

**ENHANCING AUTOMOTIVE LIFECYCLE MANAGEMENT THROUGH SAP VEHICLE
MANAGEMENT SYSTEM (VMS): AN IN-DEPTH ANALYSIS**

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Abstract

The SAP Vehicle Management System (VMS) is a comprehensive solution tailored for the automotive industry, enabling seamless management of the entire vehicle lifecycle, from procurement to sales and post-sales services. This paper provides an in-depth exploration of SAP VMS, highlighting its critical functionalities, including master data setup, vehicle search, configuration management, action control, and warranty claims handling. The system's flexibility supports both Make-to-Order (MTO) and Make-to-Stock (MTS) production strategies, integrating with core SAP modules like Sales and Distribution (SD), Materials Management (MM), and Customer Service (CS). VMS automates complex vehicle-related processes such as procurement, goods movements, pricing adjustments, and regulatory compliance, ensuring that automotive businesses can meet dynamic customer demands and operational requirements. The paper also discusses the configuration of VMS, focusing on action codes and the Vehicle Manager's role in improving operational efficiency. Furthermore, it examines how SAP VMS addresses key challenges in the automotive industry, including data integrity, supply chain visibility, and regulatory compliance, offering a holistic solution to optimize vehicle management processes.

Index Terms – SAP Vehicle Management System, SAP VMS, automotive industry, vehicle lifecycle management, Make-to-Order, Make-to-Stock.

I. INTRODUCTION TO SAP VEHICLE MANAGEMENT SYSTEM (VMS)

SAP Vehicle Management System (VMS) is a comprehensive enterprise solution tailored specifically for the automotive industry. Designed to streamline vehicle-related processes, SAP VMS facilitates the management of vehicle procurement, sales, distribution, and post-sales services. Automotive businesses, from original equipment manufacturers (OEMs) to dealers, benefit from an integrated system that manages the entire vehicle lifecycle, from production to end-customer delivery.

At its core, SAP VMS serves as a backend infrastructure that integrates several SAP modules, including Sales and Distribution (SD), Materials Management (MM), and Customer Service (CS), providing a holistic view of vehicle-related operations. One of the primary advantages of VMS is its ability to support both Make-to-Order (MTO) and Make-to-Stock (MTS) strategies. In MTO scenarios, vehicles are configured and manufactured based on specific customer orders, whereas MTS enables stockpiling of vehicles that meet general market demands [1]. A key feature of SAP VMS is its robust vehicle configuration management. Automotive businesses can manage vehicle

characteristics, such as engine type, interior features, and color, using variant configuration functionality. This allows companies to customize vehicles efficiently, catering to individual customer preferences. Furthermore, VMS integrates with SAP Pricing procedures to dynamically adjust pricing based on these vehicle configurations, ensuring flexibility during the sales process. Through real-time tracking of vehicles, companies can manage stock levels effectively, reduce inventory costs, and ensure the availability of vehicles. VMS also allows for detailed monitoring of vehicle statuses, making it easier for manufacturers and dealers to identify when vehicles are ready for delivery or when they require additional processing, such as pre-delivery inspections or rework. The sales and distribution capabilities of SAP VMS simplify complex order processing, enabling seamless coordination between OEMs, importers, and dealers. By integrating sales data with customer relationship management (CRM) systems, VMS provides businesses with a 360-degree view of customer interactions, allowing for targeted marketing campaigns and improved customer service. For instance, dealers can access up-to-date vehicle availability, pricing, and configuration information through an online portal, ensuring that customer demands are met quickly and accurately. Moreover, VMS provides advanced financial management tools, enabling businesses to track revenue, profitability, and expenses throughout the vehicle lifecycle. The system streamlines invoicing and billing processes and ensures regulatory compliance, which is critical for maintaining profitability in a highly competitive market.

II. CHALLENGES IN THE AUTOMOTIVE INDUSTRY ADDRESSED BY SAP VMS

The automotive industry faces several challenges, including complex supply chains, fluctuating market demands, and stringent regulatory requirements. SAP VMS addresses many of these challenges by providing an integrated platform that optimizes vehicle-related processes, enhances operational efficiency, and ensures compliance with industry standards.

