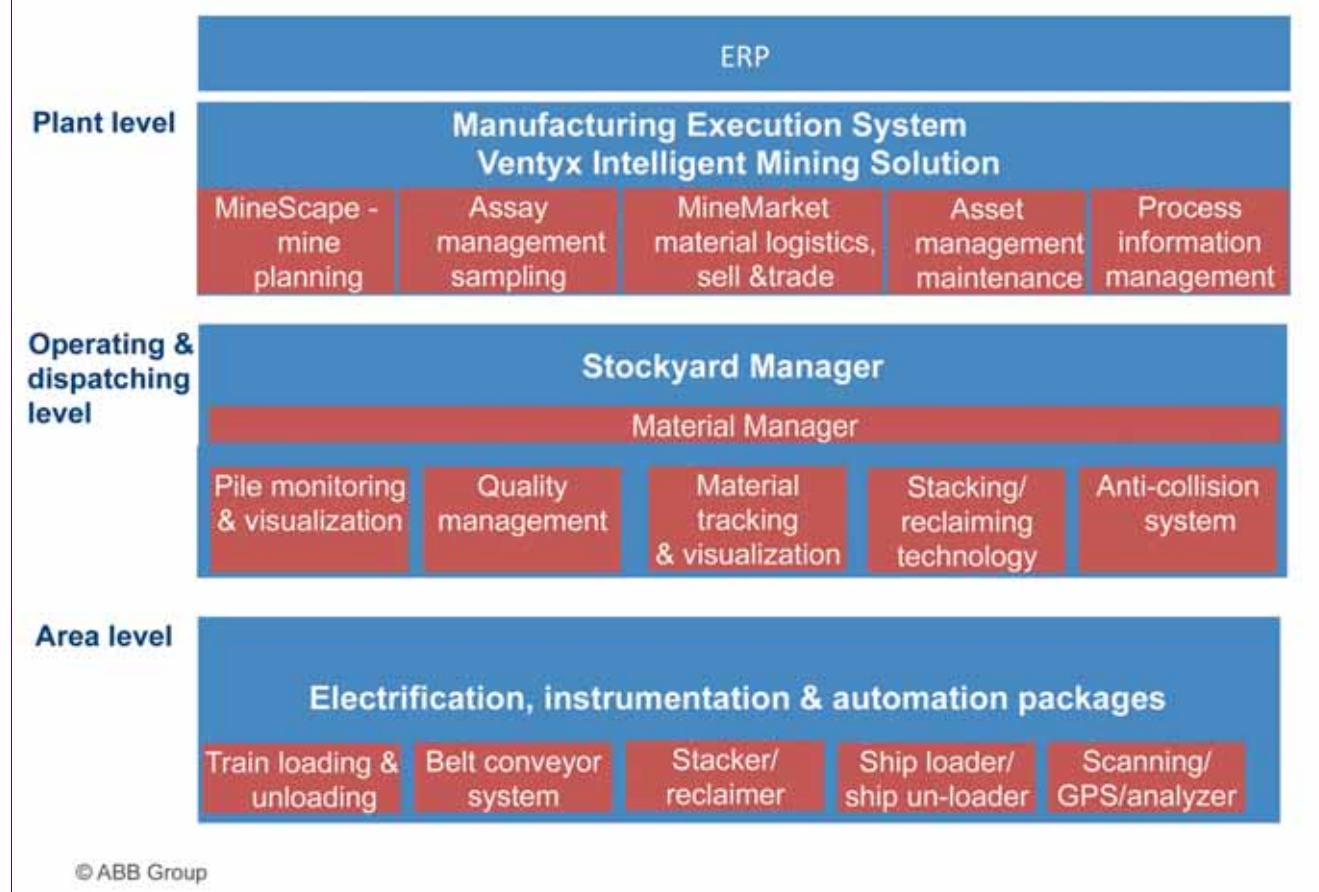


Stockyard Manager – ABB integrates process control, MES and ERP

Figure 1: Modular system for bulk materials handling.



In recent years, market focus has often been on the optimization of individual parts of the mining process — such as mine planning, or advanced automation solutions. However, what is needed now is a seamless integration of all subsystems and an overall optimization from the mine to the market.

An integrating tool is required to minimize the effort required for all steps in the material flow chain, like material processing, storage and handling. This tool should build interfaces and interaction between the different levels — from the order fulfillment in the ERP system all the way through to the basis operation on the pile or even in the mine or the plant.

Additionally, the increased degree of efficiency in modern coal power plants demands an integrated coal handling management system, in order to ensure that the coal supply is of sufficient quality and quantity.

To fulfill these demands, ABB has developed a modular system, as shown in Figure 1 above.

For operators in the central control room to achieve fully automated operation, they need real-time information about the material quantities, properties and locations, be it in a surge bin, on a belt or on the stockpile.

These requirements can be met by a computer-calculated model of the stockpile (or belt or surge bin, respectively) which is based on exact information from a database. The database provides information about the material quality in the transportation and stockpile models that monitor the material flow online.

The necessary input for the model is delivered by laser scanners and positioning systems mounted on the stockyard machines. This allows for autonomous operation of the machines.

