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VENDOR PREFERENCES AND MARKET DYNAMICS: A STUDY OF ERW PIPES IN THE MILD STEEL SECTOR

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Abstract

The research examines the buying behaviour of vendors in the mild steel market, with a specific emphasis on Electric Resistance Welded (ERW) pipes. Given the significant and important role of ERW pipes in various industrial applications, understanding vendor purchasing patterns is crucial for both suppliers and buyers. The research focuses on determining the primary factors influencing vendor decisions, including price sensitivity, quality considerations, supplier reliability, and market trends. Furthermore, it delves into how external factors like economic conditions, technological advancements, and regulatory changes affect purchasing behaviour. The paper identifies whether the customer is affirmative or not regarding the above listed factors and answers the objectives of the study: (1) to examine the customer requirement for the ERW pipes; (2) to analyze the customer satisfaction towards the ERW pipes; (3) to understand the customer perception regarding the ERW pipes.

The content analysis method involves quantitative research methodology, by using descriptive means. The results provide critical insights into vendor preferences and behaviours, offering valuable implications for suppliers aiming to optimize their sales strategies and improve market positioning for all type of categories like, fabricator, builder, dealer-pipe and TMT, OEMs and scaffolding manufacturer. In case of easy bending, seamless MS pipes can be used but there is very minimum scope for them within the market and thus less manufacturing and consumption

is seen as compared to the ERW pipes. By addressing gaps in existing literature, this research contributes to a deeper understanding of the dynamics in the mild steel ERW pipe sector and provides actionable recommendations for enhancing vendor-supplier relationships and market efficiency.

Keywords: Buying Behaviour, Supplier Reliability, Customer Satisfaction, Customer Perception, Vendor Preferences, Market Positioning, Market Efficiency

Introduction

The steel sector is an important industry that plays a crucial part in the processes of industrialization and urbanization. It is known for its high energy usage, carbon emissions, and pollution, and the industry is working towards achieving carbon neutrality by implementing innovative technologies and endorsing energy-efficient tactics. The steel sector is crucial for the growth of every society. Indeed, the steel industry serves as the foundation for many other industries that would not exist without it. The European industrial revolution in the early part of this century was built on this particular sector. Three main ways to get finished steel goods are integrated steel production, secondary processing, and direct reduction. Coke ovens are used to convert coal into coke, while iron ore is either sintered or pelletized before being input into the blast furnace for integrated steel production. In the blast furnace, the ore is decreased to produce hot metal with approximately 4% carbon and lesser amounts of additional alloying components. Afterwards, the heated metal is transformed into steel in the basic oxygen furnace (BOF). Afterward, it is consistently poured to create partially completed items like blooms, bars, or slabs. These partially completed products are shaped into bars, sheets, rails, H or I beams during the rolling process.

National Steel Policy

The ultimate aim of the 2005 National Steel Policy is to establish a steel industry in India that meets global standards and is modern and efficient. The goal is to be globally competitive in cost, quality, product variety, efficiency, and productivity on a global scale. The goal of the Policy is to increase steel production to more than 100 million mt, consumed per year by the year 2019-20, up from 38 mt in 2004-05. This means there was approximately a 7.3% annual

increase from 2004 onwards.

Because so many industries depend on steel production, the steel industry has received a lot more attention as India works to boost manufacturing through programs like Made in India. With a GDP share of about 2%, India is currently the world's second-largest producer of steel and is about to overtake China as the world's second-largest consumer of steel. India could benefit from the industry and its export manufacturing capabilities in regaining a positive steel trade balance.

Research Objectives and Hypothesis

The importance and significance of this research is to fulfill the research objectives, in order to get the clear picture of the topic studied. The importance lies within the responses collected from the customers and their perception and behavior towards the steel product. Most of the time, even the manufacturing units are not aware of the overall market need and thus proper analysis must be done in order to find what exactly customer thinks about the product. An overall view of the study can be done with the detailed framing and analysis of hypothesis, which can then give the result and a proper relationship can be made thereafter. The hypothesis should revolve around the objectives of the study and proper questionnaire should accompany them. The answers to those questions from the customers will give us the results which may satisfy the hypothesis.

Objectives

1. To examine the customer requirement for the ERW pipes.
2. To analyze the customer satisfaction towards the ERW pipes.
3. To understand the customer perception regarding the ERW pipes.

Hypothesis

Hypothesis 1

Ho – There is no significant relationship between type of category and quantity of ERW pipes required.

H1 – There is a significant relationship between type of category and quantity of ERW pipes required.

