40TH INVEST INTERNATIONAL VALUE ENGINEERING CONFERENCE

"AI And The Future Of Value Engineering"

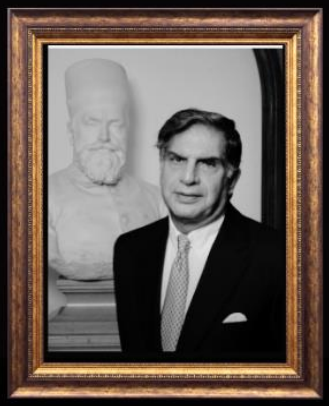
15th and 16th November 2024

"The Crown" Bhubaneshwar, India

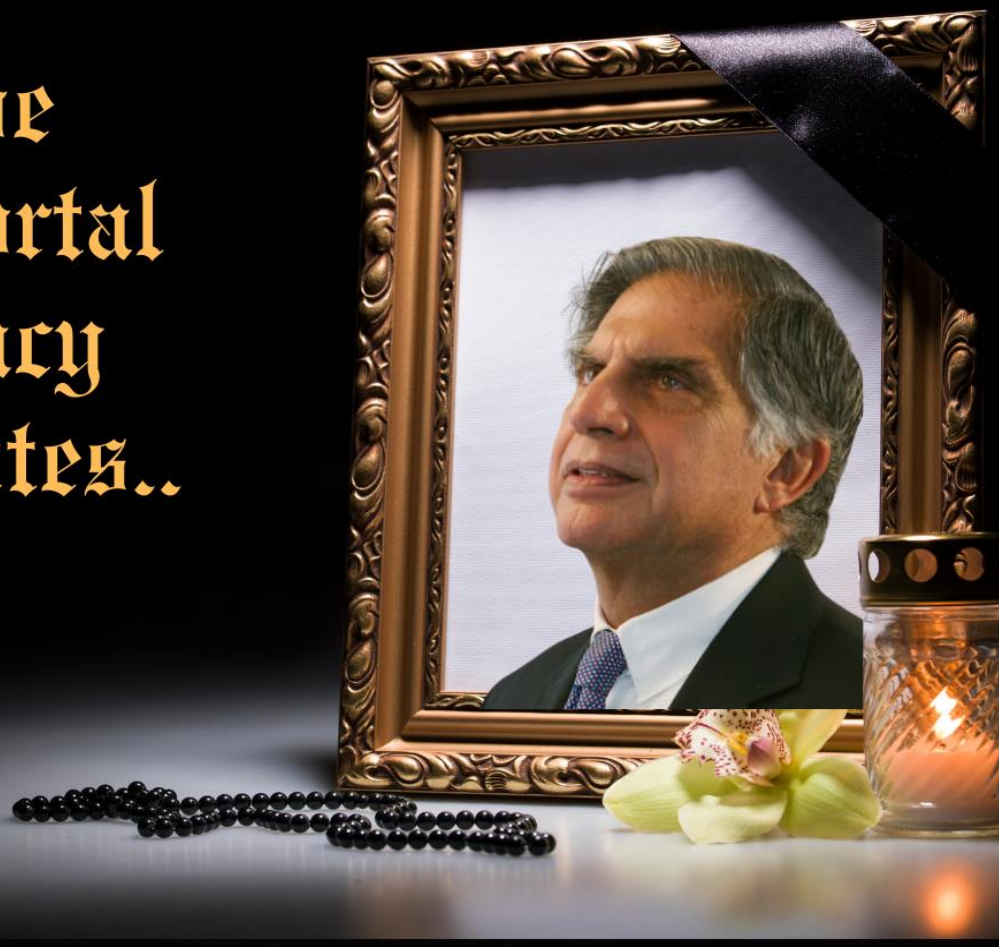
SOUVENIR

Transforming the Competitive Landscape with Integration of AI and Value Engineering

Contents



The immortal legacy reunites..



INVEST pays its heartfelt tribute to Ratan Tata, whose blazing, visionary leadership transformed the landscape of industry and innovation. His unwavering commitment to ethics and social responsibility elevated not just businesses, but entire communities, making him a true champion of humanity. Let us carry forward his profound values of compassion, courage, commitment and unwavering devotion for the greater good.

ABOUT
INDIAN VALUE ENGINEERING SOCIETY (INVEST)

About Indian Value Engineering Society (INVEST)

INVEST was founded in 1977 for advancing the knowledge and technique of Value Engineering (VE) for benefit of all sectors through its versatile applications for improving quality, productivity, profitability, competitiveness, and sustainability. INVEST undertakes its initiatives through PACE (Promote, Advocate, Certify, Educate) activities involving a wide range of stakeholders. With a strong focus on fostering a 'value culture,' INVEST serves as a valuable partner to industry and government alike.

INVEST is affiliated with SAVE International, USA and delivers training and certification programs in India on its behalf. INVEST offers its own certification programmes on Value Engineering for students, trainers, and professionals. These are practical, project-based trainings with a real-life project/s as a critical, mandatory part for certification. It has exclusive advisory services on application of Value Engineering for government and organisations operating at scale. It collaborates for designing and executing innovative, strategic projects delivering high value for the society at large.

INVEST organizes periodic regional, national, and international online and offline events which have participation from students, professionals, and organisations from diverse sectors, both from India and abroad. INVEST also has quarterly publication "INVAVE" with a wide circulation in international VE community.

Learn more at www.invest-ve.org.

As a partner in Nation Building, INVEST aims to evangelise Value Engineering as a strategic methodology to convert economic, environmental, and social challenges and opportunities into sustainable, competitive advantage for government and industry at large.

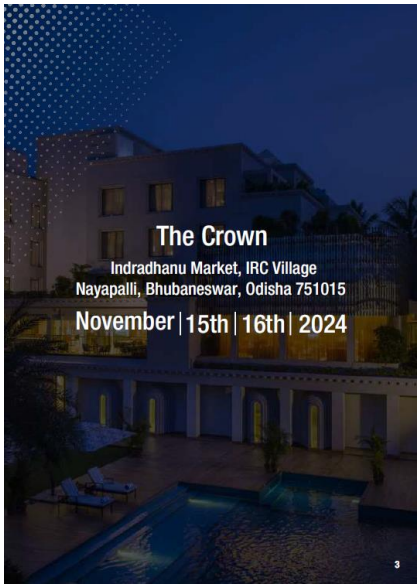
ABOUT

40TH INTERNATIONAL VALUE ENGINEERING CONFERENCE 2024

40TH INVEST ANNUAL INTERNATIONAL VALUE ENGINEERING CONFERENCE

"AI AND THE FUTURE OF VALUE ENGINEERING

In today's rapidly evolving technology landscape, artificial intelligence (AI) is becoming critical tool in building and defining business cases for technology developments. In VE, AI unlock the potential to analyze extensive datasets, predict outcomes and optimize processes, previously limited by human capabilities. These technologies forecast future scenarios, enabling businesses to anticipate changes and adapt strategies. This predictive capability is a key to minimizing risks and maximizing value. With this vision, INVEST organised the 40th Annual International Value Engineering Conference.



The conference recognizes the transformative potential of Artificial Intelligence (AI) in today's landscape. By bringing together industry experts, enthusiasts, and visionaries, INVEST aims to spark a dynamic exchange of ideas on how AI integrates with VE practices. This fusion holds immense promise for unlocking new levels of efficiency, productivity, and problem-solving across diverse sectors. The conference serves as an enabling forum for all key stakeholders to explore synergies between AI and VE.

Participants delve into how AI automates repetitive tasks currently handled by VE professionals, freeing them to focus on more strategic initiatives. Additionally, AI's ability to analyse vast data sets leads to more informed decision-making within the VE framework.

The conference brings to the fore the challenges faced in integrating AI, with ethical considerations, potential biases in AI algorithms, and the ever-important need for human oversight as central topics. Through open dialogue on these challenges, the conference paves the way for a responsible and effective future of AI-powered VE.

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KIIT-DU, Bhubaneswar

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V Krishna Member, Eastern zonal council Head Flat Rolling & Rolling Technologist	

Sightseeing Tour

A trip is arranged for the interested participants to take around Bhubaneswar and Puri on 17th November evening on a chargeable basis.

Bhubaneshwar

Chilka Lake

Udayagiri

Chandipur

Puri

MESSAGES OF DIGNITARIES AND GUEST SPEAKERS

PROF. (DR) ACTYUTA SAMANTA

FOUNDER (KIIT, KISS & AMP, KIMS)

40th International Conference, themed “AI and the Future of Value Engineering,” on November 15th and 16th, 2024, in Bhubaneswar, Odisha. We at KIIT are proud to be the “Knowledge Partner” for this event and wish you great success. We welcome all delegates to participate and appreciate the efforts of INVEST society members in making this conference a significant success.

Additionally, we are pleased to announce the establishment of the INVEST chapter for the Odisha region at the KIIT campus, specifically within the School of Mechanical Engineering. I am confident that this new initiative will provide valuable opportunities for our students, as well as students from across Odisha, to learn about Value Engineering and apply this knowledge to address industrial and societal challenges.

I wish this collaboration great success and assure you that all support from KIIT, KISS, and KIMS will be provided accordingly.

Best wishes!

Prof. (Dr.) Actyuta Samanta
Founder (KIIT, KISS & KIMS)

Amit Kumar
President
INDIAN VALUE ENGINEERING SOCIETY

Dear Delegates, Speakers, and Valued Members of INVEST,

It is my pleasure to welcome you to our 40th Annual Conference. This milestone event, centred around the theme &Impact of AI on Value Engineering, and reflects our Society's ongoing commitment to innovation, advancement, and excellence in Value Engineering (VE).

The emergence of Artificial Intelligence (AI) has unlocked exciting new possibilities for enhancing the efficiency, precision, and impact of VE. For a field focused on delivering optimal value, AI is a powerful ally, pushing the boundaries of traditional analysis and bringing fresh insights to longstanding challenges. By integrating AI, we are not only advancing VE methodologies—we're transforming them. This year's conference will feature a variety of discussions, presentations, and case studies that demonstrate how AI is reshaping our profession's core practices.

Our theme is both forward-looking and practical. AI offers VE practitioners powerful, data-driven insights that amplify our impact, but it also requires that we stay mindful of the unique human ingenuity and collaborative spirit that define our field. Our role, therefore, is to combine the analytical strengths of AI with our creativity, experience, and unwavering commitment to delivering value.

As President of INVEST, I urge leaders across industries to integrate Value Engineering into their core management practices. VE provides a structured, function-based approach to optimize resources, reduce costs, and enhance value across every aspect of organizational operations. By focusing on essential functions and eliminating inefficiencies, VE enables sustainable growth and resilience in today's competitive landscape. Incorporating VE allows management teams to make data-driven, value-oriented decisions that align closely with strategic goals, ensuring both profitability and long-term relevance. Let us champion VE as a fundamental tool for driving innovation, efficiency, and excellence in organizational management.

This conference is not only a platform for learning and exchange but also a celebration of our Society's journey. Each of you has contributed to this legacy, creating a community of professionals dedicated to excellence and innovation.

I extend my heartfelt thanks to the organizing committee, speakers, sponsors, and all attendees for making this conference possible. Your dedication and participation strengthen our Society, making it more resilient and relevant with each passing year.

Welcome to the 40th INVEST Conference. Here's to an inspiring and transformative gathering as we explore the future of Value Engineering together.

Warm regards,
Amit Kumar
President, Indian Value Engineering Society

P K GHOSE

CHAIRMAN
INDIAN VALUE ENGINEERING SOCIETY
EASTERN ZONAL COUNCIL

It gives me immense pleasure to welcome you to the 40th INVEST International Conference with the theme “AI and the future of Value Engineering”.

Ever since ChatGPT burst into the public domain in November 2022, it quickly gained the public’s imagination and popularity for its various abilities. It set off excitement, curiosity and also a fair amount of concern on the powers of AI. We have also seen a lot of discussion and debate on the role of AI in society in future as the technology evolves and develops further. While the debate on the ethics of AI rages on, it cannot be denied that AI is making significant positive contribution in diverse fields like Healthcare, Manufacturing, Logistics, Energy, Finance, Education, Retail to name a few.

Most of us are also using its power to improve our own productivity either through the use of tools like Chat, Gemini, Copilot on Outlook or Meta AI or specialized AI programs specific to the end use application.

It is therefore pertinent to reflect on the potential of Artificial intelligence (AI) to revolutionize the value engineering (VE) methodology by enhancing its capabilities and expanding its applications to better optimize projects, processes and product development. Keeping this in mind, this year’s conference theme has been identified and I look forward to meeting all participants having interesting and insightful discussions on the subject so that as competent and expert Value practitioners we can all contribute to keeping the value methodology relevant in these interesting and changing times.

Wishing you all a successful conference.

P K Ghose
Chairman, INVEST-EZC

ROBERT STEWART

CVS-LIFE, PMP, PMI-RMP
PRESIDENT, SAVE INTERNATIONAL
PRESIDENT, VALUE MANAGEMENT STRATEGIES, INC.

I am pleased to participate in the 40th Annual International Value Engineering Conference and wish to congratulate INVEST on their continuing tradition of excellence as a champion of the Value Methodology.

The theme for the conference, “AI and the Future of Value Engineering,” promises to be a fascinating exploration of the opportunities of integrating emerging AI technologies into the practical application VM. As we do so, I would urge everyone to remember the essential human nature of innovation, specifically, the application of Function Analysis. The great virtue of Function Analysis is its capacity to harness human innovation through the reframing of problems by focusing on the essential functions they are trying to address. So, in considering AI applications, lets us not lose sight of the centrality of the human element.

I attended several interesting presentations focusing on AI at the SAVE International 2024 Value Summit held in Nashville, TN, USA. I was impressed with what I observed, and it is exciting to consider the possibilities. Generative AI models rely on carefully constructed prompts to generate written or graphic content. In my own personal experiences working with AI models such as Chat GPT and Midjourney, it has been fascinating to witness how subtle changes in word prompts radically changes the output from these platforms.

