4%	55%	B	34702.23	63%	Y	BY
10	Bio Stimulant	4260	3010	3180	0	10450	2612.5	3946200	5%	3%	58%	B	1827.519	70%	Y	BY
11	Potassium Sulphate Powder (00:00:50)	11420	35650	1800	250	49120	12280	3125273.5	6%	2%	60%	B	16344.7	133%	Z	BZ
12	Copper Sulphate Powder	300	12550	750	400	14000	3500	2806600	7%	2%	62%	B	6036.417	172%	Z	BZ
13	Zinc Sulphate Hepta	39650	12550	18300	6000	76500	19125	2710900	7%	2%	64%	B	14576.84	76%	Y	BY
14	Super potassium F humate flakes 18 %	8150	9625	8925	1150	27850	6962.5	2634700	8%	2%	66%	B	3921.548	56%	Y	BY
15	NPK Fertiliser	2000	31900	0	0	33900	8475	2036300	8%	2%	68%	B	15645.1	185%	Z	BZ
16	Potassium Humate Shiny Flakes	8825	12300	6300	650	28075	7018.75	1907393	9%	1%	69%	B	4906.856	70%	Y	BY
17	EDTA Zinc 12%	5000	275	3175	0	8450	2112.5	1793850	9%	1%	70%	B	2401.779	114%	Z	BZ
18	Di Sodium Octa Borate	4100	6525	180	40	10845	2711.25	1675170	10%	1%	72%	B	3163.127	117%	Z	BZ
19	Humic Acid Powder	2150	10825	16500	200	29675	7418.75	1658075	10%	1%	73%	B	7614.498	103%	Z	BZ
20	Amino Acid 80	6640	2260	2060	40	11000	2750	1618760	11%	1%	74%	B	2780.432	101%	Z	BZ
21	Sea Weed Extract Powder	1780	1440	1240	1780	6240	1560	1460900	11%	1%	75%	B	266.8333	17%	X	BX
22	Ferti Earth	53	82	121	6	262	65.5	1440850	12%	1%	76%	B	48.47336	74%	Y	BY
23	Amihume Plus Plus	13	5	158	9	185	46.25	1286650	13%	1%	77%	B	74.57155	161%	Z	BZ
24	Fulvic Acid	2387	2049	13198	325	17959	4489.75	1271975	13%	1%	78%	B	5875.304	131%	Z	BZ
25	Stress Out	240	3200	2000	600	6040	1510	1209240	14%	1%	79%	B	1358.578	90%	Z	BZ
26	Shyam samrudhi FF	0	5000	7158	7000	19158	4789.5	1150620	14%	1%	80%	B	3340.645	70%	Y	BY
27	Grogen 200	11920	220	6600	0	18740	4685	974000	15%	1%	81%	B	5712.498	122%	Z	BZ
28	Manganese Sulphate	5600	11200	2500	2050	21350	5337.5	943050	15%	1%	81%	B	4214.929	79%	Y	BY
29	Eddha Fe	200	250	683	1225	2358	589.5	895445	16%	1%	82%	B	475.9457	81%	Z	BZ
30	Horimin B - Poultry Mineral Mix	4400	4900	6500	0	15800	3950	857100	16%	1%	83%	B	2781.486	70%	Y	BY
31	Biogrow - L	5000	0	40	0	5040	1260	809200	17%	1%	83%	B	2493.405	198%	Z	BZ
32	Phosphoric Acid	5130	525	0	430	6085	1521.25	778820	17%	1%	84%	B	2416.652	159%	Z	BZ
33	NPK 28:28:00	12000	0	0	0	12000	3000	726000	18%	1%	84%	B	6000	200%	Z	BZ
34	Fertifung	0	0	0	11000	11000	2750	715000	18%	1%	85%	B	5500	200%	Z	BZ
35	Dextrose Monohydrate	0	6250	200	6200	12650	3162.5	692400	19%	1%	85%	B	3537.272	112%	Z	BZ
36	Aqua - S	1300	1050	200	1000	3550	887.5	681250	20%	1%	86%	B	476.7512	54%	Y	BY
37	Yeast Extract	25	100	25	2100	2250	562.5	635875	20%	0%	86%	B	1025.61	182%	Z	BZ
38	Polysorbate	50	3050	100	500	3700	925	601500	21%	0%	87%	B	1430.909	155%	Z	BZ
39	Boric Acid	400	2050	3300	0	5750	1437.5	586600	21%	0%	87%	B	1526.093	106%	Z	BZ
40	Organic Liquid Fertilizer	20000	0	0	0	20000	5000	580000	22%	0%	88%	B	10000	200%	Z	BZ