Hypothesis 2

Ho- There is no significant relationship between the category of the company and buying frequency towards ERW pipes.

H1- There is a significant relationship between the category of the company and buying frequency towards ERW pipes.

This research paper goes on to discuss the topic in various phases, including the literature review, research methodology used, results from the analysis, findings, suggestions and conclusions drawn. Each phase will reflect the light upon the selective conclusion and will contribute towards the original topic of the study.

Literature Review

Hara T., Uemori R. et al (2000) examined the microstructure of inclusions, focusing on sulfides, to understand how corrosion resistance-grooving is achieved in Copper-Titanium added high frequency-electric resistance welded steel pipes. The primary findings were, the addition of Cu and Ti changes the composition of sulfides from MnS to CuxS+MnS and Ti2S, leading to an increase in the abundance of relatively small sulfides less than 0.1 μm. The entirety of MnS is coated with precipitates of CuxS in steel with added Cu-Ti. Hence, it was believed that the welded area experienced grooving corrosion due to changes in the composition and shape of the sulfides caused by the inclusion of Copper and Titanium.

Wang R (2002) stated that the researchers used the constant potential polarization method to study the corrosion behavior of steel J55 electric resistance welded pipes, focusing on various microstructures and heat-treatment methods. Steel with a continuous flowline microstructure is more prone to grooving corrosion and the welded area typically contains more corrosion groves. It is noted that the primary causes of grooving corrosion in low sulfur content steel are the loss of alloy elements and the residual stress in the welding area due to rapid heating and cooling during electric resistance welding.

Aminorroaya S., Edris H. et al (2003) claimed that electric resistance welding, or ERW, is one technique used to make API line pipe steel. By using ultrasonic inspection, hook cracks, a common fault in the upset zone of ERW pipes, are found. Small fissures known as "hook cracks" run parallel to the weld lines and, if they get big enough, can be seen on the outside of the pipe. For this inquiry, welds featuring hook cracks were procured from the Ahvaz pipe manufacturing site. With the use of scanning electron microscopy (SEM) research, it was discovered that small non-metallic inclusions were connected to all hook cracks. Using X-ray microprobe analysis (EDX), the primary constituents of the inclusions were identified.

Maksuti R., Mehmeti H. et al (2007) stated that, electric resistance welding, while done at high frequency is one of the most widely utilized methods for producing longitudinally welded carbon steel pipes appropriate for line pipe, tubing and casing. In order to create line pipes, hot-rolled strips are first shaped into a round shape using a technique called cold forming. The edges of the strips are then joined together by applying a mix of mechanical pressure and targeted high frequency electric resistance heating.

Hong H.U., Lee J.B. et al (2009) examined the effects of changing the parameters for electric resistance welding (ERW) on small diameter API X60 ERW pipes made from slit coils in order to strengthen the bondline's resilience to hydrogen-induced cracking (HIC). The results show that HIC usually starts close to the elongated Si, Mn, and Al-rich oxide inclusions (also referred to as penetrators) along the bondline. The HIC ratio rises as the proportion of penetrators at the bondline rises, independent of the degrees of central segregation. In order to achieve a sufficient level of resistance to HIC, the majority of penetrators should also have a circular form, and their proportion should not be greater than 0.03%.

Han S.W., Park Y.C. et al (2019) described the need for accurate assessment of ERW pipe strength to meet design requirements for deep-water installations has risen due to increased demand, particularly for collapse performance. An accurate assessment of ovality and residual stress is necessary as they control the collapse behavior. A method using three-dimensional finite element analysis was suggested for simulating the ERW pipe manufacturing processes of roll-forming and sizing. Incorporating the Bauschinger effect, a nonlinear material model was used to simulate significant plastic deformation during manufacturing.

Kaba M, Altay M et al (2020) stated in their study about the longitudinal cracks that occurs after quenching and tempering processes done on electric resistance welded pipes. Further research suggests that it occurred due to manganese silicate and other complex oxides under thermal stresses during cooling.

Samusev S.V., Fadeev V.A. et al (2020) studied the benefits and drawbacks of using a single-radius roll-pass plan while creating longitudinally welded channels with medium (114–480 mm) and small (5-804 mm) widths in an electric resistance welding pipe process. A double-radius (MISiS) roll-pass plan and plans for shaping the periphery of the workpiece with consistent parameters at every stage of the shaping process are presented in this article. Drawings of "flowers" are used in these roll-pass designs to build up the longitudinal-strain areas for a Dt × St Ø 50 × 1.5 mm tube and the methods of settled filaments within the workpiece.

