



HEXAGON
PPM

WHITE PAPER

EFFECTIVE MATERIALS MANAGEMENT

REDUCING COSTS AND IMPROVING PROCUREMENT EFFICIENCY



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1. INTRODUCTION

Ineffective materials management for projects can result in significant cost blow-outs and delays in project completion. Such cost inefficiencies will negatively impact global competitiveness, and owner operators (O/O) and engineering, procurement, and construction (EPC) companies are trying to streamline work processes for their projects.

Innovative technology has the capability to respond best to O/O and EPC business drivers by integrating the entire material and supply chain work processes to provide project teams with online access to information during all project phases – from engineering through the complete supply chain to onsite management. This enables effective materials management, delivering cost savings and improved procurement efficiency.

This white paper will discuss current industry challenges of materials management, the business benefits of implementing an effective materials management system, and highlight the Hexagon PPM methodology to achieve effective materials management for lowered total project and installed costs.

2. INDUSTRY CHALLENGES

As OOs and EPCs embark on bigger and more complex projects, materials management becomes an increasingly challenging process. The management of procuring materials is critical as any materials surpluses or shortages will delay the project and put it at risk. This then affects the maintenance of a consistent flow of materials for production, thus affecting the overall project.

Inaccurate materials information, such as incorrect bills of materials, inaccurate cycle counts, shipping errors, receiving errors and so on, will also affect the overall project life cycle and increase project costs. Having to deal with subcontractors outside of the materials management process impacts the overall project supply chain as there is an increased risk of data inconsistencies.

In order to remain competitive, OOs and EPCs have identified materials management as a critical work process to be streamlined and integrated for improved productivity. The Hexagon PPM methodology recognizes key industry challenges to be addressed:

- Procurement inefficiencies
- Increased risk and project costs due to delays caused by breakdowns in the materials management process
- Difficulties with the integration of the materials management process with the overall project life cycle
- Definition and quantification of material in the manner best suited to the individual project

3. BUSINESS BENEFITS

An effective materials management system has the capability to integrate the entire material and supply chain work processes. Project teams will have online access to information during all project phases – from engineering through the complete supply chain to onsite management. The business benefits of effective materials management include significant cost savings and increased procurement efficiency.

Effective materials management governs the material- and quantity-related activities by providing:

- Efficient corporate and project specification management
- Definition and quantification of material in the manner best suited to the individual project
- Procurement and material tracking through delivery
- Scheduling and forecasting
- Engineering integration with customers and subcontractors
- Timely construction planning down to the work package level

3.1. MANAGING REFERENCE DATA AT ONE PLACE

With an effective materials management system, all partners in the EPC project supply chain can manage all reference data in one location. This has several benefits, including:

- Definition of key technical material attributes for bulk materials or itemized equipment to be used downstream
- Provides a common foundation for defining all bulk materials, which eliminates redundancy by creating and managing attribute-driven bulk commodities and specifications at a corporate standard or enterprise level
- Provides internal revision control, reducing the man-hours required to make revisions
- Delivers substantial benefits from materials standardization
 - Up to 79% reduction on traditional paper-based project piping specification costs
 - Up to 70% reduction on manual 3D load file costs
 - Up to 13% reduction on change and revision management

3.2. ENGINEERING AND PROCUREMENT INTEGRATION

The integration of engineering and procurement data presents the most recent status of any material item being used within the project. The benefits of this capability include

- Ability to turn dynamic engineering data into stable procurement data
- Unlimited comparisons of different quantification statuses
 - Management of change is automated and current requirements will be clearly communicated to supply chain managers
 - Reduces risk of over/under procurement
- Rule-driven processes automatically create material requisitions according to company-specific operating procedures
 - Increases efficiency in the process by the automation of the work
- Continuous tracking of material requirements against material acquisitions, which allows for proactive management of potential surpluses and shortages

3.3. SUPPLY CHAIN MANAGEMENT

An effective materials management system enables users to seamlessly integrate interchanges with commodity suppliers, subcontractors, manufacturers, fabricators, and freight forwarders. The ability to manage the supply chain has several benefits:

- Complete supplier management allows access to historical information on supplier performance on previous projects
 - Performance measurement criteria will help to aid/advise for further selection

- Allows effective, efficient management of materials milestones, which adds value by automatic notification of missed or delayed critical events
 - Provides timely information and flexible event tracking, increasing project efficiency and savings
- Centralized storage of all data involved in the inquiry process: supplier information, attached documentation, and requisition-based data
- Allows buyers the option of picking and choosing items during the bid evaluation process or optimizing the selection of suppliers for requisition line items to minimize project costs
- Knowledge of material shipments well in advance of release from the suppliers allows for better planning and allocation of resources (labor and equipment)
 - Right material at the right place at the right time reduces site delays

