Business Integration Software

Over the last few years, control systems like the ones provided by Repete have evolved to collect and manage vast amounts of information. This information, when pertaining to the production of a product, has proven to be extremely valuable to the larger enterprise business. At the same time, other software systems like ERP, MES, MOM and enterprise business management software has become more sophisticated and is now capable of incorporating data about purchase orders, work orders, production data, shipment data and quality data directly. Therefore, the need has evolved to tie these systems together in a seamless way.

Repete has stepped up to this challenge by developing a line of business integration software. This software is designed specifically to meet the demands of connecting dissimilar software systems found in a wide range of locations in a seamless manner. In addition, Repete has overcome the challenges that network and system outages can have on the various locations of an enterprise.

The Repete Middleware Solution is best suited to companies that have grown to the point where they are consolidating functions like formulation, purchasing, inventory, work orders, shipping and lot management into a central location. Often, these functions are represented at corporate headquarters within business systems like ERP, MES, MOM and other privately developed systems. As consolidation occurs at the corporate enterprise level, often the number of remote facilities also increases, thus driving the need to integrate business management software with production and control system software located at mill sites.

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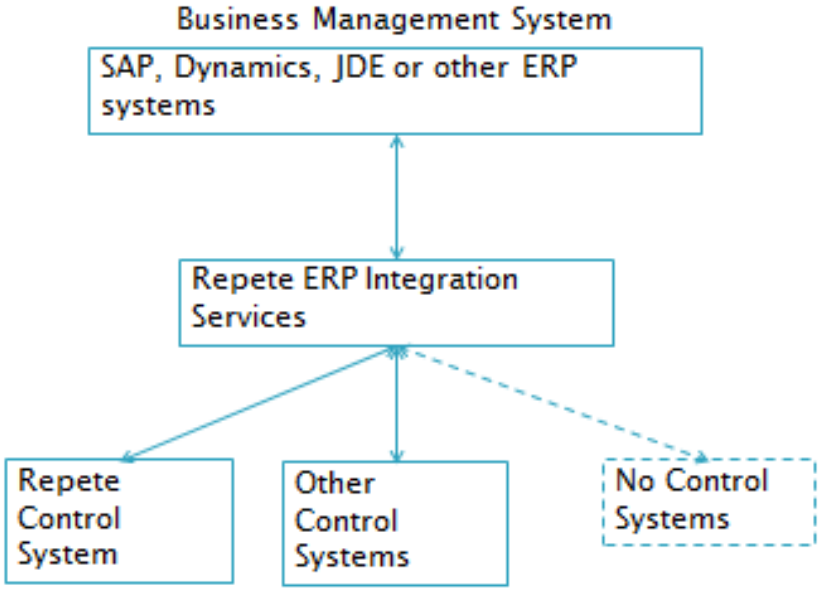
REFERENCE ARCHITECTURE

Repete has developed a web-based solution that handles safe and continuous movement of standard documents between the business management system and one or more control systems located in mills. The box labeled "Repete ERP Integrations Services" below represents this software:



The core architecture of the Repete integration services is designed to provide guaranteed delivery of information between systems without duplication. This is accomplished using a publisher and subscriber model. Using the Repete integration server, the ERP system can subscribe to production data. As the control system (the publisher of production data) completes production, a notification is created and sent to each subscriber. Subscribers then use the notification to pull the data associated with the notification and after successfully obtaining the data, the notification is deleted. This interlocked method of interaction between systems produces a fail-safe way to move information between publishers and subscribers.

For example, picture a scenario where the internet fails between the middleware and a mill control system. In this case, production continues to occur and production records continue to be created along with the notifications targeted to the subscribers. With the internet down, these notifications cannot be delivered and sit in the control system until the internet is up and running again. Notifications continue to attempt to notify subscribers periodically until eventually the internet returns and the notification goes through to the subscriber. Once notifications reach the subscriber, the process of moving data continues until it is complete, at which point the notification is deleted by the subscriber.

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This indicates that the transfer is complete. The publisher-subscriber model exists between ERP systems (and other types of systems) and the middleware, as well as between the mill control systems and the middleware. This type of architecture ensures guaranteed delivery of information between systems despite system or network failures.

Another unique feature of the Repete Middleware Solution is that it provides a user interface for all data types being moved between systems. This allows for records to be created in the middleware or even at the control system during times when networks or systems are off-line. This unique capability allows manual entry of information needed to keep production running regardless of network or systems outages. For example, assume that work orders are produced and released from an ERP system. Normally, the work order would be supplied to the middleware and then to the designated mill control system to produce the work order. The mill would represent the work order as a scheduled work item on a process area at the mill. Assume, for this example, that the network is down between the middleware and the control system, thus preventing the work orders from creating scheduled production entries at the control system. In this case, the plant can manually enter a production schedule on the control system. The work order number is entered to identify that this work order should not be duplicated when the ERP-originated order eventually reaches the control system. Production may now continue and the finished product can be produced. Later, when the internet connection is restored, the middleware notifies the control system that the work order is ready for production. Since the work order was placed manually on the schedule, the system will not be allowed to create a second one. If the ERP-originated work order differs in any way from the manually-created record, the user at the control system is notified that a work order conflict exists and the middleware can be used to reconcile the difference.