Fig-7: Sales Data Analysis: ABC-XYZ analysis

Class range	class
50%	X
80%	Y
80+%	Z

Total no. of item	184
sum of all net value	$ 13,41,59,472

CODE	Range	ITEMS	% ITEMS	
A	50.00%	7	4%	50%
B	90.00%	39	21%	40%
C	>91%	138	75%	10%
		184		

Demand variation

Cost		X	Y	Z
	A	AX	AY	AZ
		0	1	6
	B	BX	BY	BZ
		1	11	27
	C	CX	CY	CZ
		4	8	126

Fig-8: Data Analysis result

	A	B	C
X	High value percentage Continuous Demand High Predictive value	Average value percentage Continuous Demand High Predictive value	Low value percentage Continuous Demand High Predictive value
Y	High value percentage Fluctuating demand Average predictive value	Average value percentage Fluctuating demand Average predictive value	Low value percentage Fluctuating demand Average predictive value
Z	High value percentage Irregular demand Low predictive value	Average value percentage Irregular demand Low predictive value	Low value percentage Irregular demand Low predictive value

Fig-9: ABC-XYZ explanation

3.) Interviews were taken of the stakeholders:

INTERVIEWS

Interviewee Name: Mr. Abhishek
Designation: Factory Manager

Ques. Can you provide an overview of the current waste management practices in the factory?

Response: Currently, our waste management practices are not in place but we are thinking to primarily focus on waste segregation at the source and sending recyclable materials to local recycling facilities. We are also thinking to have a system in place for managing hazardous waste in compliance with regulations.

Ques. What are the major challenges you face in managing waste effectively?
Response: One of the major challenges we face is the lack of awareness among employees about proper waste management practices. Additionally, we sometimes struggle with limited space for storing recyclable materials before they are collected.

Ques. How do you currently track and measure waste generation in the factory?
Response: We track waste generation through manual records kept by our waste management team. They record the types and quantities of waste generated each day, which helps us monitor our progress towards waste reduction goals. But because of the manual work there are errors many times.

Ques. Are there any specific initiatives or projects related to waste management that you have implemented in the past?
Response: "Yes, we have implemented a project to reduce packaging waste by switching to more sustainable packaging materials. We have also conducted training sessions for employees to raise awareness about the importance of waste management.

Ques. How do you ensure compliance with waste management regulations and standards?
Response: We ensure compliance by regularly reviewing and updating our waste management procedures to align with regulations. We also conduct internal audits to identify any areas of non-compliance.

Ques. What are your goals and objectives for improving waste management in the factory?
Response: Our main goal is to reduce waste generation and increase recycling rates. We aim to achieve this by implementing more efficient waste management practices and raising awareness among employees.

Ques. How do you envision the future of waste management in the factory?
Response: In the future, we hope to implement more advanced waste management technologies, such as waste-to-energy systems, to further reduce our environmental impact. We also plan to collaborate with external partners to explore new recycling opportunities.

Ques. What support or resources do you need to enhance waste management practices in the factory?
Response: We would appreciate more support in terms of training and education for employees on waste management best practices. Additionally, additional resources for waste segregation and storage would be beneficial.

Ques. Any Specific problem you are facing here?
Response: Yes, The major is labour shortage, space constrains, and Shifting of warehouse to other location in upcoming years hold us too implement technologies.

Interview2

Group of Ladies Worker who helps in packaging and labeling

Q: Can you describe your role in the packaging and labeling process?

Response: Our primary role is to ensure products are correctly packaged and labeled according to the specified requirements.

Q: How do you currently handle waste generated during the packaging and labeling process?

Response: We segregate the waste into different bins for recyclable and non-recyclable materials. We also try to minimize waste by using packaging materials efficiently.

Q: Have you received any training or guidance on waste management practices?

Response: We have received some training on waste segregation and the importance of reducing waste. We try our best to apply these practices in our daily work.

Q: Are there any challenges you face in managing waste effectively?

Response: One challenge we face is the limited space for waste bins, which sometimes results in overflow. Additionally, some workers may not be fully aware of the importance of waste segregation, leading to contamination of recyclable materials.

Q: How do you think waste management practices can be improved in your work area?

Response: We believe that providing more bins for waste segregation and regular training sessions on waste management would help improve practices. Also, having clearer guidelines on how to handle different types of waste would be beneficial.

Q: Do you have any suggestions for reducing waste in the packaging and labeling process?

Response: One suggestion is to use more eco-friendly packaging materials that can be recycled or reused. Also, reducing the use of excessive packaging can help minimize waste.