One of the primary challenges in the automotive industry is the complexity of supply chains. Managing a vast network of suppliers, OEMs, and dealers can be overwhelming, particularly when it comes to tracking vehicle orders, configurations, and deliveries. SAP VMS mitigates these complexities by offering end-to-end visibility into the supply chain, allowing businesses to track vehicles from production to delivery. Moreover, VMS enhances warranty and service compliance by integrating warranty management tools, allowing businesses to track claims and service histories efficiently. This ensures that vehicles remain compliant with the terms of their warranties, reducing post-sales service issues by integrating data from various stakeholders, VMS ensures that all parties have access to real-time information, reducing delays and improving coordination. Data migration and quality are additional challenges faced by automotive companies, particularly when transitioning from legacy systems to SAP VMS. Migrating vehicle data, including configurations, sales orders, and customer information, often involves cleaning and transforming large datasets. SAP VMS provides robust tools to manage this process, ensuring that data quality is maintained, and inconsistencies are minimized. Additionally, by integrating advanced analytics, companies can gain real-time insights into vehicle performance, maintenance schedules, and supply chain dynamics. This capability allows businesses to make more informed decisions, improving fleet utilization, optimizing procurement strategies, and reducing inventory costs [4]. Customers expect highly personalized vehicles, and managing this level of customization can be difficult for automotive companies. SAP VMS addresses this by providing variant configuration functionality, enabling businesses to create custom vehicle configurations based on customer preferences. This

functionality also extends to pricing, as SAP VMS integrates with the pricing module to dynamically adjust prices based on the selected vehicle features

Compliance with industry regulations is another critical concern for automotive companies, particularly with respect to emissions standards, safety regulations, and data privacy laws. SAP VMS helps businesses navigate this regulatory landscape by offering built-in compliance features. For instance, the system tracks vehicle emissions data and ensures that all vehicles meet the required standards before they are sold. Moreover, VMS supports data privacy regulations by safeguarding customer data and ensuring that it is only accessible to authorized personnel. Along the same lines, another significant aspect of compliance is the system's automated reporting and auditing capabilities. SAP VMS simplifies the process of generating reports for regulatory bodies, automating data collection and reducing human error in tasks like emissions tracking and financial reporting. This helps organizations meet deadlines and maintain accurate records for audits

Finally, cost optimization is a constant challenge in the automotive industry, where businesses must balance profitability with high operational costs. SAP VMS addresses this by streamlining processes, automating manual tasks, and reducing redundancies. For example, the system's inventory management capabilities help businesses reduce excess stock and avoid costly stockouts, while its service and maintenance features enable proactive vehicle maintenance, minimizing downtime and reducing repair costs.

It is evident through multiple success stories of automobile companies that SAP VMS tackles several of the automotive industry's most pressing challenges, from supply chain complexity to regulatory compliance. By providing an integrated platform for managing vehicle data, configurations, and sales processes, SAP VMS enhances operational efficiency and ensures that automotive companies remain competitive in an ever-evolving market. Through real-time visibility, advanced analytics, and compliance tools, VMS empowers businesses to optimize their operations and deliver exceptional customer experiences.

III. MASTER DATA SETUP IN SAP VMS

The master data setup forms the backbone of efficient vehicle management, supporting all processes from procurement to sales and distribution. This foundational data includes information about vehicle models, configurations, vendors, customers, and related actions. Accurate customization and maintenance of all master data elements ensures that all underlying business processes such as vehicle creation, configuration, and pricing run efficiently within the system.

At the core of VMS is the vehicle model, which is essential a 'basic type of vehicle' that can be varied. In SAP, vehicle models are defined under the material type VEHI, enabling customization through a combination of classes and characteristics. Each model serves as a template, allowing business users to account for variations in features such as color, engine type, and interior specifications. The vehicle model setup is critical as it forms the basis for both searching and creating individual vehicle instances. Setting up a vehicle model requires detailed customization of the material master record. Fields such as the base unit of measure, item category group, and the configuration class are pivotal. These configurations enable flexibility, allowing vehicles to be adjusted to meet customer demands without altering the base model. For example, if a dealer initially quotes a customer for a hatchback and later changes the order to a sedan, the same vehicle model can accommodate this change without needing to create a new material entry thus saving time and reducing complexity. The process of constructing vehicle configurations is equally

essential. This involves defining characteristics, variant conditions, and object dependencies to enable flexible customization of vehicle features during the sales process. For instance, characteristics such as motor type or air conditioning can be linked with specific pricing rules. These pricing rules are controlled through a condition technique, allowing the system to calculate prices dynamically based on the configuration chosen by the customer [1].