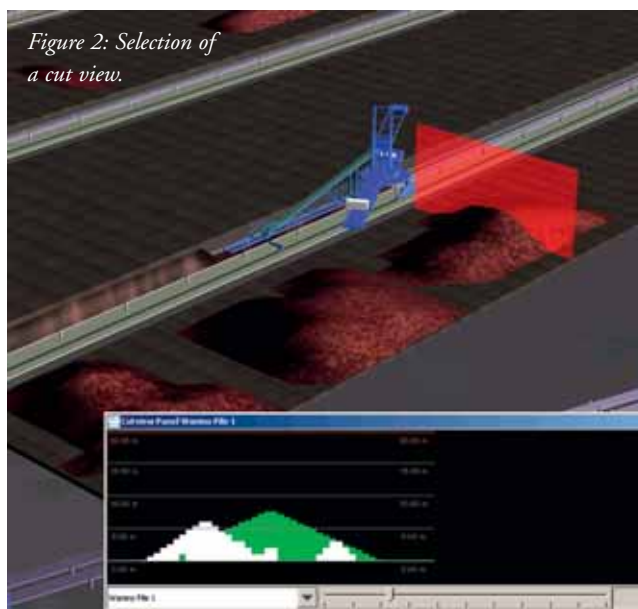


Figure 2: Selection of a cut view.

The scanners can provide surface information which will be used to recalculate the model. This solution enables a real-time and full-terrain update of the pile surface. This information remains accurate even after material movements due to environmental influences like storms or heavy rain, or due to the use of mobile machines such as graders or bulldozers. Furthermore, a scanner detects the superstructure of ships, wagons and other objects and hence enables — in combination with an adjustment to the GPS data — a goal-directed behaviour for loading or unloading.

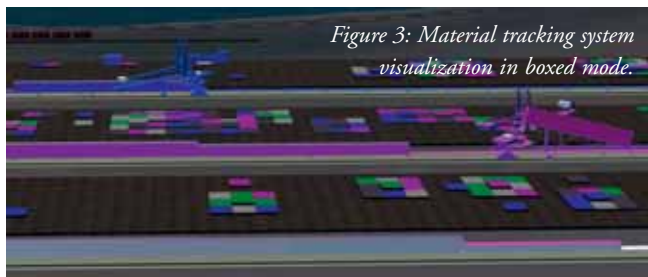


Figure 3: Material tracking system visualization in boxed mode.

For optimized material processing and handling, a pile monitoring and visualization module records material movements to and from a stockpile and calculates the material distribution on a stockpile accordingly. The module supplies information about the material on the stockpile and its shape, as well as its different properties (quality). Material distribution on the stockpile will be calculated with a computational module based on the information from the modules Material Tracking, Stacking and Reclaiming Technologies and the results of the 3D laser scanning.

The stockpile visualization component offers a graphical representation of the information stored in the stockyard management system, using modern browser technology. The visualization shows an overview of all stockpiles on the job site. The stockyard can be displayed in 2D or in 3D.

For a detailed analysis of the stockyard, it is possible to zoom and adjust the angle of the view. The view can be adjusted from different viewpoints and separate piles which could be split into small individual virtual piles that can be selected individually. Slice or cut views can be shown where the different material types and their respective properties are stored.

The system processes a complete job like unloading a whole batch with subsequent stacking, or a complete loading process of a ship including reclaiming material from the pile, haulage and loading. With a continuous overview of the tonnage and properties of the material, the system calculates the best route by optimizing the material flow to ensure the ideal employment of the machines.

The stockyard management system is fully automatic, so no workers are required to operate the stackers and reclaimers, train- or shiploaders/unloaders. It is a complete, comprehensive and fully automated system (see Figure 1) for material handling. The system includes a number of advantages:

- ❖ minimizing the administration effort;
- ❖ constant and optimized belt load and consequently optimized material throughput;
- ❖ less equipment wear due to fewer stress factors (no system overload);
- ❖ reduced maintenance costs;
- ❖ fewer faults and less damage triggered by operator failures;
- ❖ cost savings due to fewer operators; and
- ❖ energy savings by smooth and continuous operation

A proven collision-avoidance system prevents injuries or damage to equipment, whether the machines are handled by operators or not. Warning signals are issued by a laser scanner, a GPS or pile height sensors (mounted on the left and right hand side of the boom/bucketwheel respectively) help to prevent collisions of the boom/bucketwheel with the pile.

One notable recent project is a stockyard management project with a Brazilian mining company in Malaysia. In 2012, ABB won an order to fully automate the process control system at a new iron ore distribution hub on the west coast of Malaysia.

The facility will distribute ore shipped from Brazil to steel company customers in the Asia Pacific region. The project will include a palletization plant, a jetty and warehouses. ABB's delivery will automate the material handling process, which will be completely unmanned, for maximum efficiency and personnel safety.

ABB's scope of supply includes the design, engineering, fabrication, delivery, system integration, installation, testing and commissioning of a 800xA process control system to manage all plant equipment at the hub including the conveyors, stackers, reclaimers and ship unloaders. The unmanned stackers and reclaimers will be aided by 3D pile scanners and a GPS positioning system to ensure the highest level of accuracy and precision in sorting and distributing customer orders.