For example, if one enters the prompt “Generate ways to enclose space” into Chat GPT, you will get a list of 15-20 ideas organized into a half dozen categories. Likewise, if you reframe the function by entering “Generate ways to create privacy,” you will get a similar, but different, list of ideas. What is important to realize is that the prompt that is entered into the AI model is of prime importance. The prompt, of course, must be thoughtfully created by a human. Functions, as they are understood in the context of the Value Methodology, are indeed a perfect vehicle for constructing prompts at different levels of abstraction to achieve different approaches to stimulate creative problem solving.

As president of SAVE International, I wish everyone an excellent Value Engineering Conference. I am proud to support SAVE International's partnership with INVEST and look forward to supporting a mutually beneficial relationship.

Sincerely,

Robert Stewart
President, Save International
President, Value Management Strategies, Inc.

DR.-ING. MARC PAUWELS

CVS, FSAVE, TVM
DIRECTOR GLOBAL AFFAIRS SAVE INTERNATIONAL©
& MANAGING PARTNER KREHL & PARTNER

It is a great pleasure to participate in the 40th Annual International VE Conference of INVEST in Bhubaneswar. This marks the fourth INVEST conference I have had the privilege to attend in person. The theme of this year's conference, "AI and the Future of Value Engineering", is both modern and thought-provoking, reflecting the dynamic changes our field is experiencing.

As we gather here, we are likely to explore a wide range of perspectives on the intersection of Artificial Intelligence and Value Engineering. What new insights can we gain from this exchange of ideas? Some may foresee a future where advanced technology replaces traditional Value Engineering workshops and processes - a future where software, once provided with the necessary data, can automatically generate the most optimized solutions for products and processes.

However, I believe that this is still a distant reality. While AI holds immense potential, I do not expect to see a complete replacement of human expertise at this conference, or even at the next few. The unique strengths of human beings - our ability to communicate effectively, think creatively, and make nuanced decisions - will remain central to every VE activity.

That said, I do anticipate that AI will play an increasingly important role as a powerful tool in our projects. It can take over repetitive tasks, such as gathering and analyzing data or conducting research, allowing VE experts to focus more on the essential aspects of their work, such as fostering creativity and innovation. AI, in this sense, will be an invaluable assistant, enabling us to push the boundaries of what we can achieve.

It is an honor to be part of this prestigious conference. I am fully aware of the longstanding success of INVEST conferences, the unwavering dedication of the INVEST team, and the immense value that networking among participants brings to the field of Value Engineering.

On behalf of SAVE International©, I extend my heartfelt best wishes to all participants and the organizing committee for a successful conference filled with fruitful discussions and valuable networking opportunities. Together, let us continue to expand the reach of Value Engineering knowledge, sharing our insights and expertise with the world to make a lasting impact.

PROF. SARANJIT SINGH

VICE CHANCELLOR
KIIT DU

I am extremely delighted to learn that the Indian Value Engineering society (INVEST) is going to organize The 40th International Conference on the theme titled, “AI and the Future of Value Engineering” on 15th &

16th November, 2024 at Bhubaneswar (Odisha) in association with the School of Mechanical Engineering, KIIT Deemed to be University. It’s also an honour to partner with INVEST to initiate a Faculty & AMP; Student Chapters for Odisha region at KIIT premises, which will enable young minds in this region to master VE techniques and be a part of the movement.

The future of Value Engineering is poised for transformation as AI becomes increasingly integrated into its processes and shall be disrupted like any other business verticals/ processes. As we stand on the brink of this transformation, we are hopeful that said conference will unite minds from diverse sectors; all sharing a common goal to elevate value, enhance performance and drive sustainable innovative practices at workplaces and industries.

I, on behalf of KIIT, KISS & KIMS welcome all the delegates for a fruitful participation. I appreciate the efforts made by all the committee members of the conference in making the conference a success.

We also extend our gratitude to Hon’ble Founder, KIIT & KISS – Prof. (Dr.) Achyuta Samanta for providing this unique platform for scholarly debate and discussion.

My best wishes for a dynamic and inspiring conference!

DR SUSHANTA TRIPATHY

DEAN (PG), KIIT DU

It is my privilege and honor to share you that the 40th International Conference on the theme titled, “AI and the Future of Value Engineering” is organized jointly by Indian Value Engineering Society (INVEST) and Kalinga Institute of Industrial Technology (KIIT) on 15th & 16th Nov 2024 in Bhubaneswar.

This conference is designed for a diverse audience from industry, Government, and academia to share and enhance the knowledge of Value Engineering in AI Era. The integration of digital technologies, the focus on collaboration, sustainability, predictive analytics, and AI are just a few of the trends that will shape the future of Value Engineering. By embracing these trends, VE professionals can continue to improve the value and performance of projects while reducing costs.

I want to thank in advance the conference committee for extending their valuable time in organizing the program and all the participants, and other contributors for their sparkling efforts and their belief in the excellence of INVEST-2024.

Jai Hind.


OUR
VALUED PARTNERS

TATA STEEL UTILITIES AND INFRASTRUCTURE SERVICES LIMITED

TATA

About us

Tata Steel Utilities and Infrastructure Services Limited (Tata Steel UISL) is India's first comprehensive urban infrastructure service provider, with verticals dedicated to all civic amenities. It was also the first in the country to set up a 24x7 customer service centre and is a leader in the use of IoT technologies to provide sustainable, high quality services to Jamshedpur.

Our Legacy

A 100 per cent subsidiary of Tata Steel, Tata Steel UISL has a history of managing civic amenities in Jamshedpur since 1910 when Tata Steel set up its Town Services.

Our operations

We deliver comprehensive civic services to the city of Jamshedpur and have extended our water and infrastructure services to multiple Indian locations where Tata Steel operates.

Jamshedpur Fact File

- Area: **64** sq km
- Road Length: **560** km
- Power Connections: **46,000**
- Water Connections: **64,000**
- No. of Markets: **9**
- No. of Parks: **39**
- Green Coverage: **40** per cent

Our Services

Integrated Township Management

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Minimum Non Revenue Water losses and sensor-based remote monitoring of water availability and quality

Power Distribution
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Customer Centricity & e-Governance
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Road & Infrastructure Maintenance
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Green Management
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ABSTRACTS
OF CASE STUDIES
AND PROJECTS
CPU
79%

1. Utilizing Artificial Intelligence Tools in the Value Methodology Post-Workshop Implementation

Sathish Kumar
Value Engineer, Cameron a Schlumberger company
Arunkumar
Lead Value Engineer, Cameron a Schlumberger company

The primary objective of this initiative is to enhance the post-workshop implementation phase of value methodology by leveraging Artificial Intelligence (AI) tools. Several years our organization has been rigorously applying value methodology to improve our products, projects, and processes through multiple value analysis initiatives. While we have successfully navigated the phases of information phase, function analysis, creativity, evaluation, and implementation, we have encountered significant challenges in post-workshop implementation, follow-up, and savings reporting. By utilizing AI for rationalization projects to eliminate duplicate specifications and replace them with superior alternatives, and by integrating a part number selection guide with variant configuration, we aim to streamline the standard product selection process. This integration of AI tools will facilitate smoother implementation, enhance follow-up processes, and ensure accurate reporting of savings, thereby maximizing the benefits derived from our value methodology initiatives.

Scope: The scope of this project encompasses the following key areas:

Rationalization Projects: Utilizing AI to identify and eliminate duplicate specifications, replacing them with superior alternatives to streamline processes and reduce duplications.

Part Number Selection Guide: Integrating AI tools with variant configuration to simplify the standard product selection process, ensuring that the most efficient and effective components are chosen for various applications.

Implementation and Follow-Up**:** Employing AI to facilitate efficient implementation of value methodology recommendations and to enhance the follow-up process, ensuring that all steps are tracked and executed efficiently.

Savings Reporting: Leveraging AI to accurately report savings from value analysis projects, providing clear and accurate targets

Key Words*:* Abstract submitted for review and approval for INVEST-VE conference

2. Leveraging Costing Tools to Improve Value Management Studies

Ranganathan Sundarraj
Lead Value Engineer - Valves, Schlumberger, Coimbatore
Sujesh Vazhelathody Sudhakaran
Value Management and DEM lead, Schlumberger, Coimbatore

We've all faced the dilemma of preparing for a value management (VM) study. The preparation is as important as the actual study because this step uncovers specific key facts that will guide and support the ideas generated and the decisions made during the VM session. In this paper, I plan to share how we have leveraged should-cost software and tools during the preparation phase and through the VM study.

Having a clear cost breakdown of each component and feature of a design backed by an industry-wide should-cost value makes for a great start when performing a VM analysis. The time required to obtain a should-cost breakdown of new ideas is minimized, helping to speed up the evaluation and development process without having to task support groups with endless requests for quotations.

***Key Words**:* value management study, should-cost software

3. Effectiveness of Connected FAST Diagram

Ashik P M
VAVE Expert, MOLEX India

In today's highly competitive industries, the principles of Value Analysis (VA) and Value Engineering (VE) have become essential strategies for improving product quality and optimizing operational performance. The methodology and Usage of functions are getting a lot of attention and helping to improve product quality. A FAST (Function Analysis System Technique) diagram is a visual tool used in Value Engineering and Value Analysis to understand and organize the functions of a system, product, or process. It helps identify the relationships between different functions to improve value and efficiency.

In complex products comprising multiple components from electronics, mechanics, firmware, and software, understanding each subsystem often requires the development of separate FAST (Function Analysis System Technique) diagrams. However, a comprehensive view of the entire product can be achieved by linking these individual FAST diagrams. This paper explores the effectiveness of using connected FAST diagrams to provide a holistic understanding of multi-disciplinary products. It presents various applications and examples, demonstrating how this approach can enhance product value. The research aims to initiate discussions within the

Value Engineering community, encouraging improvement in our methodologies to optimize product development and operational efficiency.

Key Words: FAST Diagram, Product understanding, Value improvement, Research.

4. Cosec Vega with GPS Integration

Dhruti Bhatt
Team Leader, Matrix Comsec Private Limited
Kiran Surve
Senior Hardware Engineer, Matrix Comsec Private Limited
Chirag Rathod
Assistant Manager, Matrix Comsec Private Limited

The integration of GPS technology into COSEC devices, primarily used for time and attendance tracking in government organizations, presents significant design and engineering challenges. The objective was to incorporate GPS functionality without altering the well-established design, aesthetics, or usability of these devices. Key constraints included preserving the original device design, optimizing space and power efficiency, and maintaining cost-effectiveness.

A structured value engineering (VE) approach was employed to address these challenges. Initially, a function analysis identified the core functions of COSEC devices—time tracking, attendance recording, and the new requirement for location monitoring. The creative phase explored various integration concepts, including internal versus external GPS placement, shared power sources, modular designs, and memory upgrades.

The evaluation phase assessed these concepts based on feasibility, design impact, cost, and compatibility. The solution selected was the use of a single 512MB DDR3 module instead of two 256MB DDR3 modules. This approach optimized space, reduced costs, and maintained power efficiency while preserving the device's existing design.

In the development phase, prototypes were created incorporating the GPS module and the upgraded memory, with internal PCB layout adjustments and compact GPS technology. The power supply was also modified to ensure efficiency. After thorough testing and validation, the new design was approved for production.

Key Words: Cosec Vega with GPS integration.

5. Customization of Vehicle Validation Process by Applying AI for Fuel System in Automobiles

Ganpati Kamble
Sr. Manager, Tata Motors Ltd
Vivek Tikait
Manager, Tata Technologies

Deepak Panchal
Sr. Design Engineer, Tata Technologies

In the current technological era, automobiles are designed and engineered with a primary focus on customer safety and comfort, which is increasingly achieved through artificial intelligence (AI). Customer comfort is determined by vehicle ergonomics and the enhancement of touch-points. The fuel system is crucial for vehicle functionality and environmental balance, and AI is instrumental in optimizing this system validation.

The fuel system comprises various components, including the fuel storage system, fuel pump, fuel filling system, fuel delivery system, and fuel vapor recovery system. To reduce component complexity, minimize the number of parts, and enhance part performance, Value Engineering (VE) tools integrated with AI are utilized. This approach optimize the validation process to minimize the number of test which lead to decreases overhead charges & project time line. Functional Analysis System Technique was conducted to identify components validation requirement that could be optimize without compromising functionality, leading to best-in-class design.

This paper is presents a case study detailing the integration of the Value Analysis and Value Engineering (VAVE) methodology with AI, which explores new process of validation. The results demonstrate how this approach benefits new design and validation processes, offering a model that can be applied across the automotive sector to optimize value and performance in future programs. AI enhances VE efforts to achieve superior performance standards.

***Key Words**:* Customization of Vehicle Validation process by applying AI for Fuel System in Automobiles.

6. Value Study for Improvement & Capex Reduction for Conveyor Gallery Standardization Across Tata Steel.

S Sandip Kumar Chakraborty,
Senior Area Manager - BMHS design & Engineering, Tata steel

There are thousands of Belt Conveyors are under operation at various locations of Tata Steel for handling all kinds of Bulk Materials which are used for Steel Making. Due to non-availability of any TSL Standard, the design of Belt Conveyor Galleries used to vary depending upon OEMs which usually creates operational and maintenance related issues. Therefore, to mitigate the prevailing issues and concerns, TSL D&E Team has taken an initiative to standardize the Design of Belt Conveyor Gallery for all belt widths that will be followed all across TSL in all the ongoing and upcoming BMHS Project. Value Engineering and its details are presented in this paper.