This methodology produces a highly-available system that prevents duplicates and allows production to continue when system or network outages occur.

ERP INTEGRATION SERVICES

"ERP Integrations Services" refers to a standard set of web-based software features that make integration with an ERP, accounting or business management system easier. The ERP Integration Services has the ability to exchange the following basic document types between a business corporate enterprise (ERP, accounting or business management system) and one or many automation control systems in widely-located milling facilities. This document uses the term "business system" below to mean any ERP, accounting or business management system.

Documents exchanged between the business system and the control systems located in the mill(s)

1. Receiving Orders: These documents are originated by business systems and are used to control what ingredients a mill is allowed to receive. When a mill receives against a receiving document, the actual received results are reported back to the business system. The receiving orders can move seamlessly back and forth between the business system and the control system or can be staged, edited and released using the ERP integration services web pages.
2. Work Orders: These documents are originated by business systems and are used to inform the mill control system what finished product to make as well as in what order to make it. Work orders can carry the formula along with the order or provide the order only. Work orders can flow seamlessly between the business system and the control system or be staged for edit, sequencing and release using the ERP integration services web pages.

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a. Production Usage: When the finished product is made, the work order document is updated with the actual amounts of ingredients included into the mix along with the final product amounts.
b. Finished Production: When the finished product is made, the work order document is updated with the final amount of finished product produced. If lot-tracking is enabled in the control system, then any ingredients that had lot-tracking active also has its lot number included in the usage data. This feature can be used to update inventory systems that support lot-tracking.
c. Finally, the work order is updated with the totals of usage and production amounts, sent to the business system and used to update inventories and other systems as needed to support the business process.

3. Formulas: Formulas can be submitted along with work orders if desired. However, formula documents in various formats can be submitted by formulation systems or business systems and transferred to the control system at a mill. This method is often used when the business practice is to keep a list of current formulas at the mill and only submit work orders as needed to control production. This feature can also be used to determine what version of a formula exists at a mill.
4. Shipping Orders: Shipping orders are originated from the business system and represent an order to ship a finished product. Typically, shipping orders are load-oriented and represent a single shipment. Shipping Orders may represent a single customer order or multiple customer orders. Orders may be assigned to compartments or associated with the whole transport. Shipping orders can have more than one finished product represented on the order. As the order is fulfilled, weights can be recorded automatically or manually with each item on an order. A check weigh for the transport is also supported. Once the shipment order is fulfilled, it can be transferred seamlessly to the business system, staged in the Repete integration software for edits or released to the business management system.

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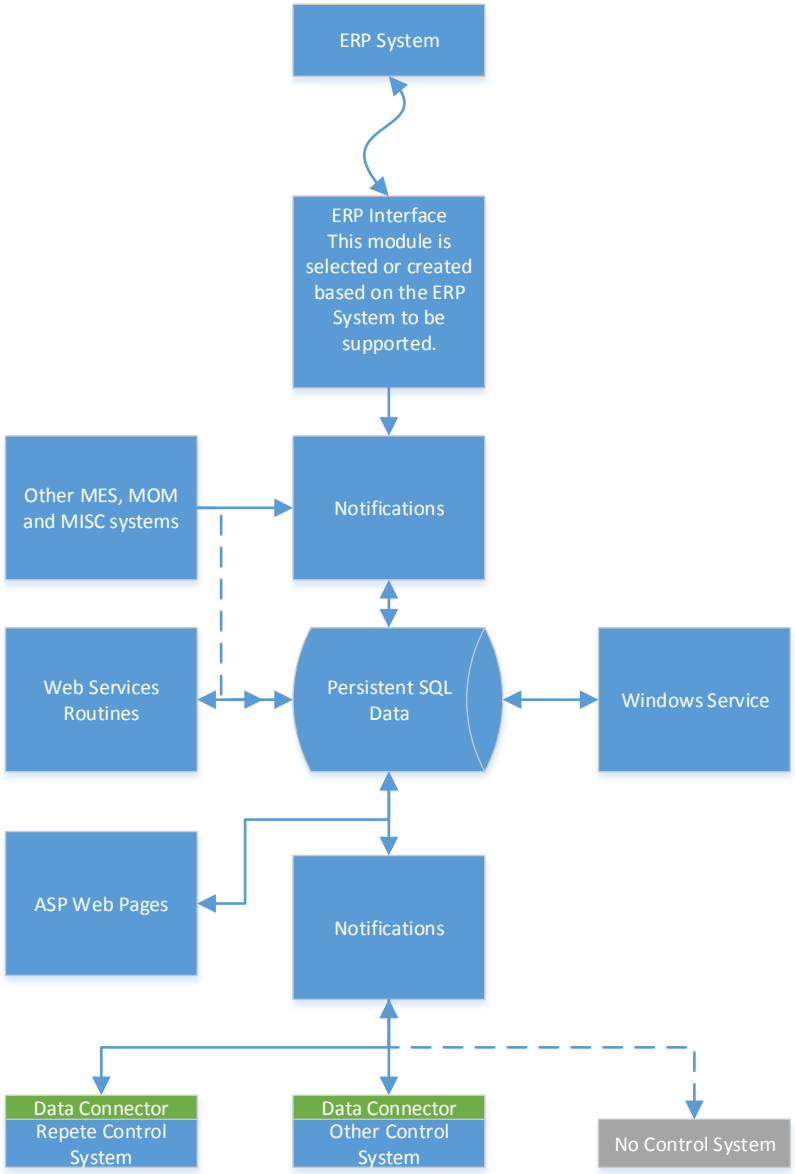
CUSTOMER EXTENSIBILITY