3.4. SITE MANAGEMENT

It is critical to balance onsite personnel with material availability so that material can be assigned to site inventories in the shortest possible time. Site management is a key component of effective materials management with several benefits, including:

- Total material visibility from shipments through issue of material to be installed into the final works
- Multiple warehouse status capabilities – physical and virtual
- Ability to track material movement between the warehouses with audit trails
- Fabrication tracking of the fabricated spools
- Work package planning with priorities by sequence or date
- Ability to forecast material availability – looking ahead by 30, 60, or 90 days
- Complete history of material issues down to the isometric/spool level, which gives material traceability

4. THE HEXAGON PPM METHODOLOGY

The Hexagon PPM solution, Intergraph Smart® Materials, is the only complete, commercially available materials management and subcontracting solution, and provides a common collaboration platform and project workbench for all partners in any EPC project supply chain.

Hexagon PPM's Smart Materials solution is proven technology and has been adopted by several world-leading engineering firms. Existing customers have reported procurement efficiency, lower risks and costs, and other business benefits since implementing Smart Materials.

4.1. PROCUREMENT EFFICIENCY

Smart Materials enables improvement in procurement efficiencies through the following:

- Single data input and SmartPlant Enterprise integration
 - Downstream processes/groups are not required to re-input data for their purposes
 - Copy and paste through Microsoft Office files is no longer required
- Less time spent organizing with more time spent on strategizing and negotiating
 - Rule-driven processes allow Smart Materials to gather the requirements and generate inquiries, which allows buyers to be more effective
- Common system and processes for all projects
 - As personnel move from project, they do not have to learn how a particular project is being run as reporting will be consistent across all projects

- Better planning and less “panic” buying
 - With better quality and quantity of information available earlier, decisions can be proactive instead of reactive

4.2. LOWER RISKS, LOWER COSTS

Smart Materials helps to lower project costs and improve risk management through the following:

- Improved audit performance with reduced data entry points
 - Inadequate performance impacts project schedules while the project team responds to findings
 - Having easier access to key audit data makes it easier to track performance and to recover from required modifications
- Minimizes shortages and surpluses
 - Tight integration of engineering and procurement facilitates the elimination of surplus materials
 - Elimination of shortages reduces risks and construction costs
- ROS-driven milestone planning and control
 - Allows for a construction-driven schedule for early planning of engineering and procurement material activities
- Material delivery and arrival control
 - Gives the project a complete view of movement and availability to support desired work fronts
- Integration of all EPC materials data in one system
 - Allows for total project material reporting and control without having to gather data from different disciplines
- ~Construction work-front planning and forecasting
 - Rule-driven processes allow Smart Materials to gather construction work package requirements and assess material situation throughout the supply chain with appropriate feedback into the EP process

4.3. OTHER BENEFITS

Smart Materials customers have reported other business benefits, including:

- Standardization reduces costs in engineering, procurement, and construction
 - Downstream integration compresses project schedules
 - Assessment of historical project data improves quality of new bids and compresses bid time
 - Improved organizational efficiency
- Enhanced integration and functionality over in-house legacy systems
 - This helps to break down silos further and facilitates faster response to change
- Ability to see full EPC material work processes at a glance
 - Seamless integration with design and engineering
 - Integration with the extended supply net
 - Real-time information
 - Improved reporting from a single integrated system

5. SMART MATERIALS USER EXPERIENCES

Many of Hexagon PPM's current Smart Materials customers have reported significant cost savings and have provided positive feedback about the solution.

5.1. WISON

Wison is an Hexagon PPM customer in China and has used management base for its EPC projects for many years. Using company's control flow, Wison has demonstrated a successful materials management mode to control the process of materials management. It covers planning, structure, flow, as well as the deployment and implementation of a materials control system.

Table 1: Wison reported significant cost savings through the implementation of Smart Materials

State	Surplus Material Costs/Aggregate Investment	Surplus Material Cost/Sum of Procurement Cost	Issuing by Mistake/Sum of Materials Number	Time for Final Account/Project Duration
Without Smart Materials in Project	0.44%	1.11%	4.00%	23.53%
With Smart Materials in Project	0.14%	0.46%	0.30%	5.00%

At the Hexagon PPM 2010 conference, Wison shared the cost savings of its projects through the implementation of Smart Materials. Table 1 shows a significant improvement in all categories when Smart Materials was implemented for a project, compared to when Smart Materials was not utilized.

For example, in a 2-billion RMB project, Wison was able to save a total of 13.8 million RMB across materials and procurement costs using Smart Materials for effective materials management.

5.2. APRIL MANAGEMENT

April Management (formerly known as PEC-Tech) is an EPC customer headquartered in Singapore and has been using Smart Materials to control project costs and deliver efficient materials management. Smart Materials has helped April Management to speed up its materials procurement process while maintaining efficiency. April Management achieved a 3% reduction in cost for a US\$200 million project for US\$6 million in savings.