***Key Words**:* Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation

7. Value Study for Improvement & Capex Reduction of Coal Vertical Storage Yard Project at Tata Steel Kalinganagar

S Sandip Kumar Chakraborty,
Senior Area Manager - BMHS Design & Engineering, Tata steel

Tata Steel Kalinganagar is going to set-up a Vertical Storage Yard along with Covered Shed for Storage and Distribution of different grades of Coking Coal and PCI Coal to all the Coke Plants and Blast Furnaces respectively at Tata Steel Kalinganagar. This innovative type of Vertical Storage Yard will cater to the Coking Coal as well PCI Coal requirements up to 16MTPA crude steel production at Tata Steel Kalinganagar Plant. The optimization of Layout, Land, Mechanical, Civil, Structural, Electrical & Instrumentation quantities of the Vertical Storage Yard has been conducted through Value Engineering and its details are presented in this paper.

***Key Words**:* Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation

8. Leveraging AI and Data Analytics for Value Analysis in Automotive Components

Girish Ravan,
Project Manager, Tata Technologies Ltd.,
Umesh Shirode
Senior Manager, Tata Motors PV Limited
Shrikrishna Sindagi
Deputy General Manager, Tata Motors PV Limited

In the automotive industry, the performance and reliability of automotive systems are critical for vehicle safety and comfort. Bench marking in the automotive industry is crucial for several reasons viz. Innovation, Strategic Planning, Quality Improvement, Cost efficient. By comparing products and processes with industry leaders, manufacturers can adopt best practices to enhance the quality of their parts.

Benchmarking of automotive parts involves several challenges, especially in data collection and analysis. Analyzing large datasets requires advanced statistical and analytical tools. Interpreting the results accurately demands expertise in both data science and automotive engineering. This study presents a comprehensive bench-marking analysis of chassis parts using Artificial Intelligence.

This paper mainly covers following value analysis of attributes of the bench marking process related to chassis parts,

Data Collection: Gather data from various sources, including manufacturer specifications, test results, and industry standards. Ensure that the data is comparable by normalizing it. This might involve adjusting for different units or conditions.

Data Quality: Ensuring the accuracy and reliability of collected data is crucial. Inconsistent or erroneous data can lead to incorrect benchmarking results

Data Integration: Combining data from various sources (e.g., suppliers, manufacturers, testing facilities) can be complex. Different formats and standards can complicate integration.

Data Analysis: Use statistical methods to analyse the data. Look for trends, outliers, and correlations that can provide insights into performance

This benchmarking framework aims to enhance the development process, optimize costs, and improve the overall quality of automotive components.

***Key Words**:* Automotive components, Chassis, Value Analysis, Data Analytics, Artificial Intelligence

9. Value Engineering Study on Tail Wiring Harness

Saurabh Bhakat
Senior Manager, Tata Motors Ltd., Jamshedpur
Pavan Singh
Senior Manager, Tata Motors Ltd. Jamshedpur

Reducing Electrical and Electronic cost in automotive manufacturing would reduce material demand, providing both environmental and financial benefits. Reducing raw materials including copper and plastics, can lessen the environmental impact of mining and manufacturing of these components. It reduces the amount of power consumption increased energy efficiency. Optimization will make vehicle lite and improve fuel efficiency and will produce less e-waste.

- No compromise in feature
- Valuable product for the customer at better price.
- Cost Benefit in Inventory as well as production

***Key Words**:* environmental impact, energy efficiency, fuel efficiency, e-waste

10. Value Study for Capex Reduction of Automation Equipment in COB- 6 Project at Tata Steel Jamshedpur

Ananda Mandal
Engineering Manager, Tata Steel Limited

Coke Oven Batteries (COB) 5, 6 & 7 are the first set of stamp-charged coke ovens installed in Tata Steel Jamshedpur (TSJ) between 1989 to1995. COB 5, 6 & 7 have served their campaign

life. It is essential to replace these old batteries for safe, reliable, cost-effective and environment friendly operations.

It is proposed to replace COB 5, 6 & 7 (4.5 m tall ovens) with a single battery COB 6 having two 50 ovens blocks (6A & 6B) with 6.25 m tall ovens maintaining same production capacity. The New COB 6A & 6B is proposed to be installed at the same footprint of existing COB 5, 6&7.

Integrated Control System which has advanced technique, easy operation, high reliability, expansibility and successful application is selected for controlling, regulating, data acquisition, alarm, sequencing and safety interlocks and management function concerning Coke Oven Plant and associated utility systems. The optimization of automation component for cost reduction, space utilization and operator ease has been conducted through Value Analysis and its details are presented in the paper.

As a part of Basic Engineering deliverable, Network Architecture was proposed by ACRE Coking & Refractory Engineering Consulting Corporation, MCC (ACRE for short). The Level-1 architecture (Plant Network) comprises of:

1. Servers as IBA, OPC cum Historian and Web Servers
2. Server Panels with redundant SCADA, Application & Database Server
3. Control Desk for Server, Engineering & Operating Stations
4. Workstations- Engineering & Operating Stations
5. Network Accessories

Scope of procurement, detail design, execution & commissioning is in TSL scope. The proposed plant had to face many operational challenges during initial conceptualization as has been listed below:

1. Fragmented systems and data present in silos
2. Layout requirements considering the facilities
3. System complexity- integration of multiple devices in Level-1 network.

In order to mitigate above challenges and reduce capex & timeline, value

***Key Words**:* Technical FAST, Function Cost Worth Analysis, Function based Idea generation, Paired Comparison Matrix, Decision Matrix, VM Change Proposal, Project and Construction.

11. Value Engineering Study on Headlamp Outrigger Bracket

Pavan Singh
Senior Manager, Tata Motors Limited

By following these VAVE phases, the study successfully addresses quality failures and enhances customer peace of mind. The modifications not only improve operational efficiency

but also achieve significant cost savings, specifically Rs 600 per vehicle. These results provide valuable insights into optimizing bracket design, contributing to better performance and cost-effectiveness in the competitive automotive industry.

***Key Words**:* Headlamp, Outrigger bracket, Signal

12. Optimizing RMC Vehicle Design for Enhanced Market Competitiveness and Cost Efficiency through VAVE

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DGM, Tata Motors
Kumar Mrityunjay
Sr Manager, Tata Motors
Naveen
DGM, Tata Motors
Ravi Shekhar
Sr Manager, TTIL

At Tata Motors, we prioritize innovation to enhance our Ready-Mix Concrete (RMC) vehicles, crucial for infrastructure projects. Traditionally, these vehicles featured a 900 Newton-meters (Nm) torque and 9-ton axles. Through Value Analysis/Value Engineering (VAVE), we revised the design to include a 700 Nm engine and 8.5-ton axles. This change reduced material and manufacturing costs, making the vehicles more affordable and competitive. The new configuration not only improved cost efficiency but also expanded our market share by offering a tailored, cost-effective solution that meets diverse customer needs while maintaining performance and durability.

Key Words: Optimization, Cost Efficiency, cost optimization, Total Cost of Ownership (TCO), Design selection

13. Optimizing RMC Vehicles for Enhanced Value and Sustainability through VAVE

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DGM, Tata motors
Krishna kanta
DGM, Tata motors
Kumar mrityunjay
Sr manager, Tata motors

At Tata Motors, our focus is on pioneering sustainable solutions for the automotive industry, particularly through our Ready-Mix Concrete (RMC) vehicles. These vehicles are equipped with advanced After Treatment Systems (ATS) that cut emissions and support environmental sustainability. In our Value Analysis/Value Engineering (VAVE) initiative, we transitioned from

a vertical to a horizontal ATS configuration. This shift optimized material usage, reducing manufacturing costs and conserving resources without requiring new capital investment. The new design also improved vehicle aerodynamics and fuel efficiency, aligning with our commitment to operational excellence and environmental stewardship.

***Key Words**:* Optimization, Ready to mix, After Treatment system, Emission.

14. On Time in Full (OTIF) and VAVE: A Case study of Indian Automobile Sector

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Saurav Kumar
Senior Manager, Tata Motors.

On-Time In-Full (OTIF) is not only a measure of supply chain reliability but also a significant driver of cost savings. In the context of Value Analysis and Value Engineering (VAVE), focusing on OTIF can unlock substantial cost efficiencies by reducing waste, minimizing penalties, and enhancing operational productivity.

OTIF measures the effectiveness of the supply chain in meeting customer demands accurately and punctually, directly influencing costs associated with inventory, transportation, and customer satisfaction. When integrated into VAVE initiatives, the emphasis on OTIF ensures that any redesign or process improvement focuses on eliminating inefficiencies that could lead to delays or shortages. By ensuring high OTIF performance, companies can reduce the need for expedited shipping, lower inventory holding costs, and avoid costly penalties for late or incomplete deliveries.

Moreover, maintaining a high OTIF rate can lead to long-term cost savings by building stronger customer relationships and securing repeat business, as consistent delivery performance enhances brand reputation. In summary, optimizing OTIF through VAVE not only aligns product value with customer needs but also drives significant cost reductions across the supply chain, contributing to overall business profitability.

***Key Words*:** Value Engineering (VE), On time in Full (OTIF), Automobile, Inventory, Transportation, Cost Efficiency

15. Value Optimization of Overland Conveying System (OLCS) at Noamundi Iron Ore Mines.

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Sr. Area manager D&E BMHS OMQ, Tata steel Ltd.,

As part of an expansion program in TSL, a new 6 MTPA iron ore processing plant (IOPP) is being constructed at Noamundi iron ore mines. To transfer Iron Ore, new Overland conveyor system

(OLCS) is being installed to convey iron ore from IOPP & existing wet plant to bottom bin area (from where material shall be despatched) of Noamundi. Also, in future existing OLCS will be dismantled as it is in mining area and iron ore shall be despatched via new OLCS system.

Hence, new OLCS shall become very vital for convey of iron ore as it will convey both the material i.e. from new IOPP as well as from existing plant.

This OLCS project was subjected to a comprehensive value engineering study aimed at optimizing both CAPEX and OPEX while maintaining the system's efficiency and reliability. The primary objective was to explore innovative solutions that could reduce costs, improve performance, and ensure long term sustainability without compromising project's technical integrity.

The value engineering process involved a multidisciplinary team from different disciplines i.e., BMHS, structural, civil, electrical etc. that analyzed the project design and construction. Detailed Function Analysis and accordingly Technical FAST was developed to establish the required technical functions. High-cost Functions (Value eroding Functions) were also identified using Function Resource Matrix.

The result of value engineering study led to a significant reduction in both CAPEX (₹ 5.89 Cr) and OPEX (₹ 21.15 Cr), with total estimated savings of ₹ 27.04 Crore.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation

16. VE Study for Utilization of Surplus Stock in Electrical Package of Power Source Connectivity from MSDS to BF#2 to Reduce Capex at TSK

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Anjay Chandrakant Raich
Chief Construction, Electrical, Tata Steel Limited
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Samarjeet Sahu
Sr. Area Manager, Power System, Tata Steel Limited
Surya Prakash Prabhakar
Sr. Area Manager Improvement, Tata Steel Limited

Tata Steel Kalinganagar (TSK) is setting-up a new Blast Furnace (designated BF#2) for its Phase-2 expansion from 3 MTPA to 8 MTPA crude steel capacity. For operating the BF#2 plant, approx. 70MW power was required to be sourced at 132 kV voltage level from our 132 kV MSDS substation to Blast Furnace S/S designated as MSDS-BH substation (2.5 KM apart).132

kV Cables and jointing kits were budgeted to be procured and installed for this transfer of power from MSDS to MSDS BH sub-stations.

TSK was initially commissioned with 220 kV input power supply (as 400 kV grid sub-station construction was delayed) and before Phase#2 project start up, it was planned to shift from 220 kV to 400 kV voltage level connection to grid. Power at 400 kV would be received at outdoor gantry inside TSK and thereafter to BPRS 400 kV S/S through 400 kV cables. As we got only 220 kV power from Grid, 220 kV cables were installed from gantry to our internal sub-station which would later become defunct when we migrated to 400 kV supply.

The following were technical challenges during initial conceptualization for using 220 kV cables:

1. 220 kV cables are dimensionally very different from 132 kV cables. How to ensure correct fitment at 132 kV GIS and the technological interventions required? This has never been done before by us anywhere for GIS connection.

2. Whether the existing length of 220 kV cables would suffice or we need to procure 220 kV cables (some qty) if existing cable length does not suffice? How do we modify cable routing to match length required?

Value Engineering study was conducted to optimally utilize invested capital in 220 kV cables and has resulted in reuse of 220 kV Cable for connectivity between MSDS and MSDS BH thereby resulting in saving of Capex by Rs. 10.46 Cr.

Key Words**:** Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation

17. Value Engineering Study on Video Analytics for Quality Improvement Project (Digital Inspection of Dashboard Switch Tray)

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Abhijit Paul Chowdhury
Senior Manager - Process Automation Maintenance, Tata Motors Ltd

By applying the VAVE methodology, we have completed the project by implementing a smart inspection of the dashboard switch tray using computer vision methodology. Some of the challenge also faced by us in term of AI Model Training, Model Accuracy, Quality Acceptance & User Training etc.

With the help of this project, company is going to make benefits of Rs. 22 lakhs per annum for a single implementation. We have planned for horizontal implementation of the system in all trim line across the plants.

Key Words**:** By applying the VAVE methodology, Team have completed the project with Implementation of Smart Inspection of Dashboard Switch Tray using computer vision

18. AI and the Future of Value Engineering: A Case Study of Indian Automobile Sector

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Kumar satyam
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Value Engineering (VE) has undergone a revolutionary change in how project value and efficiency are optimized with the incorporation of Artificial Intelligence (AI). In the digital age, the application of artificial intelligence technology has gained wide attention..The introduction of AI technologies presents new potential and difficulties for value engineering, which has historically concentrated on increasing function and cutting costs through methodical analysis. In exploring the synergy between AI and VE, this study focuses on the ways in which AI, via automation, optimization algorithms, predictive analytics, and advanced data analysis, might improve VE processes in commercial vehicle sector. As the commercial vehicle sector continues to expand, the integration of AI into VE will be a crucial driver of innovation, allowing manufacturers to satisfy the growing needs of customers while preserving a competitive cost advantage in the market.