Pricing is an integral part of VMS, as each vehicle's configuration directly impacts its cost. SAP's standard pricing procedure RVAA01 is typically employed, allowing for flexible pricing adjustments based on variant conditions. For example, a vehicle with upgraded features like premium paint or an advanced engine will have corresponding variant pricing added to the gross list price. This approach ensures that each vehicle's price reflects its individual configuration, simplifying the sales process for dealers and customers alike [2]. In addition, vehicle-specific data in the Sales and Distribution (SD) module ensures that billing and invoicing processes are aligned with the vehicle's configuration and order status. Customizing actions – such as defining material type VEHI and integrating it with VMS0 item categories – facilitate streamlined handling of sales orders and invoices within the system

Another critical aspect of master data setup in VMS is managing vendors and customers. Vendors, typically original equipment manufacturers (OEMs), are responsible for supplying vehicles/ vehicle parts, while customers (usually dealers) purchase vehicles for resale. Each vendor and customer requires representation in master data that captures essential information such as location, payment terms, and organizational data. This information is vital for creating accurate procurement and sales orders. For example, a vendor's payment terms, and purchase order conditions must be reflected accurately in the system to avoid transaction errors. VMS also supports the management of end customer data, which is typically handled by dealers. The system ensures that end customer data remains private, with each dealer managing their own customer details. In cases where multiple end customers are associated with a single vehicle – such as in leasing scenarios – VMS enables this relationship to be documented and managed appropriately. This setup helps in scenarios where customers may share ownership or where multiple entities need to be linked to the vehicle.

IV. VEHICLE MANAGER IN SAP VMS

The Vehicle Manager is the central component of the SAP Vehicle Management System (VMS), offering a comprehensive tool for managing vehicle lifecycle processes, including procurement, sales, shipping, and post-sales services like warranty handling. SAP VMS is designed to accommodate diverse production and distribution strategies such as Make-to-Order (MTO) and Make-to-Stock (MTS), providing flexibility for businesses to accommodate different production/distribution models. Through transaction VELO, the Vehicle Manager consolidates essential tasks such as vehicle search, configuration changes, action execution, and warranty management into a single interface

The vehicle search feature allows users to locate vehicles based on various search criteria. Using transaction VELO, users can search for vehicles by specific identifiers, such as the Vehicle Identification Number (VIN), internal vehicle number, or based on attributes such as configuration and location. This function is particularly important for MTO strategies, where individual vehicles need to be tracked throughout production and sales processes. The search function also supports mass processing by filtering multiple vehicles that meet certain criteria, streamlining operations for

large-scale manufacturers. Once a vehicle search is executed, the Vehicle Overview displays all vehicles that match the search criteria. The overview provides detailed information, including vehicle configuration, status, and stock availability, and integrates with the Materials Management (MM) module to track inventory levels and procurement statuses. For example, a dealership can quickly check the availability of stock vehicles in an MTS setup or monitor incoming vehicles under procurement in an MTO process. This real-time visibility enables businesses to manage goods movements and coordinate shipping activities efficiently. The Vehicle Details tab offers a granular view of individual vehicles, allowing users to monitor their status throughout procurement and sales. It provides data such as configuration details, sales orders, and customer information, which is crucial for both MTO and MTS strategies. Additionally, users can modify vehicle data when necessary, ensuring that changes are accurately reflected in ongoing business processes. This capability is particularly useful for managing vehicle configuration changes (action SMOD) when customer preferences or regulatory requirements evolve during production. Lastly, the Vehicle Action Log records all business transactions related to a vehicle, including sales orders, configuration changes, procurement orders, and goods receipts. Actions such as creating a purchase order (ORD1) or sales order (CUOR) can be tracked in real-time, ensuring accurate documentation of a vehicle's lifecycle. The log differentiates between primary actions, which affect the vehicle's status (e.g., order creation), and secondary actions, which may involve more specific tasks, such as sending invoices or updating customer details. The action log also facilitates the batch execution of actions for multiple vehicles at once, further enhancing operational efficiency. The ability to modify vehicle configurations after a vehicle's creation is a key feature of SAP VMS. In scenarios where vehicles are produced based on customer-specific orders (MTO), configurations such as engine type or interior features might need to be adjusted post-order. The Vehicle Manager enables users to implement these changes seamlessly, provided they do not conflict with existing sales orders or procurement documents. The system automatically updates the vehicle's pricing when configuration changes impact variant conditions, ensuring that pricing remains accurate and aligned with the new configuration.

The Vehicle Manager in SAP VMS integrates with Sales and Distribution (SD) and Materials Management (MM) modules to facilitate end-to-end procurement, sales, and shipping processes. In an MTO model, procurement begins with the creation of a customer-specific purchase order (ORD1) and continues through goods receipt (GORE) and vehicle delivery (DELI). The system provides real-time visibility into the status of each vehicle, allowing businesses to track its journey from the supplier to the end customer. In the MTS model, the Vehicle Manager enables users to manage stock levels, ensuring that vehicles are available for immediate allocation to sales orders without delays in shipping. Sales processes are managed through the integration with the SD module, allowing for seamless creation of sales orders (CUOR) and delivery notes (DELI). The Vehicle Manager also supports action control, a mechanism that defines the sequence of actions a vehicle must undergo before reaching the customer, such as quality checks, pricing adjustments, and transport preparation. Actions are controlled through matrices that define allowable vehicle statuses and the next steps in the sales process.