Q: How do you think waste management practices can be made more efficient overall in the factory?

Response: Implementing a system for monitoring waste generation and setting targets for waste reduction can make practices more efficient. Also, involving workers in decision-making processes related to waste management can lead to better implementation of practices.

Q: What improvements would you like to see in waste management practices in the future?

Response: We would like to see more emphasis on reducing waste at the source and finding innovative ways to reuse or recycle materials. Also, more awareness campaigns on waste management for workers would be helpful.

After thorough analysis and frequent visits to the facility, these were the deviation found with different department SOPs

- Deviation from SOP or Not followed by Team for **Packaging & Dispatch** Department: -

    - **Dispatch Error**: Incorrect quantities or items being dispatched due to errors in the packing process. Sometimes, they did not weigh the material properly.
    - **Ontime Record Keeping:** Ontime record keeping was absent. Inaccurate or incomplete record-keeping leads to confusion and inefficiencies in the packaging department.

- Deviation from SOP or Not followed by Team for **Store** Department: -

    - Store person shall wear safety protective equipment like hand gloves, safety shoes, safety goggles, and safety nose mask while dispensing of material. **(mentioned in SOP but not followed)**

- Deviation from SOP or Not followed by Team for **Quality Control** Department: -

    - Existing product development/ Updation: Working on existing products regularly and updating the product to the best quality.
    - This was missing as both the quality check personnel mostly occupy with regular quality checks, hampering the R&D of Products.

- Deviation from SOP or Not followed by Team for **Marketing** Department: -

    - Marketing SOP is so detailed, and good coverage of processes or steps are included.

Analysis and Suggestions Phase

The Analysis and Suggestions Phase is a critical stage in the Six Sigma methodology, where the focus shifts to analyzing the data collected in the Measure phase to identify root causes of problems and develop targeted solutions for improvement. This phase is essential for driving meaningful change and achieving the project objectives.

1. Root Cause Analysis (RCA): Conducting a thorough root cause analysis is key to understanding the underlying issues that contribute to process inefficiencies or defects. We used techniques such as fishbone diagrams, 5 Whys, and Pareto analysis to identify the root causes of problems identified in the Measure phase. By systematically analyzing the data, we were able to pinpoint the factors that were most critical to addressing for process improvement.

2. Data Analysis: We further analyzed the data collected in the Measure phase using statistical tools and techniques to gain deeper insights into process performance. We used tools such as regression analysis, hypothesis testing, and correlation analysis to identify patterns, trends, and relationships in the data. This analysis helped us validate our findings from the Measure phase and identify areas for improvement.

3. Process Mapping: Process mapping was revisited in this phase to incorporate the insights gained from the data analysis. We updated the process maps to reflect the current state of the processes and highlight areas where changes were needed. This helped us visualize the impact of our proposed solutions on the overall process flow.

4. Solution Development: Based on the root cause analysis and data analysis, we developed targeted solutions to address the identified issues. These solutions were aimed at improving process efficiency, reducing waste, and enhancing overall operational performance. We ensured that the solutions were practical, feasible, and aligned with the organization's goals and objectives.

5. ABC-XYZ Analysis: This analysis helped us prioritize the solutions based on their potential impact and feasibility.

6. Risk Assessment: Identifying and mitigating risks associated with the proposed solutions was an important part of the analysis phase. We conducted a thorough risk assessment to anticipate potential issues and develop contingency plans to address them. This helped us minimize the likelihood of project delays or failures due to unforeseen circumstances.

7. Stakeholder Engagement: Engaging stakeholders throughout the analysis phase was essential to ensure that their feedback and perspectives were considered in the decision-making process. We kept stakeholders informed of our progress, sought their input on proposed solutions, and addressed any concerns or questions they had. This helped build buy-in and support for the project.

8. Documentation: Documenting all our findings, including the root cause analysis, data analysis results, proposed solutions, cost-benefit analysis, and risk assessment, was essential. This documentation served as a record of our work and provided a basis for communicating our findings to stakeholders and implementing the proposed solutions.

9. Review and Validation: We reviewed our analysis and suggestions with our project team and stakeholders to validate the findings. It was important to ensure that everyone was aligned on the proposed solutions before moving forward with implementation.

Overall, the Analysis and Suggestions Phase was instrumental in identifying root causes of problems, developing targeted solutions, and laying the groundwork for the implementation phase. The insights gained from this phase informed our decision-making process and set the stage for achieving our project objectives.

Objective:

• The objective was to analyze collected data to identify root causes of inefficiencies and waste generation and develop suggestions and recommendations for improvement based on data analysis.