This study presents a set of case studies to demonstrate the practical effects of AI on VE in the leading Indian Automobile manufacture, Tata Motors Ltd. The report also discusses the challenges of integrating AI, including data quality issues, system complexity, and ethical considerations. In discussing future options for AI in VE, the study focuses on the need for specialized training, interdisciplinary collaboration, and potential advancements in technology. By thoroughly examining its consequences and potential future uses, this paper aims to offer light on how Value Engineering is changing in connection to AI.

This article concludes with a thorough analysis of the junction of VE and AI in the commercial vehicle sector. The paper shows how AI is changing VE processes and producing more economical, dependable, and efficient vehicles through a combination of theoretical analysis and real-world case studies.

Key Words: Value Engineering (VE), Artificial Intelligence (AI), Predictive Analytics, Automobile, Ethics.

19. Value Engineering Study on Propeller Shaft

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Lead Solutions Developer, Tata Motors Ltd.,

The propeller shaft is the mode of transferring the power from the engine to the rear axle via the gearbox. They come in all different lengths depending upon the mode of application and

wheelbase Propeller shaft has to be strong to withstand the high working environment. It is which is responsible for converting the torque.

***Key Words*:** Propeller shaft, Reduction, optimization

20. Value Study for Capex Optimization for Vehicle under Pass (VUP) of Runway End Safety Area (RESA) at Sonari Airport, Jamshedpur

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Subrata Mahata
Head Eng. Civil, Tata Steel Ltd.,

Sonari Airport is a domestic airport in Jamshedpur, India, owned by Tata Steel. As per DGCA's requirement and guidelines, additional 90m runway end with 60 m width Runway end safety area (RESA) is proposed at both east and west end of runways. In west side construction area is within airport boundary whereas in east side various challenges were encountered while extension of Runway such as Existing residential Buildings, existing River meet road, existing Church etc.

A vehicular underpass is proposed for enabling RESA system and during estimation is impacting Project cost & Timeline. The optimization of civil and structural quantities of the proposed airport Runway extension has been conducted through Value Engineering and its details are presented in the paper.

The proposed Location of airport had to face many operational challenges during initial conceptualization as has been listed below:

1. Safeguarding existing facilities such as existing River meet road, existing runway, existing Church.

2. By construction of underpass (box structure) for passage in east end of the runway.

3. Develop optimum design which provides maximum value over the life cycle & ~25% reduction in capex was taken as a target.

In order to mitigate above challenges along with Capex optimization & timeline, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed Technical Functions. High-cost Functions (Value eroding Functions) were also identified using Function Resource Matrix. These Functions were utilized for idea generation, subsequent concept formation, evaluation, and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in improved productive area and safety along with Capex saving by Rs. 9 Cr. respectively

***Key Words*:** Function Analysis, Technical FAST, Technical Functions, High-cost Functions, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation.

21. Value Engineering Study on Electronic Brake Distribution System

Aman Srivastava
Team Lead, Tata Motors Limited

This project will assess the replacement of an analogue load sensing valve with EBD functionality in the Tractor ABS Electronic Control Unit. The EBD functionality adapts a brake force distribution from the front to rear axles based on the amount of weight each axle is conveying, which will contribute to improved stability during loading conditions establishing better performance overall when a load is present. Mounting EBD functionality directly to the ABS ECU will eliminate the load sensing valve, with its mounting arrangements on the axle.

***Key Words*:** Electronic Brake Force Distribution (EBD), Anti-lock Braking System (ABS) , Load Sensing Valve (LSV) , Tractor Braking System, Brake Force Distribution, ABS ECU Integration, Braking Efficiency, System Simplification, Weight Reduction, Cost Savings, Vehicle Stability, Safety Enhancement

22. Value Analysis on Rear Twist Beam Axle in Passenger Vehicle through Intelligent Design Program

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Deputy General Manager, Tata Motors Ltd.,

Rear Twist Beam axle is popular type of suspension in modern passenger cars and SUVs due to its ease of assembly and lower production cost. It is a complex assembly having multiple dynamic and static functions. To design and develop a Rear Twist Beam Axle meeting the desired vehicle ride and handling performance and durability, involves numerous intelligent trade-offs. This paper covers parameterization of function to cost with an Artificial Intelligence enabled methodology which is further working as a Value Analysis tool.

In this paper, Primary and secondary function of each child part of Rear Twist Beam Assembly identified and revisited to understand significance from function and cost point of view.

Additionally benchmarking, design strategy and detailed methodology of developing a Rear twist beam axle is discussed with systematic approach on the principles of value engineering leading to optimized and robust part on road. The methodology is nothing but an Artificial Intelligence system developed with defined set of Input, defined rules of data processing which lead to be an enabler to make product strategies with First-Time-Right Approach.

This methodology can influence early design stages where rules and formulas are used to optimize design for strength, weight to improve performance and energy efficiency. The program is versatile such that it can be integrated during New Product Development or Post SOP cost reduction activities.

This abstract emphasizes the importance of systematic design approach of vehicle rear suspension along with classical VAVE leading to evolution of modern engineering to improve competitiveness, innovativeness and address global challenges.

Key Words: Rear Twist beam, Value Analysis, New Product development

23. Value Engineering Study on Vertical Exhaust Structure

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Solution Developer, Tata motors limited

The objective of this project is to improve the manufacturing process of EGP (Exhaust Gas Purification) mounting stray rods primarily using Cold Extruded Wires (CEW) technology which is common in heavy commercial vehicle (HCV) tipper vertical exhaust systems by shifting to Electric Resistance Welded (ERW) rods. The aim is to improve the productivity, lower the cost and enhance the mechanical properties of the stray rods used.

Key Words: Structural support, Vibration damping, Heat resistance, Safety enhancement, Vertical exhaust

24. Value creation in CYMS System Upgrade for F7 Project in TSCR at Tata Steel Jamshedpur

Daya
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In Tata Steel, Jamshedpur LD3TSCR is CSP plant and currently producing 3MTPA HRC with six stand four hi, Hot Strip Mill (Flat product). The Mill is producing about @ 10500 coils per month which comes around 335 coils per day. These coils are being tracked by Level#1 and Level#2 system and managed by CYMS system for storage and dispatch to customer. Seeing the large no of coils, it become more critical to manage the coils with highest level of accuracy, to achieve delivery compliance to customer, SAP cost data posting etc. There is ongoing revamp project in LD3TSCR which considers additional stand installation which will be F7 along

with complete automation upgrade. In the existing CYMS system, the associated automation assets are, DCM controller(L#1), SMS CYMS(L#2) server (which is a gate way to L#1 and Tata CYMS Server at L#3 network). Currently DCM is upgraded along with F7, but SMS CYMS will be retained. This SMS server is Obsolete (EOCL) and going forward with obsoleted system becomes a bottle neck for plant productivity. Hence a need felt to upgrade L#2 CYMS server too, which calls for additional cost of INR 2.8 Cr., investment.

The Objective is to eliminate L#2 CYMS server and achieve same functionality. This gave the benefit in terms of

1. Capex Cost reduction.
2. To eliminate obsoletion issue of L#2 CYMS server on a re-curing basis.
3. To increase system availability.

The optimization additional capex cost, we decided to explore internally to achieve complete functionality without SMS CYMS server and has been conducted through Value Engineering and its details are presented in the paper.

Key Words: HRC: Hot Rolled Coil , CYMS: Coil Yard Management System, Technical FAST, Function Resource Matrix, Value Study, Function based Idea generation. L#1 & L#2: Level 1 & Level 2 automation, DCM: Down coiler Master.

25. Value Improvement of In-Bound Logistic of Finished Good (FG) Coil at Exit Area in Hot Rolled Pickling & Galvanizing Line (HRPGL) Project

Padmaranjan Maharana
Manager Engg. Flat Products, TATA Steel
Vikash Kumar
Sr. Area Manager Engg. Flat Products, TATA Steel

Tata Steel, Cold Rolling Complex (CRC-West) at Tarapur is setting-up a Hot Rolled Pickling and Galvanizing Line (HRPGL) of 0.7 MTPA capacity. This includes one HRPGL Line and one Packaging Line. During facility conceptualization, one EOT crane and one transfer Car was envisaged for the following finished good coil movement to packaging line.

1. Feeding of Finished Goods coils to Inter Bay transfer car.
2. Inter Bay transfer of Finished Goods coil.
3. Feeding of Finished Goods coil to Packaging Line.
4. Transfer of packaged coils to dispatch yard.

The following probable logistics challenges were envisaged:

1. Unsafe handling due to manual intervention while moving goods using Overhead Crane.
2. Material damage while moving goods through Crane.

3. Fitment of Line layout as it is a brown field project.
4. Space for Packaging line for finished goods coil and coil storage space

To mitigate above challenges, Value study was conducted. Customer and Stakeholder needed Functions were identified and analyzed to establish the essentiality of Functional requirement to fulfill higher order purpose of the project. Post Customer Function Analysis, Critical Path Functions and other supporting (All Time/Some Time, One Time) were developed using Technical FAST to assure delivery of required Customer Functions identified in Customer FAST. Value eroding Functions (High-cost Functions) were identified using Function Resource Matrix. These Technical, Value eroding and required Enhancing Functions were used for exploring ideas as a part of Value Methodology Job Plan. Post feasibility check, feasible ideas were transformed into concept. The best concept was selected and implemented considering customer and stakeholders' requirements to ensure optimum value of the project.

The value study has resulted in benefits in terms of reduction in man-machine interface, material damage, and human error, along with reduction of Capex & Opex saving by 7 Cr. and 1 Cr. and productivity improvement.

Key Words: Customer and Stakeholder Analysis, Customer FAST (Function Analysis and System Technique), Technical FAST, Function Resource Matrix, Customer Functions, Technical Functions, Value Study, Project and Construction, Logistic System, Finished Good

26. Value Study of Reject Roller Table at Hot Strip Mill of Kalinganagar

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Instrumentation & Control
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M/s. TATA Steel Ltd. is expanding the capacity of existing plant at TSK from 3 Mtpa to 8 Mtpa. In view of this expansion HSM capacity will also be augmented. To augment capacity of HSM from 3 Mtpa, to 6.3 MTPA it is envisaged to install 2x350 TPH Re-heating furnaces. Due to the additional furnace new hot slab delivery table is getting added. Another Reject table is also being added to directly reject slab from delivery table to Slab yard.

The Reject table is designed with Hitachi make Motors & Hitachi drive in Phase#1.

In order to optimize cost of the project, this was taken as a project for value study. Detailed Function analysis, FAST diagram, Function resource matrix was prepared for Cost items such as motor design & Controls to identify the value eroding function. Function based idea

generation was done as a part of Value Methodology Job Plan. Post idea generation, feasibility check with different stake holders, the feasible ideas were clubbed to different options for evaluation to ensure that the proposed solution should create better value in the system through optimization of Cost. Post evaluation and management approval, the proposed options of optimizing Reject Roller Table at Hot Strip Mill of Kalinganagar were developed for implementation.

1. The Roller table Motor of Hitachi make were replaced by Nord make motors with suitable modification in mounting arrangement.

The change in make of motor shall have no effect on functioning of the Reject roller table with saving in Capital cost & spare cost.

2. The Roller table Drive of Hitachi make were replaced by Siemens make Drive with suitable arrangement for mounting in an E.Room.

The change in make of motor shall have no effect on functioning of the Reject roller table with saving in Capital cost & spare cost.

Value Engineering study has resulted in Capex saving by Rs. 14. Cr.

Key Words: Value Study, Function Analysis, Function Resource Matrix, Bill of Quantity (BoQ), Life Cycle Costing, Capital Projects, Hot Rolling Mill, Furnace Control, Slab handling.

27. Value Study for Optimization of Specific Gas Consumption by Improving Design in Reheating Furnace #3 & #4 of HSM, TSK

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Sunny Kumar Amaranth Singh
Head Engineering Flat Products, Tata steel

Tata Steel is setting up two new Reheating furnaces at HSM, Kalinganagar. Optimization of Fuel gas consumption & improving emission norms of the proposed plant has been conducted through Value Engineering and its details are presented in the paper.

The proposed plant had to face many operational challenges during initial conceptualization as has been listed below:

1. Higher temperature of waste gas at stack.
2. Higher emission values at stack.
3. Consumption of Fuel gas.

To mitigate above challenges and reduce emission, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed Technical Functions. High-cost Functions (Value eroding Functions) were also identified using Function Resource Matrix. These Functions were utilized for idea generation, subsequent concept formation, evaluation and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in improved emission norms and saving in OPEX by Rs. 729 Lakhs annually.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation.

28. Reduction in Downtime of Plant Due to Spray Boom Maintenance in Acid Regeneration Plant (ARP) at CRM, BARA.

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Manager Engg. Flat Products, TATA STEEL

Tata Steel, Cold Rolling Mill Complex (CRM-BARA) at Jamshedpur has set-up a new Acid Regeneration Plat (ARP) of 2700 L/Hr capacity. Reduction of downtime of plant due maintenance activity has been implemented through Value Engineering and its details are presented in the paper.

This ARP is using Waste acid to produce Regenerated Acid and due to iron oxide particles Spray boom nozzles are getting were chocked. For maintenance of two spray booms plant must undergo complete shutdown mode.

There were challenges as mentioned below:

1. We were not able to identify which spray boom was chocked.
2. Early detection/ preventive maintenance was not possible.
3. Every time we had to remove two spray booms to check which one was chocked.

To mitigate above challenges and reduce downtime of plant, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed Technical Functions. High-cost Functions (Value eroding Functions) were also identified using Function Resource Matrix. These Functions were utilized for idea generation, subsequent concept formation, evaluation, and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in reduced plant downtime and helps in preventive maintenance.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function Based Idea Generation.