5.3. BARAN

Baran is a global provider of engineering, technology and construction services and has implemented Smart Materials as a company standard. Smart Materials has enabled Baran to reduce client costs in material procurement and engineering costs for its projects. Less rework is also involved due to integrated work processes between engineering, procurement and construction. Construction costs are also reduced as once an item is supplied onsite, the information can be validated in engineering systems for total material control.

5.4. CLOUGH

Clough is an Australia-based EPC customer and has implemented Smart Materials to play an important role in its business initiative to provide integrated global collaboration systems for project execution. Smart Materials is recognized as an industry-standard product and significantly complements Clough's well-known logistical strengths. Clough will replace its in-house systems with Smart Materials, which will grow and develop with the company.

5.5. CHIYODA

Chiyoda Corporation is a Smart Materials customer in Japan. Smart Materials has the ability to handle all material management processes, from establishing a corporate material standard to quantification, procurement, and control of material onsite in one integrated environment, which has helped Chiyoda to significantly improve efficiency and minimize risk. Chiyoda has also extended the solution globally for use with joint venture partners and suppliers.

5.6. WORLEYPARSONS

WorleyParsons is a leading provider of professional services to the energy, resource and complex process industries with headquarters in Sydney, Australia. WorleyParsons implemented the Hexagon PPM SmartPlant Enterprise suite of engineering applications, including Smart Materials. This has enabled WorleyParsons to increase productivity through core engineering and materials control tool standardization, streamlined work processes and consistent training methodology.

5.7. IV – OIL & GAS

IV-Oil & Gas is a Dutch EPC customer and has implemented Smart Materials to manage project materials and reduce costs for its customers' capital-intensive oil and gas projects. Smart Materials has enabled IV-Oil & Gas to provide procurement and material specification information in a faster, more accurate and efficient way, providing the EPC with another boost to its efficiency. The Hexagon PPM solution has delivered benefits throughout the procurement and materials management processes to IV-Oil & Gas, as well as its project partners, vendors, suppliers and construction companies.

5.8. MCDERMOTT

McDermott International (formerly CB&) is one of the world's leading EPC companies and has implemented Smart Materials as its materials management system across its global network of 80 offices and 16,000 employees. McDermott used Smart Materials on its energy and natural resources projects, including oil and gas and offshore installations, across the complete project execution lifecycle. Smart Materials has helped McDermott to improve efficiencies across all material management work processes and drive efficiency in plant engineering and construction.

5.9. CTCI

CTCI Corporation is the largest integrated engineering and construction firm in Taiwan and has implemented Smart Materials to replace several legacy systems for materials management. Smart Materials has enabled CTCI to address challenges of data consistency in EPC execution and multi-office operation. Smart Materials is a data-centric platform and data only needs to be entered once. Other users from various disciplines can gather up-to-date information at any time according to their material

management roles. As a web-based system, it has proven to be very effective and Smart Materials has made CTCL's materials management more accurate and efficient.

6. PROVEN MATERIALS MANAGEMENT SOLUTION

Smart Materials is the Hexagon PPM integrated lifecycle material and supply chain and subcontracting management solution and is proven technology for OOs and EPCs. Smart Materials is a real project workbench for all material and subcontract-related activities, spanning the entire project lifecycle to enable organizations to focus on corporate project objectives rather than departmental or discipline-specific goals.

Modular, open, and fully Web-enabled, Smart Materials responds to OO and EPC business drivers by:

- Lowering total project and installed costs by reducing labor hours and eliminating material surpluses and shortages
- Reducing plant schedule through integration with design and cost systems
- Increasing competitiveness through minimized project bidding time, compressed schedules, and reduced labor hours – including administration, engineering, procurement, supply chain management, and construction
- Improving risk management through better overall project performance, project cash flow management, and true management by exception
- Enabling global project worksharing and execution, using correct, complete, and consistent data
- Enabling data reuse throughout the plant lifecycle, including plant operations and maintenance, and refurbishment
- Managing subcontracts via eSupplier functionality from the planning phase to tracking each progress step of a subcontract

For an effective materials management system, choose Smart Materials for total materials management and subcontract management for your plants and projects. For more information, please contact your local Hexagon PPM office.



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About Hexagon PPM

Hexagon is a global leader in digital solutions that create Autonomous Connected Ecosystems (ACE). Our industry-specific solutions create smart digital realities that improve productivity and quality across manufacturing, infrastructure, safety and mobility applications.

Hexagon's PPM division empowers its clients to transform unstructured information into a smart digital asset to visualize, build and manage structures and facilities of all complexities, ensuring safe and efficient operation throughout the entire lifecycle.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 19,000 employees in 50 countries and net sales of approximately 3.5bn EUR. Learn more at hexagon.com and follow us @HexagonAB.

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