Activities:

• Root cause analysis was conducted using tools like Fishbone diagrams and 5 Whys.
• Root causes were prioritized based on impact and feasibility of improvement.
• Potential solutions to address identified root causes were generated.
• Selected solutions were pilot tested, and feedback was gathered for further refinement.

Outcome:

• Identification root causes of inefficiencies and waste generation.
• Developing suggestions and recommendations for improvement.

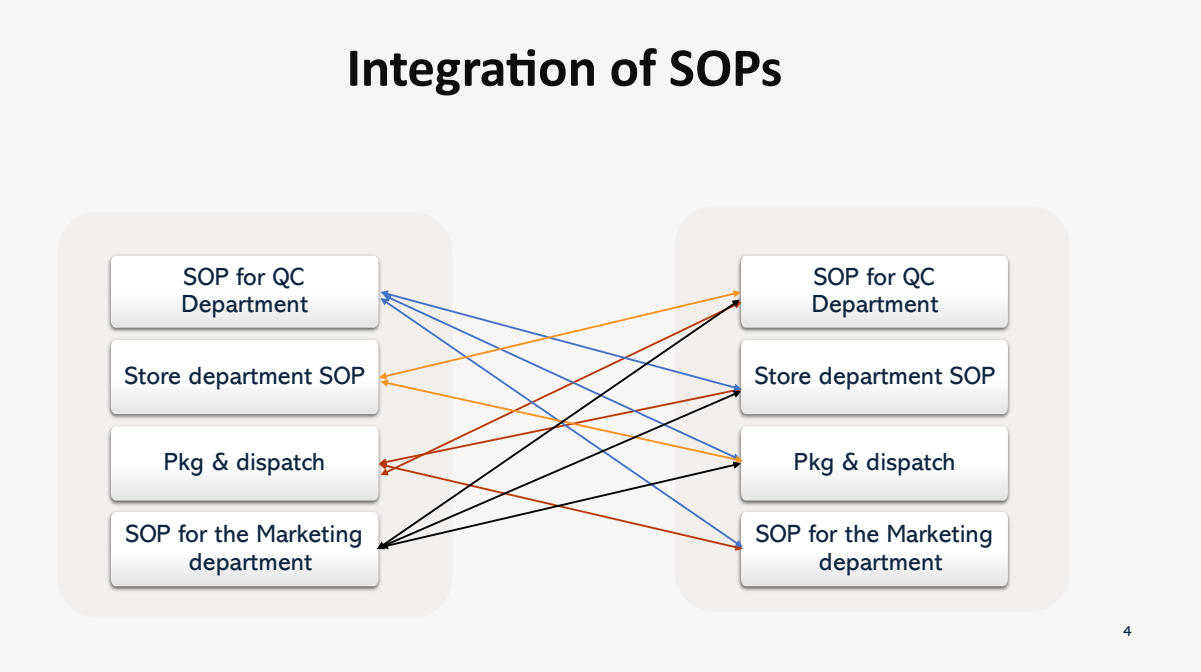

Fig-10: Integration of SOPs within different department

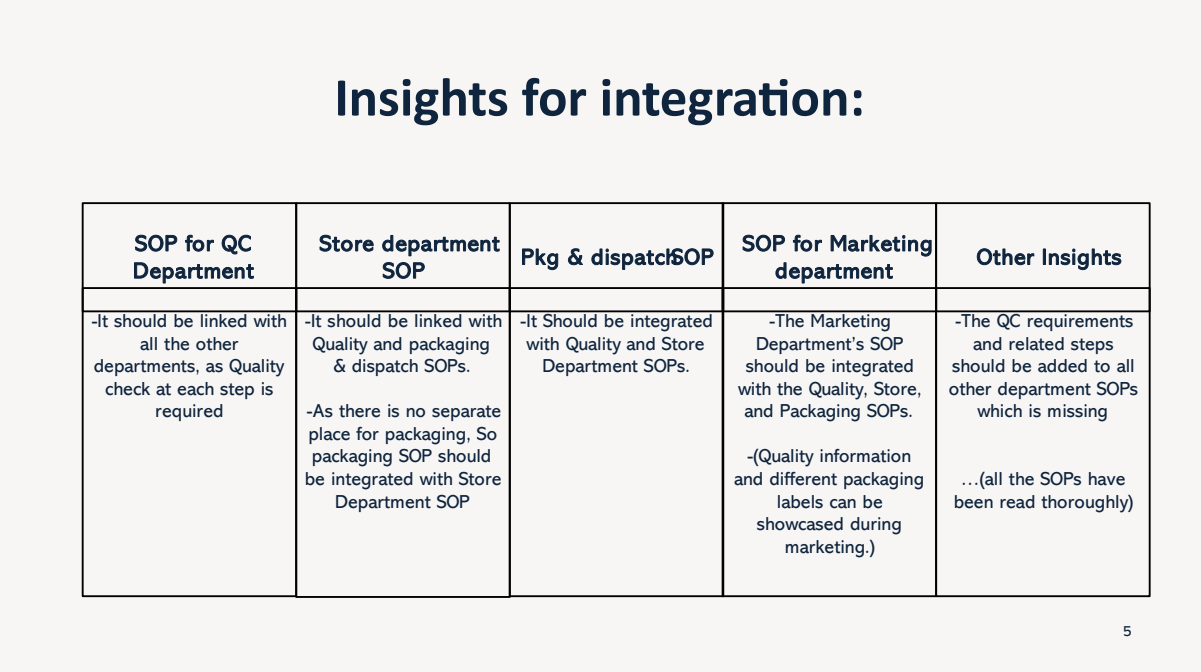

Fig-11: Insights for integration

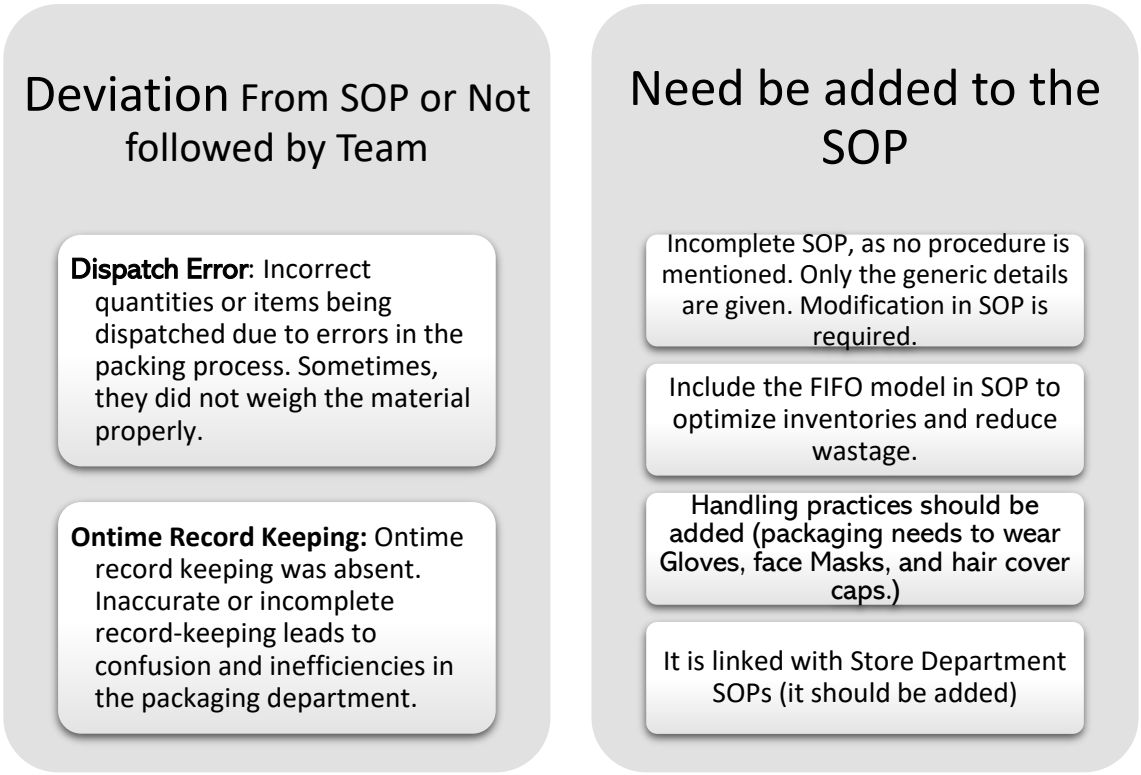

Fig-12: Packaging & dispatch SOP deviations and suggestions

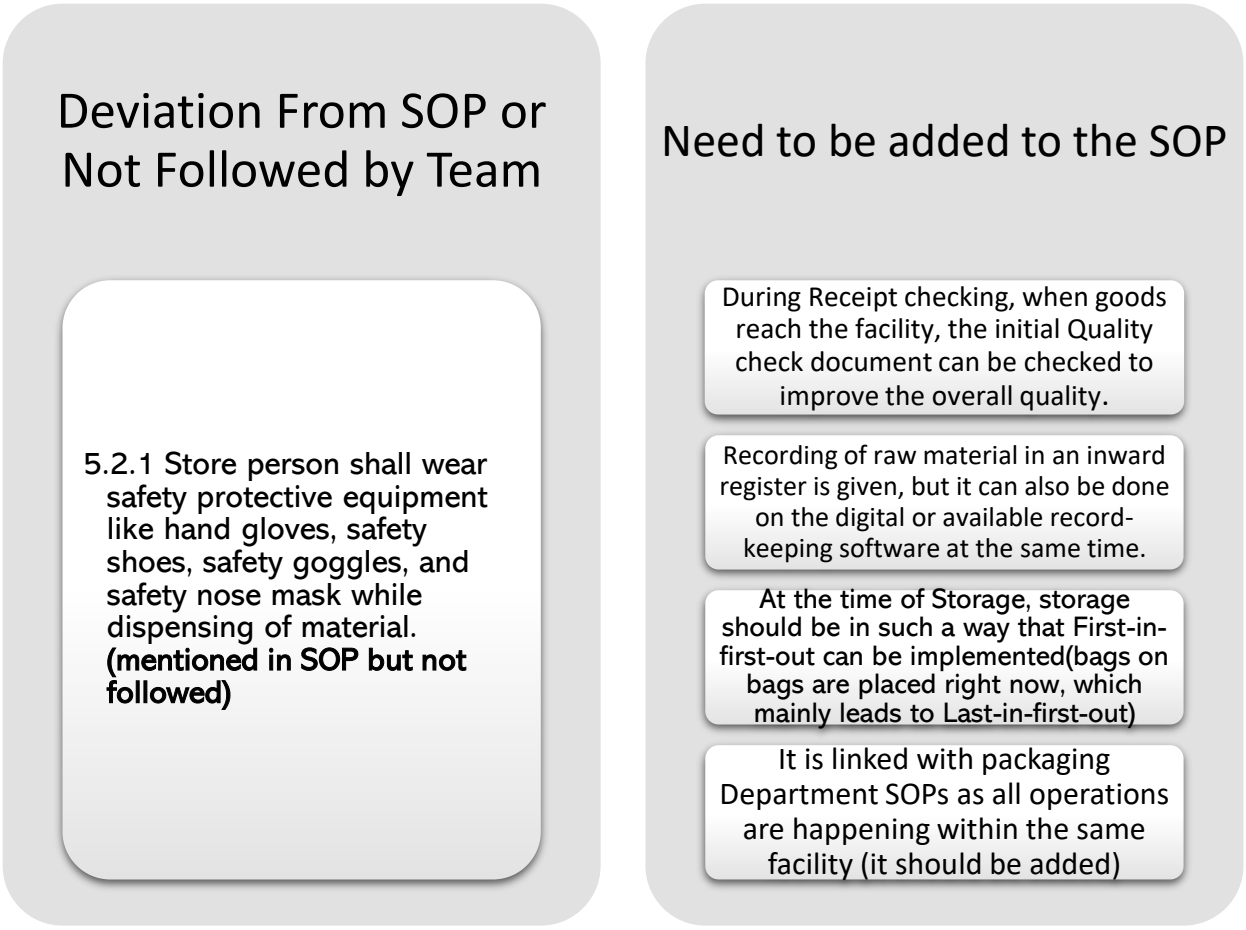

Fig-13: Store department SOP deviation and suggestion

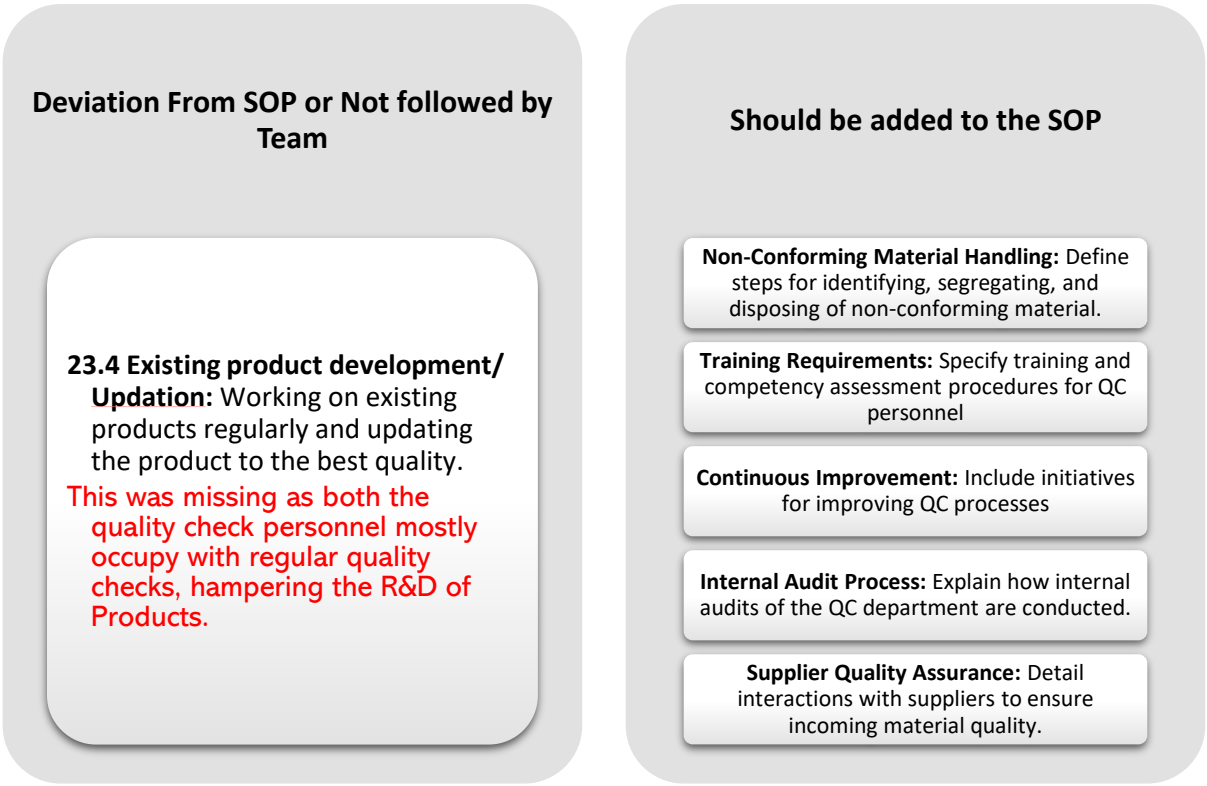

Fig-14: QC department SOP deviation and suggestions

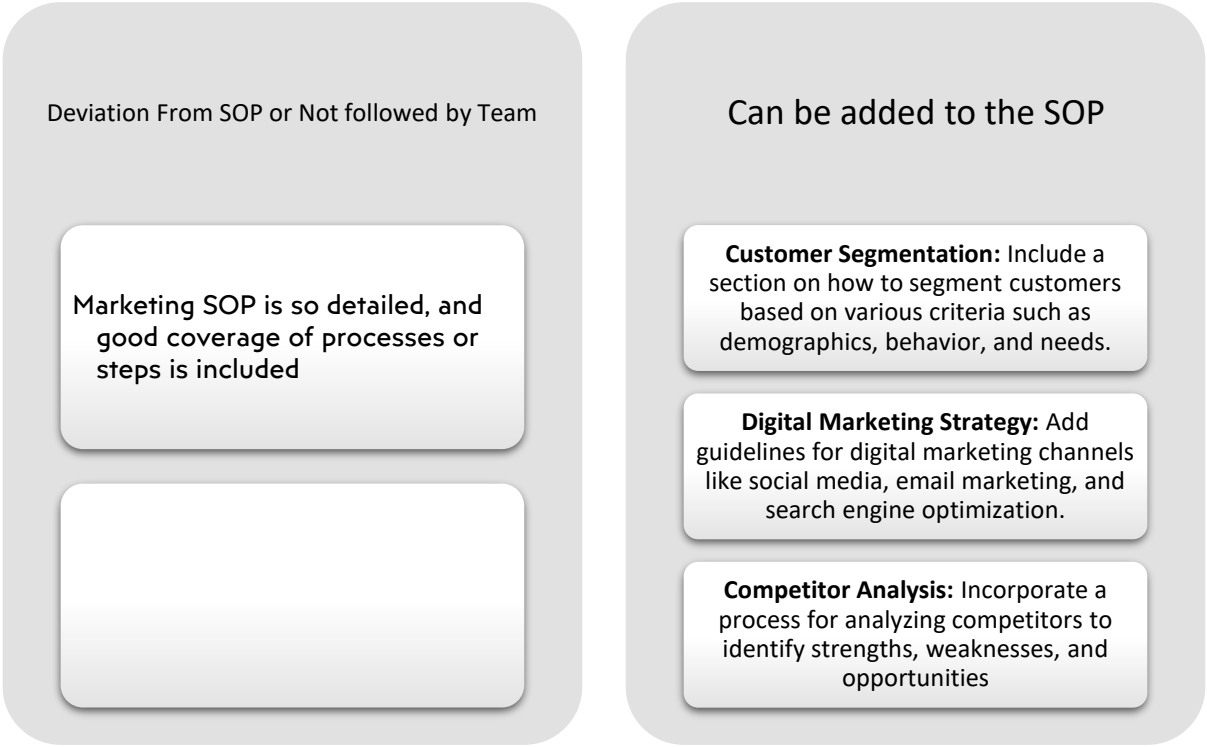

Fig-15: Marketing department SOP suggestions

TOOLS for Measurement:

Inventory Management Systems: Implement software solutions to track the storage and movement of packaging materials.