29. Value study for cable Route optimization during consolidation of substations in L town project at Jamshedpur

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Tata Steel Jamshedpur (TSJ) intends to set up new 2x120Mega Watts (MW) captive power plant (CPP), Powerhouse-7 (PH#7) which will also have provision for setting up a third 120MW unit in future. As part of enabling work for proposed CPP project and space creation, 6 no existing Power substations in the area are required to be consolidated into one. The details of the substation & their location are as follow:

i. 33kV L-Town Substation near L-Town Gate

ii. 6.6kV L24 old, L24 New Substation at I Blast Furnace site.

iii. 6.6kV L5, L26 & L13 Substations at Sakchi supervisory flat area

The major challenge in this project was:

1. Consolidation of geographically scattered 6 No substations into one substation.
2. Planning for shifting & switching of loads from old to new substations without power disruptions.
3. Plan of new cable routes in areas having densely laid Power Cables, Busy Road and heavy flow of underground water
4. Execution of long underground cable laying job within project timeline
5. Completing the project within estimated cost.

To mitigate above challenges and reduce capex, subject job was taken for value study. Detailed Function analysis, Technical FAST diagram, Function resource matrix were preprepared for Bill of Quantity (BOQ) items such as Cables of various sizes and cable laying cost to identify the value eroding functions. These Technical, Value eroding and required Enhancing Functions were used for exploring ideas as a part of Value Methodology Job Plan. Post feasibility check, feasible ideas were transformed into concept. The best concept was selected and implemented considering customer and stakeholders' requirements to ensure optimum value of the project.

During VE study, emerging technology such as Geometrical information system (GIS), Underground utility surveys and Horizontal deep drilling technique (HDD) was also explored.

Post VE study, an optimized cable route with optimum cable sizes and cable length was achieved.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation, Geometric Information System, Heavy Deep Drilling.

30. Value Engineering Study on 1516 Cowl

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Vandana Kandukuru
Deputy General Manager, Tata Motors Limited
Shuvendu Patel
Deputy General Manager, Tata Motors Limited

Improving profit margins is crucial for automobile manufacturers in today's competitive market. They are striving to reduce unit-manufacturing costs through various engineering and management tools while aiming to provide better quality products at lower prices to delight customers. The global automotive sector, including its expansion in India, faces challenges such as rising input material costs, frequent updates to emission norms, and increasing competition from alternative transport modes like trains. These challenges necessitate cost-effective and innovative solutions. This study aims to apply classical Value Analysis and Value Engineering (VAVE) techniques to optimize the design of truck cowl bodies for 48 T Cowl trucks. The goal is to address spatial constraints, enhance cargo capacity, and achieve substantial cost savings through improved design efficiency.

Key Words: 1516 Cowl, Cargo Capacity, VAVE

31. Study of Revision in Construction Philosophy of Box Bridges Underneath the Existing Road Over Bridge at Noamundi Railway Siding

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Reepak Gupta
Head Engineering Logistics, Tata Steel Limited

Noamundi Iron Mines, TSL has planned for establishment of additional Rapid Loading System #3 (RLS#3) and associated railway tracks in addition to existing operational RLS-1 & RLS-2 in view of increase in iron ore dispatch capacity. The revision in construction philosophy of underground cast-in-situ RCC Box Bridge to underground precast RCC Box Bridge underneath the existing road over bridge to reduce the planned operational shutdown of existing RLS-2 railway track at TSL Noamundi in Plant yard was done through Value Engineering and its details are elaborated in the paper.

The execution of underground cast-in-situ box bridge had many construction, safety, and quality challenges during initial conceptualization, which has been listed below:

1. Mobilisation of planned resources and machineries during operational shutdown of RLS-2 railway track for 10 days.

2. Ensuring safety during working beside RLS-1 railway track which is operational and RLS-2 railway track which is under shutdown.
3. Ensuring quality control and quality assurance for construction of cast-in-situ RCC Box Bridge under shutdown of RLS-2 railway track.

In order to mitigate the above challenges and reduce capex & timeline, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed technical functions. High-cost functions (Value eroding Functions) were also identified using Function Resource Matrix. These functions were utilized for function-based idea generation, subsequent concept formation, evaluation and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in improved quality, safety and saving in shutdown time along with Capex avoidance by Rs. 13.07 crores.

Key Words: technical FAST, Function Resource Matrix, value study, function-based Idea generation, Rapid Loading System, Value Methodology Job Plan

32. Study of realignment of Post Loading Railway Tracks of RLS#1 and RLS#2 at Noamundi Iron Mines

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Head Engineering Logistics, Tata Steel Limited
Sudipto Paul
Area Manager Engineering Logistics, Tata Steel Limited

Noamundi Iron Mines, TSL has planned for establishment of additional Rapid Loading System #3 (RLS#3) and associated railway tracks in addition to existing operational RLS-1 & RLS-2 in view of increase in iron ore dispatch capacity. The re-alignment of existing post-loading railway tracks of RLS-1 and RLS-2 at TSL Noamundi In-plant yard was done to avoid huge enabling works for construction of proposed post loading RLS-3 track through Value Engineering and its details are elaborated in the paper.

The execution of proposed post loading RLS-3 track had many construction and safety challenges during initial conceptualization, which has been listed below:

1. Cutting of hard soil along the slope for temporary approach road 7 m wide by excavator from Bottom Bin top to bottom with a height difference of 25-30 meter.
2. Ensuring safety during earthwork excavation by excavator and dumpers in steep slope beside operational tracks of RLS#1 and RLS#2, as there are chances of toppling of dumpers and excavators.
3. Space constraint for storage of construction materials and operation of machineries.

In order to mitigate the above challenges and reduce capex & timeline, value study was conducted. Detailed Function Analysis and accordingly technical FAST was developed to establish the needed technical functions. High-cost functions (Value eroding Functions) were

also identified using Function Resource Matrix. These functions were utilized for function-based idea generation, subsequent concept formation, evaluation and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in improved productive area, safety, construction time along with Capex avoidance by Rs. 1.97 crores.

Key Words: Technical FAST, Function Resource Matrix, Value study, Function-based Idea generation, Rapid Loading System, Value Methodology Job Plan

33. Value Study of Slope Protection of Iron Ore Process Plant of Tata Steel Ltd., Joda

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Seemi Mishraa
Head, Design & Engg, Projects, Tata Steel Ltd.

Tata Steel Joda is expanding its raw materials production capacity by setting-up a new iron ore process plant at Joda. Hilly topography of the proposed plant location brings many challenges including the stability of the area. To stabilize the slope, detailed study has been conducted & suitable slope protection measures were proposed.

The proposed plant had to face many challenges during initial conceptualization as has been listed below:

1. Area constraints due to limited available space.
2. Unstable cut slopes.
3. Heterogeneous strata.

In order to mitigate above challenges and reduce capex & timeline, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed Technical Functions. High-cost Functions (Value eroding Functions) were also identified using Function Resource Matrix. These Functions were utilized for idea generation, subsequent concept formation, evaluation, and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in improved productive area and safety along with Capex saving by Rs. 12.60 Cr.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation.

34. Enhancing Value Engineering Job Plan with Artificial Intelligence (AI)

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Manager, John Deere India Pvt. Ltd.

The Value Engineering (VE) is a systematic and structured approach for improving efficiency of projects, products, processes and services.VE helps to achieve an optimum balance between function, performance, quality, safety and cost. The proper balance results in the maximum value for the project. The VE process follows SAVE International's standard job plan, which consists of eight phases like Preparation, Information, Function Analysis, Creativity, Evaluation, Development, Presentation, and Implementation.

Artificial Intelligence refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. AI systems can perform tasks such as problem-solving, understanding natural language, recognizing patterns, and making decisions. The advance techniques of AI allow systems to perform a wide range of functions across various industries, enhancing efficiency and decision-making capabilities.

This paper gives insights on how AI can play a crucial role in advancing Value Engineering job plan to make it more effective, open new opportunities for value creation and competitive advantage with improved decision-making abilities, shortened time-to-market, and sustainable practices.

Key Words: Value Engineering (VE), SAVE International, Function Analysis, Artificial Intelligence, Human intelligence

35. Application of AI & Machine Learning algorithm for Function Analysis in Value Engineering

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Lead Engineer, John Deere India Pvt. Ltd.

Function phase is considered as the heart of any Value Engineering study. It is very much important to identify the correct functions in Function phase which will define further scope of VE study. By systematically categorizing the functions (Active Verb & Measurable Noun) of a product or project or process, we aim to identify opportunities for cost reduction and value enhancement.

The research integrates artificial intelligence and machine learning techniques to identify, understand & classify functions based on their impact on cost and performance, enabling a

more structured approach to function analysis. This study explores the application of Machine Learning classification algorithms in function analysis. Classification algorithm has highest accuracy, simple and versatile to use when categorical data is considered like k nearest neighbor (nn), Logistic Regression or Naive Bayes. Dataset with labelled categories is fed to algorithm to supervise on available intelligence and later this learning is used to classify new dataset under primary or secondary functions. The findings demonstrate that classification algorithms can effectively streamline the decision-making process in value engineering, leading to optimized resource allocation and improved project outcomes.

This approach not only enhances the understanding of function relationships but also supports the identification of non-essential functions, thereby facilitating innovation and efficiency in design and manufacturing processes. This approach is well explained with the supporting case study.

Key Words: Artificial Intelligence, Machine Learning, Classification Algorithms, categorical data, nearest neighbor (nn), Logistic Regression, Naive Bayes, Dataset.

36. Use of AI for Cost Driver Identification - Value Engineering Case Study

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In the realm of value engineering, identifying cost drivers is crucial for optimizing both cost efficiency and product value. This paper introduces a novel approach that leverages artificial intelligence (AI) for the identification of cost drivers, aiming to enhance the effectiveness and precision of value engineering processes. By integrating advanced AI techniques such as image recognition, our methodology tries to identify and highlight cost driving parameters. The proposed AI-based framework not only improves cost driver identification but also deliver actionable insights, streamlines decision-making, and drives cost reduction idea generation.

This paper offers a new, robust tool for value engineers and sets the stage for advanced, AI-enhanced value engineering techniques that can lead to more efficient and cost-effective solutions.

Key Words: Artificial intelligence (AI), Value Engineering, Cost drivers, Image Recognition

37. Use of AI Based Image Recognition for PCB BOM Preparation - Value Engg Case Study

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In the evolving landscape of electronics manufacturing, the efficient preparation of Bill of Materials (BOM) is critical for cost management and operational efficiency. Traditional

methods of BOM preparation are often labor-intensive and prone to errors. This paper explores the application of Artificial Intelligence (AI) in image recognition to streamline and enhance the accuracy of PCB (Printed Circuit Board) BOM preparation. Through a case study focused on value engineering, we demonstrate how AI-driven image recognition can automate the extraction of component information from PCB images, significantly reducing manual effort and improving data precision. Our approach utilizes convolutional neural networks (CNNs) and advanced image processing techniques to identify and classify PCB components, generating accurate BOMs with minimal human intervention. The case study highlights the integration process, performance metrics, and the comparative benefits over conventional methods. By leveraging AI for image recognition, we present a transformative solution that not only optimizes the BOM preparation process but also contributes to quick estimation of cost of PCB. It optimizes efforts of value engineers and enhances idea generation.

Key Words: Artificial intelligence (AI), Value Engineering, PCB (Printed Circuit Board), image recognition

38. Hybrid Cross Car Beam

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The Hybrid Cross Car beam is an innovative structural component that combines several materials, such as high strength steel and advanced thermoplastic composites, to deliver optimal strength, stiffness, and crash-worthiness while minimizing weight. The Cross Car Beam is meant to absorb and distribute impact forces, thereby protecting occupants and vehicle components. Its multi-material design allows for customized material qualities, decreasing waste and optimizing production costs. The beam's design and material selection are optimized using finite element analysis and multi-objective optimisation techniques, resulting in increased vehicle safety, weight reduction, and fuel efficiency. This component demonstrates a viable solution to vehicle light weighting, adaptability, and safety enhancement in line with industry trends and regulatory standards.

This case study describes in detail the VAVE process for implementing Hybrid Cross Car Beam. This allowed us to validate a fresh paradigm that can be implemented across vehicle programs to boost value while cutting costs. Incorporating this concept into new projects helped optimize costs and improve quality issues throughout the design stage.

Key Words: Hybrid Cross Car Beam, Low Cost, Low Weight, VAVE

39. Pioneering Eco-Efficient Green Steel: Minimizing PLD in Coke Oven Batteries through Value Engineering

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The steel industry is shifting towards Green Steel, adopting greener production methods to meet stringent environmental regulations and market demand for sustainable products. In this context, Coke Oven batteries are crucial components in the steel manufacturing process; their efficiency and lifespan heavily rely on maintaining optimal sealing of doors to prevent gas leakages. This value engineering project focuses on reducing the percentage of leakage from the doors of coke oven batteries, aiming to enhance operational efficiency, extend the life of coke oven batteries, and improve environmental health. By analyzing the root causes of leakage, three key interventions have been proposed: the use of torque wrenches for precise tightening of door bolts, the implementation of a test bed using colored gas to inspect repaired doors, and the evaluation of the effectiveness of springs in maintaining door seals. Tangible Benefits: Reduced Emissions, Enhanced Operational Efficiency, Cost Savings and Enhanced Life of Coke Oven Battery Anchorage Intangible Benefits: Improved Worker Safety, Reputation and Compliance and Increased Equipment Longevity

This project demonstrates that through targeted value engineering interventions, significant improvements in Green Steel production in existing facilities can be achieved, leading to a more efficient, cost-effective, and environmentally responsible operation, with both tangible and intangible benefits.

Key Words: Green Steel, Value Engineering, PLD, Environmental Norms, Pollution Control, Value Engineering

40. Role of Data Analytics in Value Methodology Project: VM Cost Reduction Project using Geometry Matching Tool and Heat Maps

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technologies trending in the market. However, Data Analytics plays a vital role in the initial stages of the product design process.