Kiefner J.F., Clark E. (2022) stated that the ERW line pipe is commonly utilized for oil and gas pipelines. The process involves shaping previously hot-rolled strip into a circular form through cold-forming, heating the edges that meet by applying electric current, and joining the edges without using filler metal by forcing them together while molten or nearly molten. The first ERW process, known as the "Parpart" process, was created during the 1910s and 1920s, while the Johnson process, which was responsible for the majority of ERW line pipe production from 1930 to 1960, was introduced in 1924. By 1970, high-frequency ERW processes had largely replaced the Johnson process, which utilized low frequency a.c. current ranging from 60 to 360 cycles per second.

Kim T.H., Kim C. et al (2023) inspected how the microstructure and affect sturdiness of electric resistance welded (ERWed) API X70 steel pipe were influenced by the warm input and post-seam toughening (PSA) temperature. The pipes' ERW crease welds were made utilizing moo, medium, and tall levels of warm some time recently experiencing the PSA handle at 950 oC. Indeed in spite of the fact that PSA870 had the littlest grain estimate, it shown the most reduced affect sturdiness esteem and endured a delicate break at -20 degrees Celsius. The gap boring strategy did not identify any plainly visible contrasts in leftover stresses This investigate yields

instructive discoveries, appearing that remaining stresses have a more noteworthy affect on the affect durability of ERW crease welds compared to the grain refinement impact.

Research Methodology

Quantitative Research Methodology

This research methodology is employed in this study to objectively measure the collected data. Assessing and comparing variables like purchase frequency and pricing strategies will be assisted by it. It will also assist in studying patterns and trends in purchasing behaviour. The study includes significant samples; therefore utilizing this specific research approach will deliver dependable outcomes and ensure uniformity.

Descriptive Research Design

The research necessitates a thorough depiction of vendors' purchasing behavior and a snapshot of their current behaviour, thus utilizing a descriptive research design. It will establish a foundation for factors such as price sensitivity, market influence, and data quantification, while also aiding in vendor segment understanding and serving as a basis for future research.

Convenience Sampling

The primary data, with a sample size of 100, is collected through field surveys, by asking particular set of questions and by taking the informative feedback from the customers. The population of the target segment is vast, which leads to apply the convenience sampling in this particular study. The population includes all the MS steel vendors, but the sample size consists of those MS steel vendors who buys or consumes ERW pipes, thus making a perfect fit for the above discussed sampling method.

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Data Analysis

Hypothesis 1

Ho – There is no significant relationship between type of category and quantity of ERW pipes required.

H1 – There is a significant relationship between type of category and quantity of ERW pipes required.

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Monthly Potential (MT)	Based on Mean	2.239	5	94	.057
	Based on Median	2.262	5	94	.054
	Based on Median and with adjusted df	2.262	5	79.996	.056
	Based on trimmed mean	1.874	5	94	.106

ANOVA

Monthly Potential (MT)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.585	5	3.317	4.128	.002
Within Groups	75.525	94	.803		
Total	92.110	99			

Interpretation- Since the tests of homogeneity of changes is more than the level of centrality-0.05, we did the anova test whose esteem is coming out to be littler than the level of importance, i.e. 0.002, so invalid theory is rejected, which implies alternate hypothesis is acknowledged, i.e. there's a critical relationship between sort of industry and amount of ERW channels required.

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Hypothesis 2

Ho- There is no significant relationship between the category of the company and buying frequency towards ERW pipes.

H1- There is a significant relationship between the category of the company and buying frequency towards ERW pipes.

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
I prefer to buy from brands I trust, even if it means paying more	Based on Mean	1.605	5	94	.166
	Based on Median	.681	5	94	.639
	Based on Median and with adjusted df	.681	5	77.894	.639
	Based on trimmed mean	1.673	5	94	.149

ANOVA

I prefer to buy from brands I trust, even if it means paying more

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.412	5	.082	.333	.892
Within Groups	23.298	94	.248		
Total	23.710	99			

Interpretation- Since the tests of homogeneity of changes is more than the level of centrality-0.05, we did the anova test whose esteem is coming out to be more noteworthy than the level of importance, i.e. 0.892, so invalid speculation is acknowledged, i.e. there's no noteworthy relationship between the category of the company and buying recurrence towards ERW channels.