Lastly, The Warranty Claim Display function is essential for managing post-sales services, such as warranty claims and vehicle servicing. Using transaction WTY, users can view existing warranty claims for specific vehicles, track service history, and manage ongoing claims. The Vehicle Manager integrates warranty data from the Customer Service (CS) and Warranty Management modules, ensuring that all warranty-related activities are visible to both the manufacturer and

dealer. This function is particularly critical for businesses handling a high volume of vehicles under warranty, as it allows for efficient claim processing and management of service costs.

V. TECHNICAL INTEGRATION OF SAP VMS WITH OTHER SAP MODULES AND SYSTEMS

SAP VMS is highly integrated with other SAP modules such as Materials Management (MM), Sales and Distribution (SD), Customer Service (CS), and Financial Accounting and Controlling (FI/CO), which provides seamless data flow across the automotive supply chain. This integration ensures that all stages of vehicle management—from production and procurement to sales and aftersales services—are efficiently executed.

A crucial part of SAP VMS is its interaction with SAP Advanced Planning and Optimization (APO) and SAP Business Warehouse (BW). SAP APO plays a critical role in demand planning and characteristics-based forecasting, enabling businesses to predict demand for specific vehicle configurations and adjust their production accordingly. The forecasting model helps manufacturers balance inventory levels and meet customer expectations without overproducing or underproducing vehicles, which could result in unnecessary costs. By using characteristics-based forecasting, APO ensures that customized vehicles are manufactured in line with market demand. SAP BW is leveraged to provide detailed reporting and analytics. With BW, companies can track key metrics such as vehicle production timelines, sales performance, and inventory turnover. This integration allows decision-makers to have real-time visibility into their supply chain performance, providing valuable insights into where process optimizations can be made. The combination of VMS with BW enhances operational efficiency by offering detailed reports on sales orders, purchase orders, and invoice status, ensuring that the financial aspects of vehicle management are tracked alongside production. In terms of optimizing operations, SAP VMS integrates with the SAP Digital Vehicle Hub. This platform allows vehicle data—such as production status, vehicle configurations, and delivery timelines—to be managed centrally and updated in real-time. The SAP Digital Vehicle Hub ensures that vehicle data, including customer-specific configurations, is replicated and synchronized with SAP S/4HANA VMS, ensuring smooth data flow across systems. This integration helps companies maintain a holistic view of vehicle statuses and ensures timely delivery by connecting logistics, sales, and warehouse management [2]. Furthermore, SAP VMS is equipped with Advanced Variant Configuration (AVC), which simplifies the process of customizing vehicles to specific customer requirements. AVC allows manufacturers to efficiently manage complex product configurations, ensuring that custom orders are fulfilled accurately and within the required timeframes. By integrating AVC with real-time analytics, companies can improve resource allocation, optimize production schedules, and enhance overall customer satisfaction by delivering tailored vehicles on time.

When it comes to system implementation and deployment, deploying SAP systems, including VMS, in cloud environments can significantly enhance scalability and operational flexibility. Cloud-based SAP implementations allow automotive companies to manage large datasets associated with vehicle lifecycles and supply chains without the heavy burden of on-premises infrastructure[5]. The critical role of effective project management in the successful deployment of SAP ERP systems like VMS cannot be understated. It is important to adhere to structured methodologies such as the Accelerated SAP (ASAP) framework, which ensures the correct

allocation of resources, strict adherence to project timelines, and clear communication among stakeholders. Without such structured management approaches, there is a risk of project delays, budget overruns, and misalignment with business objectives, which can lead to failed implementations or systems that do not deliver their intended value[6].

VI. CONCLUSION

SAP VMS is a comprehensive tool for managing vehicles throughout their lifecycle, supporting both Make-to-Order (MTO) and Make-to-Stock (MTS) production strategies, allowing businesses to optimize procurement, sales, and distribution.

- It integrates seamlessly with key SAP modules like Sales and Distribution, Materials Management, and Customer Service, enhancing data flow and improving overall operational efficiency across departments.
- The system's features, such as vehicle search, mass updates, configuration changes, and warranty claim management, help streamline processes and reduce manual interventions.
- SAP VMS addresses critical industry challenges, including supply chain complexity, real-time inventory management, and regulatory compliance, by automating workflows and improving decision-making.
- By optimizing resource allocation and ensuring regulatory adherence, SAP VMS enables automotive companies to meet market demands, enhance customer experiences, and lead in the digital transformation of vehicle management.

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