Aligning to this theme in the given VM study, Data Analytics based tool can compare all the parts and assemblies in single or multiple CAD databases. When available, attributes can be used to filter the comparisons, which helps effectively in project selection & creativity phases of VM Job plan.

Here are the below technologies that are positively impacting in the creativity phase of VM projects.

1. Geometry Matching Tool
2. Heat Maps

Geometry Matching Tool Analytics provides a fully automated analysis of geometric similarity across an entire library of CAD models to find duplication, opportunities for standardization and unwarranted variances in price or performance. Heatmap is a process of coding color of CAD parts or assemblies based on variety of themes and technical attributes.

This paper along with case study is an attempt to share few thoughts about use of Data Analytics in Value Methodology job plan for enhanced & optimized output from any VM study.

Key Words: Value Methodology, Creativity, Project selection, Data Analytics, Geometry Matching Tool, Heatmap, Cost Reduction

41. Improvement of Homogeneity of lighting by changing technology from LED Array to LED Light Guide.

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Deputy General Manager, Tata Motors Passenger Vehicle Ltd

The styling of car lamps has grown in significance and strength, serving as a catalyst for innovation in exterior lighting. Concepts for automotive exterior lamps that are cutting edge and futuristic yet nevertheless adhere to regulations and functionality. The automobile industry is highly demanding for innovative technologies which will meets consumer’s expectation with wow-effect. All this in an environment of reduced space, shorter development cycles and higher quality expectations.

The lighting is no longer be the best visibility or safety parameter of vehicle but also a highly appreciated signature mark for the vehicle. Digitization & automated driving has revolutionize the vehicle lighting. With the inclusion of electronics, the traditional lamps has been replaced with a very presentable futuristic homogeneous lamps, thanks to advances electronically controlled LED (Light Emitting Diode) technology. Even if the customer's expectations were met, the OEM incurred additional costs, which ultimately increased the cost of lighting as a whole. With a diligent effort of VAVE, our team has taken on the challenge of reducing this cost without sacrificing the customer's persuasive value.

This case study explains in detail what the VAVE methodology entails for the implementation of Homogeneous Lamps using light guide technology. This helped us verify a novel paradigm that may be applied across vehicle programs to increase value while lowering costs. Incorporating this notion into new programs helped to optimize costs during the design stage.

Key words: Homogeneous light, Cost Optimization, Customer Persuade Value, VAVE.

42. Value Analysis of LV Wiring harness In Passenger Vehicles

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In the rapidly evolving automotive industry, electrical systems are becoming increasingly complex, requiring sophisticated wiring harness solutions to efficiently manage power and data communication throughout the vehicle.

The Low Voltage (LV) wiring harness is a critical component in passenger vehicles, serving as the backbone for electrical and electronic systems. It connects various electrical components, ensuring the proper distribution of power and signals. As modern vehicles continue to integrate more electronic features, the complexity and cost of LV wiring harnesses have increased. This paper aims to present a comprehensive value analysis of LV wiring harnesses, focusing on identifying opportunities for cost reduction, enhancing performance, and improving the overall design efficiency.

In this paper, we have described the concept of VAVE, and analyse the LV wiring harness in passenger vehicles from a value engineering perspective. The goal is to identify areas where cost savings can be achieved without compromising performance, safety, or quality. This includes evaluating the current design and manufacturing processes, material selection, and routing strategies, as well as exploring innovative solutions that could lead to significant improvements in cost efficiency and functionality.

***Key words*:** Low Voltage (LV), Design Efficiency, Power distribution, Value Analysis, Value Engineering, Passenger Vehicles.

43. Use of Generative Design in creative phase of Value Methodology

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In value methodology projects, in creative phase we do create different ideas by including different people from different teams to get optimized ideas.

Type and quality of ideas is totally dependent on experience and knowledge of people involved in creative phase. If we talk specifically on design ideas it becomes difficult to get design optimization ideas from people other than design teams.

So, we have used generative design module to generate different ideas to get optimized design solution along with the brainstorming session in creative phase.

In this paper we will see one example through value methodology where we will see output for creative phase by conducting brainstorming session as well as along with brainstorming there will be use of generative design.

Generative design will help to generate number of outputs by providing required inputs. It is suitable for complex multi-criteria design problems where important performance criteria are incomputable.

In generative ML is leveraged to mimic natures approach to design the concepts. Basically, it has software developed for generative design, which explores possible combinations of solutions & quickly generates the number of concepts/options. Next job will be with designer to filter the out better options & choose best one

Key words: Generative Design, Creative phase, Brainstorming session

44. Value Analysis for Auxiliary System Integrating Optimization Algorithm

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In diesel engines the Auxiliary assembly system components play an important role on engine performance and the vehicle integration. The parts are exploding to high temperature and with space constraint with other periphery parts around engine which makes design difficult. The bolting structure and the path of applying force on gasket with restriction to apply torque in the assembly is crucial while designing optimized part. The aux cover plates mounted on TJC cover is sustaining vibrations coming from back side due to fuel injection pumps as well as external conditions in field, so it's being very crucial to analyses this component on stress, pressure & vibrational point of view. The gasket subjected to sandwich part should have

uniform pressure. The optimized design which can reduce weight of the part and meet vibrational requirements to maximum possible extent and can create leak proof joint.

In current paper Topology optimization (TO) is used at the concept level of the design process to arrive at a conceptual design proposal that is then fine-tuned for performance and manufacturability. In particular, the target function was defined with the aim of increasing the pressure on gasket of the bracket, whereas the bracket mass reduction was considered as a constraint function for the TO process. The objective function for constraint is also to include number of bolts. TO process uses a finite element method (FEM) to evaluate the design performance. The genetic algorithm used for optimization are using gradient-based mathematical programming

Key words: System analysis, Fuel pump, leakage, Auxiliary components.

45. Value Analysis of Engine Auxiliary, DOC- DPF Mounting Bracket Assembly

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On an agricultural machine, the diesel oxidation catalyst (DOC) & Diesel Particulate Filter (DPF) system is installed on casting and sheet metal brackets that hold the engine auxiliary components. We will make this design more functional without sacrificing the envelope size & its functional requirement. Multiple sheet metal and casting components make up the current assembly, which is built using a range of production techniques. This assembly is analyzed through the application of a structured value methodology, and generative design is employed to identify a feasible solution for the optimal possible design. Without compromising the intended degree of quality or meeting structural load requirements, it must be finished. Using the value methodology approach and tools, a multifunctional value engineering team streamlines the process. The aim of this case study is cost reduction and Design optimization using AI (Artificial Intelligence) Technology.

Creo based Generative Design tool helps in designing the advance solution in creativity phase, it utilizes topology optimization to explore all the possible permutations of a solution, continuously iterating and learning from the process. The generative design application produces multiple shapes, all meeting the stated requirements using Advance algorithms, can parallelly connected to cloud for multiple iteration at same time.

Key words: Engine auxiliary, DOC DPF bracket, Generative Design, Advance algorithms, agriculture machine, design optimization, value methodology, FAST technique, Cost reduction

46. Value Analysis of Hydraulic Hoses used in Agriculture Machines

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In agricultural machinery, most mechanisms are powered by hydraulic systems, which include components such as pumps, motors, flexible and rigid hoses, valves, cylinders, and fittings. It has often been observed that hoses are selected based on existing machines, leading to over design.

This paper systematically investigates the identification of these hoses through various Value Mapping Techniques. These hoses come in various sizes, pressure ratings, lengths, materials, and are sourced from multiple suppliers. There is potential to optimize these variations using Value Methodology. Value Methodology is a structured and systematic approach that follows a step-by-step process to enhance the design, product, process, or project.

For this study, one of the harvesters was selected, with 100+ hoses identified for analysis. Data collection posed a major challenge since it required manual input from drawings. To mitigate these efforts and collect data efficiently, a smart tool from Creo Parametric was utilized. The collected data were grouped and used to identify functions and apply the FAST technique. All design requirements were discussed within a cross-functional team to maximize benefits. The outcome of the study shows optimized design without affecting functional and quality requirements.

The study resulted in more than a 10% cost reduction over current hose costs and helped reduce part variations. Such studies are valuable for conducting Value Methodology assessments on bulk items such as pins, fasteners, washers etc. This case study can be implemented as a best practice across various John Deere product lines, including sprayers, harvesters, and construction and forestry equipment.

Keywords: Hydraulic Hoses, Value Methodology, Value Mapping

47. Tube Optimization Using Rate of Standardization Approach

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This paper examines the methodology for calculating the rate of standardization, through which components can be identified for value analysis, this approach focuses on data analytics approach to pick components. The approach states that if there are 100 assemblies and 1 component can used for all 100 assemblies then the Rate of STD is 100% if 100 components are used for 100 Assemblies then Rate of Std is 0%. A detailed study was done and different Rate of Std were obtained for different assemblies which were later binned, after binning

Tubing Subassemblies was chosen. The value analysis was conducted on tubing using the Value analysis methodology resulting in productivity

Keywords: Standardization; Value Analysis;

48. Leveraging AI-Driven Tools to Eliminate Duplication and Redundancy Through VE Methodology

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In every organization, a common challenge arises when productivity opportunities are developed by following VE methodology and later found to have been previously implemented, leading to wasted time and effort. To address this issue, a tool was developed that leverages PowerApps, Power Automate, EVA (internal generative AI) and Microsoft AI Copilot to create a smart database for managing value engineering ideas.

This tool is primarily designed to eliminate duplicate ideas and prevent redundant work by employees. By intelligently categorizing and filtering submissions in real-time, our solution ensures that only unique concepts are pursued, enhancing the efficiency of the efforts by individuals. Crucially, this project demonstrates that artificial intelligence is not a threat to value engineering but rather a powerful tool that can streamline processes and support in making informed decisions in an organization.

Keywords: Trane Technologies_ AI-Driven Tools to Eliminate Duplication

49. Application of Value Methodology to New Gen Data-Logger

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Thermo King is a manufacturer of transport temperature control systems for refrigerator trucks and trailers, refrigerated containers and refrigerated railway cars along with heating, ventilation and air conditioning systems for bus and passenger rail applications.

This paper speaks about how VE methodology was used for developing a new Gen data-logger based on the data analytics of user profile / refrigeration data points received to envision desired functional product to meet customer requirement. This provides a greater flexibility for customer to select optimal product line with minimal constraints and low-cost of ownership. The product will be equipped with a wireless technology with cloud data storage and cost optimization by more than 70% compared to existing product, installation time reduction by 80% which will be beneficial for both organization and customer.

The scope under study is “Develop New Gen Data-Logger for Trailer & Truck Refrigeration units” which is used to install on refrigeration units in the insulated container.

By adopting the VE approach, we were able to save $ 500 K per year by using new technologies to meet desired operation and minimize installation time significantly to customers, in accordance with Trane Technologies using AI tools/Data analytics.

Key words: Trane Technologies _ New Gen Data-Logger

50. Abstract Application of Value Methodology to Optimize the APU Telematics Module in Tractor

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Trane Technologies is a global climate innovator. Through our strategic brands Trane® and Thermo King®, and our portfolio of environmentally responsible products and services, we bring efficient and sustainable climate solutions to buildings, homes, and transportation. We are advancing our digital capabilities to help our customer reduce carbon emissions, manage energy and asset performance and unlock operational cost savings.

This paper gives insights about how Value Engineering methodology along with Data analytics we able to come up with an optimized of the APU telematics module in tractor with value addition as well as meeting function requirements. By optimizing the APU telematics module, we were able to eliminate the non-value added component as well as improved customer experience.

Utilizing the Value Engineering methodology and AI together helped to optimize the Telematics module as well as minimize the overall project cycle time, reduced number of parts in assembly, reduced take time and delivered better experience to customers.

Keywords: Trane Technologies APU Telematics

51. Application of AI tools within VE Framework for the Study of New Generation Fuel Lines

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As part of its carbon reduction commitments, India had launched the Ethanol Blended Petrol (EBP) programme back in 2023. Indian automakers had to quickly adapt to these change and upgrade their product to be compatible with this new age bio-fuel. Tata Motors apart from the Passenger Vehicle segment also introduced such options in the SCV segment that could run on blended petroleum.

Rubber hoses are used to transfer this fuel from Fuel tank to engine. Currently most fuel lines hoses in BSVI engines were made of EPDM or Nitrile rubber primarily due to their excellent resistance to heat, aging, and ozone, good mechanical properties and affordability. However, with the increased use of ethanol in fuels, it's limitations in chemical compatibility have become more apparent, resulting in more complex hose design requiring resistant materials like fluorocarbon rubber. Due to lack of advanced technology in India, as in the case of most specialized proprietary items, this material too had to be imported and it came at a premium cost. These updates were horizontally deployed for all hoses which resulted in a 3 times cost increase. In light of such major cost increase, management directed our module team to develop alternate proposal to mitigate this cost impact.

This paper presents a comprehensive study on the application of Value Methodology to fuel line systems which helped us generate function based ideas. During this activity we were able to analyse vast set of data and draw meaningful insights with the help of AI tools to optimize the material used and achieve the cost target set for the project.

Keywords: Value Methodology, Function based Idea, AI tools, Fuel line

52. Tube Routing Optimization Through AI

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The integration of Artificial Intelligence in automatic ‘Tube Routing’ for vehicles represents a groundbreaking advancement in automotive manufacturing, particularly at the time of conceptual to embodiment design phase which provide strength to Value Engineering. This

innovation aims to enhance efficiency, precision, and adaptability in Value Engineering process. By leveraging machine learning algorithms and data analytics, AI-driven systems optimize the design and implementation of routing pathways.

Team made use of AI right from the information phase that has help to manage more things effectively in design. AI systems continuously learn and adapt to changes, providing tube routing designs with reduced downtime. Additionally, AI introduces smart decision-making capabilities that optimize design processes, ensuring consistent design quality and reduced lead times as vehicle demand grows. The data driven nature of AI aligns with the principles of Industry 5.0, fostering a more interconnected and intelligent manufacturing environment.