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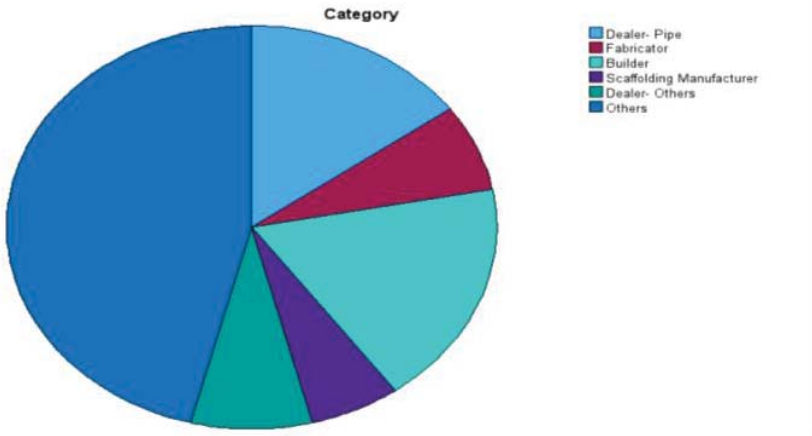
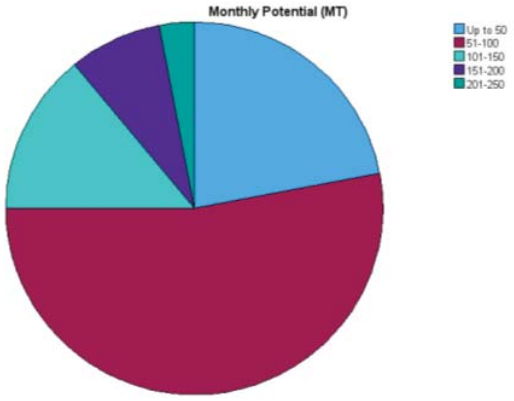
Results



Interpretation- According to the above graph, 46 percent of the data surveyed falls under 'Others' category, which is Original Equipment Manufacturers (OEMs) and users.



Interpretation- According to the above graph, 53 percent of the data surveyed has their monthly potential between 51-100 MT.

Findings

1. There is a huge scope in steel industry and more narrowly in ERW pipes sector.
2. Monthly potential or requirement is also enormous for different categories, which will give huge business opportunities to many companies.

3. Purchasing decisions, availability of discounts, recommendations from industry networks and convenience of purchasing plays a significant role in the market for ERW pipes.

4. The relationship between the type of industry and quantity of ERW pipes required holds true, which means that the quantity of ERW pipes required will be different for different industries, achieving customer satisfaction by fulfilling their needs and wants.

5. The type of industry and their buying frequency towards ERW pipes have nothing in common, which means that any type of industry will have the variable curve for the buying frequency towards ERW pipes because of very stiff competition in the market.

6. Due to infrastructural and technological expansion and advancement, the scope for the ERW pipes will increase, resulting in more business opportunities in the steel sector.

Suggestions

1. Regular visits should be done for stockiest, because the person will only call to his known one whenever there is a need for the material.

2. Companies should go for bigger sizes and thicknesses, which require huge machines, because there will be a huge requirement for the material and demand will also increase due to increase in the infrastructural projects across India. Apart from this, companies must look for new technologies and processes, which will help them in gaining more market share in the industry.

3. There is also an internal competition between traders and dealers, so we have to deal with that situation as well and make a particular strategy to achieve higher customer satisfaction.

4. In case of fabricator and builders, the monthly requirement of the material is based on the projects they are doing and most of the time builders go for the brand mentioned in the tender quote, so we have to see the bigger picture and focus on various projects in order to make our market presence.

Conclusion

ERW steel pipes are commonly chosen in different industries for their dependable performance and cost efficiency. ERW steel pipes have multiple benefits, including their manufacturing process guarantees even wall thickness and diameter, resulting in a consistent product. Furthermore, they are extremely long-lasting and capable of enduring intense pressure and temperature conditions, therefore, making them appropriate for various applications. They also show superb corrosion resistance, which improves their lifespan and decreases maintenance expenses. Various ERW steel pipes are designed to meet different needs, such as standard pipes, line pipes, and structural pipes used in construction ventures. The ERW steel pipes market is rapidly growing worldwide due to the increasing need for transportation infrastructure for oil and gas resources. This is reinforced by the rapid growth of urbanization and industrialization globally, coupled with a surge in the construction sector. Furthermore, the growing demand for ERW steel pipes is being driven by the thriving renewable energy industry, specifically in wind and solar power. The growing requirement in the industry for strong, long-lasting, and lightweight parts is increasing the request for ERW steel pipes in different manufacturing procedures, consequently boosting the growth of the ERW steel pipes market.

Conflict of Interest Statement:

The author declares no competing interests related to "Vendor preferences and market dynamics: A study of ERW pipes in the mild steel sector".

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