Quality Control Checks: Implement quality control measures to monitor product damage during and after the packing process.

Kanban Systems: Utilize technology to track and verify dispatch quantities accurately.

Record-Keeping Software: Implement digital record-keeping systems to ensure accurate and comprehensive documentation.

Safety Audits: Conduct regular safety audits to identify and address workplace hazards.

Time Management: If there will be more than one container at a time then the duration for loading & unloading will increase which leads to increase in cost as well.

Predictive Outcomes:

Improved Efficiency:

By identifying and addressing inefficiencies in the packing process, overall productivity and efficiency can be enhanced.

Reduced Dispatch Errors:

Utilizing barcode systems can minimize dispatch errors, leading to fewer customer complaints and returns.

Enhanced Compliance: Accurate and comprehensive record-keeping can facilitate compliance with regulations and standards.

Reduced Workplace Accidents:

Proactively addressing workplace hazards and ensuring safety precautions are followed can lead to a decrease in workplace accidents and injuries

Time & Cost Reduction:

With the different bay of loading & unloading the time and money both can be saved.

Implementation Phase:

In the Implementation phase, the focus is on executing the solutions developed in the Analyze phase and integrating them into the organization's operations. This involves several key steps:

1. **Developing an Implementation Plan:** A detailed plan outlining the steps, resources, and timeline for implementing the proposed changes is created. This plan includes assigning responsibilities to team members, setting deadlines, and establishing metrics for monitoring progress.
2. **Training and Communication**: Employees are trained on the new processes and procedures to ensure a smooth transition. Communication strategies are developed to inform all stakeholders about the changes and the reasons behind them.
3. **Pilot Testing**: In some cases, a pilot test of the new processes may be conducted to identify any potential issues before full implementation. This allows for adjustments to be made and lessons to be learned on a smaller scale.
4. **Process Documentation**: All new processes and procedures are documented in detail to ensure clarity and consistency in their implementation. This documentation serves as a reference for employees and helps maintain standardization.