AI's role begins in the design phase, where it analyses vast amounts of historical data and current vehicle specifications to generate the most efficient routing paths. By considering factors such as space constraints, structural elements, and thermal dynamics, AI ensures optimal placement of tubes, valued for their flexibility and reduced complexity.

Furthermore, AI enhances adaptability and accelerates design cycles, reducing operational costs by minimizing design time and material wastage, all while promoting sustainable solutions. This technology can be implemented across the automotive, aviation, and manufacturing industries.

In conclusion, the integration of AI into automatic routing for vehicles significantly enhances efficiency, precision, and modularity, leading to substantial advancements in Value Engineering and Value Analysis

***Key Words**:* Artificial Intelligence, Tube Routing, Value Engineering and Value Analysis

53. AI based Value Engineering of Chassis Frame in Light Commercial Vehicles

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Prashant Sagar
GM, Tata motors

In today's the fast-changing world of business technology, artificial intelligence (AI) is becoming critical tool for creating and making business cases for technology investments. Artificial intelligence describes the capacity of machines to gather information, identify trends, and make judgments with very little human intervention.

Value engineering (VE) is a systematic approach designed to identify potential Value while minimizing costs, without compromising quality or performance. In VE, artificial intelligence (AI) opens up unattainable possibilities for process optimization, result prediction, and extensive dataset analysis previously limited by human capabilities.

This technical paper highlights the successful application of VE & integration of AI for VE study of Truck Chassis. The chassis frame is the "backbone" of a vehicle, which supports entire weight of the aggregates. Due to large variety of designs for different payload conditions, a significant obstacle faced to enhance and optimize LCV vehicle design to satisfy competitive market demand. This has served as the catalyst to initiate value engineering study on chassis frame. The aim of the VE project was to achieve the weight reduction and optimization of torsional stiffness of frame while ensuring cost competitiveness.

Now a days AI is used in many sectors to simplify the complex task, reduce time and generate creative ideas. The VE project requires collection, analysis of vast data from different resources. Application of AI tools in Value methodology (VM) Job Plan improved the level of efficiency and productivity of VE project. Various alternatives were generated which reduced the cost of the frame exponentially without compromising the vehicle performance.

***Key Words**:* AI based Value Engineering, AI tools, Value Methodology, AI & VE

54. AI-powered Value Engineering Study of Tipper Body for Heavy Commercial Vehicle

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Senior Manager, TATA Motors

A truck tipper body is a specialized container mounted on a truck chassis, designed to efficiently transport and dump loose materials. It's a crucial component in industries like construction, mining etc. to transport sand, gravel, stones, coal etc. and saves time for unloading thought tilt mechanism to dump the material.

A tipper body typically have more than 300 components. The manufacturing process is spread across multiple vendor in multiple states. Different designs are used by different manufacturers. There are challenges in availability of selected material at multiple locations. Furthermore, there are manufacturing facility constraints and any optimization may require investments. Due to these, creating best value design for a tipper body becomes complex problem. The management wanted to explore any opportunity for reducing this complexity and cost of truck tipper body

We have taken this challenge to resolve the complexity though value methodology and integration of artificial intelligence tools helped in smoothing the execution of VAVE job plan. Using value engineering principles, various alternatives were generated and analysed though use of AI based algorithm. Use of AI algorithms The final developed idea resulted in saving of ~8% leading to substantial reduction in cost and manufacturing footprint, while delivering the same value to customer. Many out-of-box ideas generated where horizontally deployed to other tippers

***Key Words**:* Value Methodology, Light Weight, Job Plan, Function Analysis, Tipper, Artificial Intelligence

55. Design Optimisation by Enhancing AI for Fuel Management System in Automobiles

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Sr. Design Engineer, Tata Technologies Ltd

In the current technological era, automobiles are designed and engineered with a primary focus on customer safety and comfort, which is increasingly achieved through artificial intelligence (AI). Customer comfort is determined by vehicle ergonomics and the enhancement of touch points. The fuel system is crucial for vehicle functionality and environmental balance, and AI is instrumental in optimizing this system.

The fuel system comprises various components, including the fuel storage system, fuel pump, fuel filling system, fuel delivery system, and fuel vapor recovery system. To reduce component complexity, minimize the number of parts, and enhance part performance, Value Engineering (VE) tools integrated with AI are utilized. This approach lowers manufacturing and assembly costs, reduces the number of components, and decreases overhead charges, all while maintaining desired performance and profitability.

Functional Cost Analysis was conducted to identify components that could be eliminated without compromising functionality, leading to optimized, best-in-class design. This paper presents a case study detailing the integration of the Value Analysis and Value Engineering (VAVE) methodology with AI, which explores new design possibilities. The results demonstrate how this approach benefits new design and validation processes, offering a model that can be applied across the automotive sector to optimize value and performance in future programs. AI enhances VE efforts to achieve superior performance standards.

Keywords: Design Optimization by enhancing AI for Fuel Management System.

56. Application of AI/ML in Hydrobush Tuning to Enhance Overall Value Proposition

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In this intense market of the automotive industry, optimization of vehicle components for superior performance and customer satisfaction is paramount. Hydrobushes play an integral

role in achieving this within vehicle suspension systems by absorbing vibrations and improving ride comfort. The methods tra

ditionally used for tuning these components are not only time-consuming but also heavily reliant on extensive empirical testing. This paper explores the ever-growing field of artificial intelligence (AI) and machine learning (ML) in the Hydrobush tuning process. Leveraging AI/ML algorithms enables to analyze vast datasets, identify patterns, and predict optimal configurations more efficiently than conventional methods. The stated approach accelerates the tuning process while also enhancing the precision of the outcomes, leading to superior ride quality and durability. Thus, the integration of AI/ML techniques in Hydrobush tuning offers significant cost savings, reduces development time, and improves the overall value proposition of automotive products. This paper presents a detailed examination of the methodologies, implementation strategies, and benefits of incorporating AI/ML in Hydrobush tuning, backed by case studies and empirical data.

Key Words: Hydrobush, AI/ML, Optimization

57. Value Engineering Study on Lime Kiln Prediction Model

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The present paper is focused on exploring the possibility of using AI driven decision making for Quality control of lime Kiln. Consistent Calcium oxide content in lime is necessary to have consistent dephosphorisation during primary steel making. While Lower calcium oxide content can cause high phosphorus content in steel making it invaluable, a higher calcium oxide content tends to increase free lime content in slag causing wastage of lime as well as difficulty in slag processing.

After narrowing down to 5 causes through Fish-bone diagram and Impact –Ease matrix, Linear regression is applied. Linear regression highlights 2 primes' causes that is responsible for 20% of the variation in the output i.e. available CaO%. Statistical Design of experiment is performed on the two factors to find their optimum range. Kilns are run in these ranges and we saw significant improvement in the available CaO% in lime.

In this paper, running parameters of lime making process is analyzed with respect to heat consumption and quality of lime produced. In absence of any strong correlation between

input parameters and heat consumption, a novel technique of grouping of data into good and bad zones were employed to get the optimum range for kiln parameters. Kilns that are Twin shaft vertical PFR were run within the range provided by the model under the same production rate. Data during the trial period shows that there was significant reduction in heat consumed per kg of product. At the same time a decrease in heat loss from waste gas temperature and Lime heat is also seen. We used value engineering techniques to improve the seemingly impractical CaO predictive model to very useful prescriptive model. With the help of the Value Methodology technique, we successfully and timely completed the project and resolved the business issue.

58. Value Methodology Study of Optimization of Lime Consumption kg/tcs and its Conversion Cost Reduction from Hot Metal to Crude Steel at LD3 Converter

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India is on its way for producing 300 MnT of crude steel by the year 2030. Syncing with the above aim, TATA steel is also expanding its horizon and is focused on improving productivity in its steel manufacturing division. In present scenario of steel making, basic oxygen Furenace (LD Process) having significant contribution of producing more than 60% steel through this route worldwide. This is the cheapest process of the steel making The World capacity of steel making per annum is around 1700 MT. The biggest challenges are being faced by LD process are the CO2 foot print. There is a typical data for producing 1T crude steel around 2T CO2 carbon foot print emissions in environment. All raw materials input usages for steel making contributing CO2 carbon foot print emissions one way or the other. Lime (Calcium Oxide-CaO) plays a crucial role in steel making and it is used as fluxes for removing the impurities of iron in the form of oxides present in the LD slag, its cost contributions is varying depending upon the quality of lime used, lime production sources and reaching at Steel melt shop the mode of transportation used, operational discipline of LD process, steel volume production, converter slag basicity etc.

The Conversion cost contribution of lime is around 7%. The Lime consumption in LD process depends up on the, quality of lime, hot metal chemistry, quality of steel we are producing and converter operational philosophy. Optimization of lime usage in steel making not only essential for cost reduction but also the LD converter byproduct slag handling is a big challenge too, in terms of storages inside plant, so dumping outside is a concerned for soil contamination and water pollution of water bodies. To promote sustainable steel making process the lime usage optimization in steel making is paramount Benefits of this project is 4.5 crore

59. Using Value Methodology, Design and Development of the Communication Module Enclosure for Different Communication Technologies in the HT 3Ph Smart Energy Meter

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A smart energy meter is a digital device that measures and records your energy usage in real time. The communication modules are used in smart energy meters. The module conveys data from meters to concentrators and then transmits to the Head End System (HES).

Smart meters have different connectivity needs and often require different solutions that vary on the data link, network, and transport layers of the network architecture. Smart meters are often indoors and sometimes underground. There are many communication solutions, like RF, cellular, and PLC technology, used according to requirements that can penetrate buildings and obstructions. So, there is a challenge to designing a common communication module enclosure to suit different communication technologies.

In this situation, VAVE offered a platform for multidisciplinary teams to systematically apply approaches that identified a function or process and established a value for that function. It produced generic enclosure solutions that worked well for a variety of communications systems.

By utilizing the VAVE methodology we have obtained the following benefits:

1. Developed the common communication module for different communication technologies

2. Quick and easy interchangeable feature in module enclosure as per requirement.

3. Elimination mounting fasteners for sustainable development.

60. VE Study for Revision in Construction Philosophy of Box Bridge

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Noamundi Iron Mines, TSL has planned for establishment of additional Rapid Loading System #3 (RLS#3) and associated railway tracks in addition to existing operational RLS-1 & RLS-2 in view of increase in iron ore dispatch capacity. The revision in construction philosophy of underground cast-in-situ RCC box bridge to underground precast RCC box bridge underneath the existing road over bridge to reduce the planned operational shutdown of existing RLS-2 railway track at TSL Noamundi

In Plant yard was done through Value Engineering and its details are elaborated in the paper. The execution of underground cast-in-situ box bridge had many construction, safety, and quality

Challenges during initial conceptualization, which has been listed below:

1. Mobilisation of planned resources and machineries during operational shutdown of RLS-2 railway track for 10 days.
2. Ensuring safety during working beside RLS-1 railway track which is operational and RLS-2 railway track which is under shutdown.
3. Ensuring quality control and quality assurance for construction of cast-in-situ RCC box bridge under shutdown of RLS-2 railway track.

In order to mitigate the above challenges and reduce capex & timeline, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed technical functions. High-cost functions (Value eroding Functions) were also identified using Function Resource Matrix. These functions were utilized for function-based idea generation, subsequent concept formation, evaluation, and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in improved quality, safety and saving in shutdown time along with Capex avoidance by Rs. 13.07 crores.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Function-based Idea generation, Rapid Loading System, Value Methodology Job Plan

61. Value Study for Cable Optimization during Consolidation of Substations in L Town Project at Jamshedpur

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Tata Steel Jamshedpur (TSJ) intends to set up new 2x120Mega Watts (MW) captive power plant (CPP), Powerhouse-7 (PH#7) which will also have provision for setting up a third 120MW unit in future. As part of enabling work for proposed CPP project and space creation, 6 no existing Power substations in the area are required to be consolidated into one. The details of the substation & their location are as follow:

I. 33kV L-Town Substation near L-Town Gate

II. 6.6kV L24 old, L24 New Substation at I Blast Furnace site.

III. 6.6kV L5, L26 & L13 Substations at Sakchi supervisory flat area

The major challenge in this project was:

1. Consolidation of geographically scattered 6 No substations into one substation.
2. Planning for shifting & switching of loads from old to new substations without power disruptions.
3. Plan of new cable routes in areas having densely laid Power Cables, Busy Road and heavy flow of underground water
4. Execution of long underground cable laying job within project timeline
5. Completing the project within estimated cost.

To mitigate above challenges and reduce capex, subject job was taken for value study. Detailed Function analysis, Technical FAST diagram, Function resource matrix were prepared for Bill of Quantity (BOQ) items such as Cables of various sizes and cable laying cost to identify the value eroding functions. These Technical, Value eroding and required Enhancing Functions were used for exploring ideas as a part of Value Methodology Job Plan. Post feasibility check, feasible ideas were transformed into concept. The best concept was selected and implemented considering customer and stakeholders' requirements to ensure optimum value of the project. During VE study, emerging technology such as Geometrical information system (GIS), Underground utility surveys and Horizontal deep drilling technique (HDD) was also explored. Post VE study, an optimized cable route with optimum cable sizes and cable length was achieved. With this optimization, the project was completed in planned duration. This Value Engineering study has also resulted in much simple, short, and safe cable route with Capex saving of 51% of project cost i.e. Rs.1.26Cr.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Project and Construction, Function based Idea generation, Geometric Information System, Heavy Deep Drilling.