The business integration software is a collection of software designed to ease the burden of interfacing multiple dissimilar systems together with a Repete control system. The architecture of the integration services is shown in the block diagram below:



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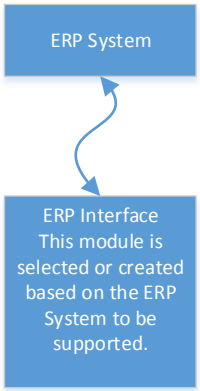
ERP Interface Module



The ERP interface module provides standard function access to popular ERP systems (SAP, JDE and AIX being examples). The ERP interface comes with the ability to handle most common needs for ERP integrations. Examples include:

1. *Coordination of purchase orders with plant site receiving.* Purchase orders generated by the ERP system can be made available to the receiving system of a plan. The receiving control system can then receive against these purchase orders and respond to the ERP system with the results.
2. *Coordination of work orders with plant site production control system.* ERP-generated orders can be made available to the production control system. This would normally show on the control system as a scheduled item of work. After production is complete, the ingredient usage and production results are made available to the ERP system. ERP normally uses production result data to update inventory.
3. *Coordination of shipment orders with the shipping/loadout control system*. ERP-generated shipment orders can be made available to the shipping control system. The control system normally shows this as a shipping ticket. Once the shipping ticket is processed and the transport vehicle is loaded, the results of the load can be made available to the ERP system.

This module can be extended easily to add other interactions between ERP, any other system and external systems. For example, this interface may be used to receive formulas from a formula management system and integrate them into the ERP system.

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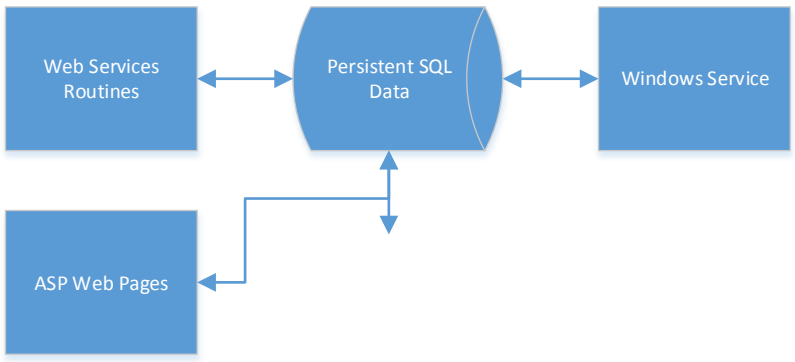
Integration Services Solution Core

The core of the Repete integration services is the logic that provides connectivity with all external systems. The integration services core is shown below:



The web services are SOAP (Simple Object Access Protocol) services that are used to provide communication with systems such as ERP systems, MES/MOM systems and other miscellaneous systems. SOAP-style services provide a flexible method for the creation of interfaces between dissimilar systems. Data is saved to a SQL database, allowing it to be recalled at a later time if needed.

The integration services provided by Repete include the functions described above, however they can be enhanced or added upon to customize various needs required by different integration strategies.

The Windows service is provided by Repete to allow background and scheduled business logic to occur as needed to accomplish integration with different systems. The service comes with functions that allow recovery and automatic data transfer. The service code provided with the Repete integration services can be extended to provide any automatic business logic desired.

The provided ASP (Application Service Provider) web pages allow a visual interface as needed to support the functions described above. ASPX is an industry standard visualization interface and can be extended to allow a wide variety of middleware functions.

SUMMARY

As can be seen from the examples described above, the Repete Middleware Solution is a robust and highly-available system that can connect many types of systems together to form a superior enterprise solution.

Repete has successfully implemented our middleware solution in mid-size and large companies; making Repete the only widely-accepted, proven solution on the market.

To learn more about the Repete Middleware Solution, contact a Repete representative.

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