5. **Monitoring and Feedback**: Progress is monitored closely, and feedback is gathered from employees and other stakeholders. This feedback is used to make any necessary adjustments and ensure that the changes are effective.
6. **Continuous Improvement:** The implementation phase is not the end of the process but rather the beginning of a cycle of continuous improvement. Regular reviews and evaluations are conducted to identify further areas for enhancement and refinement.

Control Phase:

The Control phase is focused on ensuring that the improvements made during the project are sustained over the long term. This phase involves several key activities:

1. **Establishing Controls**: Control measures are put in place to monitor the performance of the improved processes and ensure that they continue to meet the desired standards. Key performance indicators (KPIs) are identified and tracked to measure success.
2. **Process Standardization:** Standard operating procedures (SOPs) are updated to reflect the new processes and procedures. Training is provided to ensure that all employees are familiar with the standardized processes.
3. **Performance Monitoring:** Regular audits and reviews are conducted to monitor the

performance of the improved processes. Any deviations from the desired standards are identified and addressed promptly.

4. **Corrective Actions:** If any issues or deviations are identified, corrective actions are taken to address them. Root cause analysis is conducted to identify the underlying causes of the issues and prevent them from recurring.
5. **Feedback and Improvement:** Feedback from employees and other stakeholders is used to identify further areas for improvement. The organization continues to seek ways to enhance its processes and procedures to achieve ongoing excellence.
6. **Celebrating Success**: Recognizing and celebrating the success of the project and the improvements made helps to reinforce the positive changes and motivate employees to continue striving for excellence.

Although these phases were not implemented in the current project, they are crucial for ensuring the sustainability and long-term success of the Six Sigma initiatives at Alligo Horizon Pvt Ltd. By effectively implementing and controlling the improvements, the organization can achieve lasting improvements in process efficiency and operational performance.

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