62. VE Study for CAPEX Reduction of Automation Equipment in COB-6 Project at Tata Steel

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Coke Oven Batteries (COB) 5, 6 & 7 are the first set of stamp-charged coke ovens installed in Tata Steel Jamshedpur (TSJ) between1989 to 1995. COB 5, 6 & 7 have served their campaign life. It is essential to replace these old batteries for safe, reliable, cost-effective and environment friendly operations. It is proposed to replace COB 5, 6 & 7 (4.5 m tall ovens) with a single battery COB 6 having two 50 ovens blocks (6A & 6B) with 6.25 m tall ovens maintaining same production capacity. The New COB 6A & 6B is proposed to be installed at the same footprint of existing COB 5, 6&7. Integrated Control System which has advanced technique, easy operation, high reliability, expansibility and successful application is selected for controlling, regulating, data acquisition, alarm, sequencing and safety interlocks and management function concerning Coke Oven Plant and associated utility systems. The optimisation of automation component for cost reduction, space utilization and operator ease has been conducted through Value Analysis and its details are presented in the paper. As a part of Basic Engineering deliverable, Network Architecture was proposed by ACRE Coking & Refractory Engineering Consulting Corporation, MCC (ACRE for short).

The Level-1 architecture (Plant Network) comprises of:

1. Servers as IBA, OPC cum Historian and Web Servers
2. Server Panels with redundant SCADA, Application & Database Server
3. Control Desk for Server, Engineering & Operating Stations
4. Workstations- Engineering & Operating Stations
5. Network Accessories

Scope of procurement, detail design, execution & commissioning is in TSL scope. The proposed plant had to face many operational challenges during initial conceptualization as has been listed below:

i. Fragmented systems and data present in silos

ii. Layout requirements considering the facilities

iii. System complexity- integration of multiple devices in Level-1 network.

In order to mitigate above challenges and reduce capex & timeline, value study was conducted. Detailed Function Analysis and accordingly Technical FAST was developed to establish the needed Technical Functions. High-cost Functions (Value eroding Functions) were also identified using Function Resource Matrix. These Functions were utilized for idea generation, subsequent concept formation, evaluation and implementation as a part of Value Methodology Job Plan.

Value Engineering study has resulted in following benefits:

1. Reduction in Capex by Rs. 0.75 Cr.
2. Improvement in maintainability and time to repair.
3. Improvement in productive area utilization and safety.
4. Elimination of frequent requirement of manpower for maintenance of OPC cum Historian Server,
5. Server Panel, Workstation & Network Accessories.
6. Reduction in construction time by 8 weeks.

I think, this is 1st time in Tata Steel India based on a new idea with paradigm shift.

Key Words: Customer and Stakeholder Analysis, Bill of Quantity (BoQ), Technical FAST (Function Analysis System Technique), Function Cost Worth Analysis, Function based Idea generation, Paired Comparison Matrix, Decision Matrix, VM Change Proposal, Project and Construction

63. VE Study for Re-alignment of Post Loading Railway Tracks of RLS#1 and RLS#2 at Noamundi Railway Siding

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Noamundi Iron Mines, TSL has planned for establishment of additional Rapid Loading System #3 (RLS#3) and associated railway tracks in addition to existing operational RLS-1 & RLS-2 in view of increase in iron ore dispatch capacity. The re-alignment of existing post-loading railway tracks of RLS-1 and RLS-2 at TSL Noamundi In-plant yard was done to avoid huge enabling works for construction of proposed post loading RLS-3 track through Value Engineering and its details are elaborated in the paper.

The execution of proposed post loading RLS-3 track had many construction and safety challenges during initial conceptualization, which has been listed below:

1. Cutting of hard soil along the slope for temporary approach road 7 m wide by excavator from Bottom Bin top to bottom with a height difference of 25-30 meter.
2. Ensuring safety during earthwork excavation by excavator and dumpers in steep slope beside operational tracks of RLS#1 and RLS#2, as there are chances of toppling of dumpers and excavators.
3. Space constraint for storage of construction materials and operation of machineries. In order to mitigate the above challenges and reduce capex & timeline, value study was conducted.

Detailed Function Analysis and accordingly technical FAST was developed to establish the needed technical functions. High-cost functions (Value eroding Functions) were also identified using Function Resource Matrix. These functions were utilized for function-based idea generation, subsequent concept formation, evaluation, and implementation as a part of Value Methodology Job Plan. Value Engineering study has resulted in improved productive area, safety, construction time along with Capex avoidance by Rs. 1.97 crores.

Key Words: Technical FAST, Function Resource Matrix, Value Study, Function-based Idea generation, Rapid Loading System, Value Methodology Job Plan

64. Role of Digitalization towards the Value in Aerospace Industry

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What is digitalisation? Digitalization refers to the continuous evolution of processes using digital technologies [1]. It enables easier access to information, provides a platform for expression [2], and promotes the rapid integration of innovative technologies [3], creating

machine-readable digital artifacts for seamless adoption of new technologies [4]. Digitalization in Aerospace Industry The aerospace sector has led technological advancements in manufacturing with automation and computer-aided processes [5]. Though digital technologies like AI are seen as disruptive, their adoption in aerospace is gradual [6]. Digitalization, driven by Model-Based System Engineering, is enhancing collaboration between Space Agencies and Industry [7], and is already prevalent in aviation management, operations, and maintenance [8].

65. Value Engineering Towards Sustainability in the Era of Digitalization

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Value engineering is essential in sustainability and advanced technologies, especially with introduction of Industry 4.0 for resource efficiency Stock, T. (2016), Additive manufacturing enhances product life cycles but experiences difficulties Ford, S. (2016). AI transforms business practices, offering sustainability opportunities, though its social impact is still unclear Nishant, R. (2020), Khakurel, J. (2018). These technologies highlight the requirement of sustainable innovation and value optimization. The key findings and key challenges in sustainable value engineering are discussed in the paper.

66. Value Engineering Study on Re-designing and Manufacturing Din 500 Bobbin

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Value Engineering (VE) serves as a crucial tool for companies in the global market to meet customer demands. When implemented effectively, the VE process can lead to sustained growth and success for a company. VE is essentially the methodical use of established techniques to determine the purpose of a product or service, assign a financial value to that purpose, and ensure the required reliability is achieved at the lowest possible cost. This paper

presents the basic fundamental approach that can be implemented in any product to optimize its value (both in terms of performance & cost). A case study of a DIN 500 Bobbin is discussed in which major constraint faced related to its delivery/ cost / quality and performance. Therefore we have redesigned & manufactured the DIN 500 bobbin in-house by applying value engineering technique to improve the performance as well as reduce the cost of its components such as Raw material / Belly/ Flange/ Bushes etc., this has resulted in improving the overall (P/C) ratio.

Keywords: Value Engineering, DIN 500 bobbin, Design of component, Performance & cost.

67. VE Study for Utilization of Surplus Stock in Electrical Package of Power Source Connectivity from MSDS to BF#2 to Reduce Capex at TSK

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Tata Steel Kalinganagar (TSK) is setting-up a new Blast Furnace (designated BF#2) for its Phase-2 expansion from 3 MTPA to 8 MTPA crude steel capacity. For operating the BF#2 plant, approx. 70MW power was required to be sourced at 132 kV voltage level from our 132 kV MSDS substation to Blast Furnace S/S designated as MSDS-BH substation (2.5 KM apart).132 kV Cables and jointing kits were budgeted to be procured and installed for this transfer of power from MSDS to MSDS BH sub-stations. TSK was initially commissioned with 220 kV input power supply (as 400 kV grid sub-station construction was delayed) and before Phase#2 project start up, it was planned to shift from 220 kV to 400 kV voltage level connection to grid. Power at 400 kV would be received at outdoor gantry inside TSK and thereafter to BPRS 400 kV S/S through 400 kV cables. As we got only 220 kV power from Grid, 220 kV cables were installed from gantry to our internal sub-station which would later become defunct when we migrated to 400 kV supply.

The following were technical challenges during initial conceptualization for using 220 kV cables:

1. 220 kV cables are dimensionally very different from 132 kV cables. How to ensure correct fitment at 132 kV GIS and the technological interventions required? This has never been done before by us anywhere for GIS connection.

2. Whether the existing length of 220 kV cables would suffice or we need to procure 220 kV cables (some qty) if existing cable length does not suffice? How do we modify cable routing to match length required?

Value Engineering study was conducted to optimally utilize invested capital in 220 kV cables and has resulted in reuse of 220 kV Cable for connectivity between MSDS and MSDS BH.

68. AI-Driven Value Engineering to Facilitate Eco-Efficient Design 1n Manufacturing

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This paper explores how integrating Value Engineering (VE) and Artificial Intelligence (AI) enables reducing carbon footprints using the systematic cost-reduction approach offered by VE and taking advantage of the advanced data analytics and optimization capabilities of artificial intelligence. In AI-driven VE, timely analysis of production systems reveals areas in the use of materials, streamlining processes, and minimizing emissions. AI in combination with VE promotes the adoption of sustainable materials, eliminates the modelling of predictions for waste, and allows for adaptive control of the process such that energy efficiency is ensured. AI also upgrades the lifecycle analysis, where ongoing evaluation of the environment is assessed and informs data-driven decisions towards greener manufacturing. This approach is innovative not only in sustaining but also in ensuring functionality of the product along with cost efficiency. It is an advanced solution being presented to industries looking at how to minimize their carbon footprints while staying extremely competitive in an increasingly eco-conscious market.

Key Words: Value Engineering; Artificial Intelligence; Sustainability; Cost Reduction; Manufacturing

69. Application of Value Engineering and AI for Sustainability

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Value Engineering (VE) is a systematic approach focused on enhancing the value of products, processes, or services by optimizing their functionality while minimizing costs. In the context of engineering, VE analyses key functions, identifies cost-saving opportunities, and improves overall performance without compromising quality. VE is interdisciplinary, often involving collaboration between design, production, and operational teams to ensure resource-efficient solutions. In renewable energy, VE aims to enhance system efficiency, reduce environmental impact, and improve sustainability by refining materials, processes, and designs. The end goal of VE is to achieve the optimal balance between performance, cost-effectiveness, and long-term viability (Makin Miles, L.D, 1961).

VE in renewable energy is a method focused on optimizing the performance, cost-efficiency, and sustainability of renewable energy projects. It involves evaluating alternative designs, materials, and processes to enhance value without compromising quality or performance. By systematically analyzing project components, VE helps reduce unnecessary costs and identifies innovative solutions that increase efficiency in energy production and distribution. For example, in solar and wind energy projects, VE might involve choosing more durable materials that reduce maintenance costs or implementing modular designs to improve scalability. Further, VE can be made more effective with integration of appropriate Artificial Intelligence (AI) tools. The approach ensures long-term viability and environmental benefits, crucial for addressing global energy demands sustainably.

Key Words: Value Engineering; Cost Reduction; Artificial Intelligence; Renewable Energy; Sustainability

70. Significance of Value Engineering in Mechanical Engineering

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The aim of this paper is to highlight the significance of Value Engineering (VE) and analysis and how it has enhanced the different aspects of Mechanical Engineering (ME). Effectiveness and sustainability of the product is increased by applying various VE methods like improvisation of design, cost reduction by model simplification, increasing product quality and reliability, developing better manufacturing techniques, according to customer's priority and trending technologies. We have portrayed the significance of VE in various vital aspects of Mechanical Engineering by surveying various applications of VE in Thermal Engineering, Aerospace Engineering, Robotics and Automation, etc. This paper also highlights the role of AI and Digitalization and how it amplifies the impact of VE. Such analysis hereby justifies the advantage and impact of VE in the domain of Mechanical Engineering.

Key Words: Value Engineering; Mechanical Engineering; Artificial Intelligence; Sustainability

71. Value Engineering Towards Sustainability in the Era of Digitalization

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Value Engineering (VE) is essential in sustainability and advanced technologies, especially with introduction of Industry 4.0 for resource efficiency Stock, T. (2016), Additive manufacturing enhances product life cycles but experiences difficulties Ford, S. (2016). AI transforms business

practices , offering sustainability opportunities, though its social impact is still unclear Nishant, R. (2020), Khakurel, J. (2018). These technologies highlight the requirement of sustainable innovation and value optimization. The key findings and key challenges in sustainable value engineering are discussed in the paper.

Key Words: Value Engineering; Sustainability; Technology; Industry 4.0

72. AI-Driven Value Engineering to Facilitate ECO-Efficient Design in Manufacturing

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This paper explores how integrating value engineering and artificial intelligence enables reducing carbon footprints using the systematic cost-reduction approach offered by value engineering and taking advantage of the advanced data analytics and optimization capabilities of artificial intelligence. In AI-driven VE, timely analysis of production systems reveals areas in the use of materials, streamlining processes, and minimizing emissions. AI in combination with VE promotes the adoption of sustainable materials, eliminates the modelling of predictions for waste, and allows for adaptive control of the process such that energy efficiency is ensured. AI also upgrades the lifecycle analysis, where ongoing evaluation of the environment is assessed and informs data-driven decisions towards greener manufacturing. This approach is innovative not only in sustaining but also in ensuring functionality of the product along with cost efficiency. It is an advanced solution being presented to industries looking at how to minimize their carbon footprints while staying extremely competitive in an increasingly eco- conscious market.

73. Value Engineering in Aerospace Industry

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Value Engineering (VE) is a methodical analysis of products and services on cost and function to create more value. One of the significant components for performing such an activity is the functional study. It determines which functions are essential to perform, then identifies necessary and unnecessary costs. Its goal is to maximize the use of available resources but in a manner that encourages efficiency and innovation.

In brief, value engineering is the systematic approach to changing the value to purpose through the optimisation of functions of a product and reduction in costs while its quality is maintained. Analysis is carried out on design, materials, and all processes involved. In aerospace, VE is an essential interface that tries to minimize costs while maintaining high performance.

For instance, López Pascual et al. (2021) conceptualized the Enhanced-Earned Value Management model for efficiency and, similarly, Haque (2003) considered lean engineering as one of the waste-removing avenues. Interestingly, one of the essential facets of value creation in aerospace manufacturing has been claimed to be sustainability (Hallstedt et al., 2015; Bertoni et al., 2015). According to Taylor & Kim (2021), it is also significant in the sustainable manufacturing processes of the aerospace industry.

Key Words: Value Engineering; Quality; Aerospace; Manufacturing

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