Plant Information Management and Historian Extension
Introduction
Optimization of production plants is a continuous process. Improvements can only be made if all of the people involved in the process have access to the right information to analyze plant operations and make the right decisions. Traditional means of data collection and analysis of plant data is a labor-intensive and time-consuming process.

IndustrialIT Enabling allows Tenore to operate smoothly with all the new products of the IndustrialIT Product Strategy, preserving the customer investments in technology and experience.

Features and Benefits at a Glance
- Multi-master inter-operation
- Up to 128,000 tags
- Alarm management
- Analog and digital trending
- Data historian and archiving
- Parameter and event logging
- Report generation
- Web Extensions support
- Windows 2000 platform
- DDE access
- OLE2/COM support
- TCP/IP, Ethernet protocols
- ORACLE/ODBC SQL TM support
- OPC Server and OPC Client support
- Support for multinational languages
- Multilevel security
- Scanner suite for foreign protocols interfacing

Overview
The Plant Information Management Extensions to InformIT Information Management Tenore increase productivity by basing decisions on comprehensive, plant wide information. They offer the decision support architecture needed to collect, store, consolidate and manage data from business, production and control systems throughout the enterprise.

Its flexible architecture offers comprehensive information management capabilities, information storage and archiving, display management and control system connectivity. Tenore facilitates the integration of plant performance applications, “what-if” modeling tools, predictive maintenance systems, diagnostic systems, Energy Management Systems (EMS) and control systems (DCSs, PLCs). Tenore puts the right combination of tools and information into the hands of the right decision makers, at the right time, creating a robust environment for effectively achieving profitable plant performance goals.

Fig. 1: Example of Performance Assessment Application
**InformIT Information Management Tenore**

**Plant Information Management Extension**

**Architecture**
Tenore is based upon a distributed, open, client/server architecture taking advantage of distributed servers for data management and display/report generation.

The four primary components of Tenore, as shown in Figure 2, are:
- History services for distributed data collection, storage, and archiving
- Display services for distributed graphical user interface
- DCS/PLC connections for the consolidation and historical storage of process information from ABB or other vendor’s systems
- Interfaces to plant management applications

Tenore provides local and remote access to geographically distributed enterprise information. It contains a powerful, real-time database, plant-wide or even enterprise-wide network in a Microsoft® Windows® compliant client/server environment. Plant personnel can view and/or create real-time process graphics, trends and reports from any PC in the network.

Flexible scalability will enable our customers to start small and grow the system together with their applications. The system can be tailored according to the following parameters:
- Number of points per server
- Number of control System Connections
- Number of Historian Servers
- Distributed or Central Servers possible
- Data Replication between Servers possible
- Number of Client Workplaces
Functional Components

The core Tenore Information Platform has been extended with the following management functions:

- High performing historian with efficient Data Compression and fast Data retrieval
- Interfaces with business and planning systems
- Database Connectivity (SQL, OLE, OPC) for application integration
- Lifetime counters for maintenance support
- Built-in logs and sequence of events
- Calculation engine with predefined libraries of advanced functions
Historical Database
The core Tenore Information Platform includes, as a default feature, the archiving of the values for all configured tags for 10 days. No historical database is needed for this timeframe, as the short-term archival is provided as a standard extension of the real-time database. A state-of-the-art, highly efficient data compression mechanism, based on the boxcar/back-slope algorithm, is applied to all analog values.

For longer-term storage, the PIMS extensions include a historical database, with no preset time limit. Values are transferred from the real-time to the historical database according to one of the following archival policies, which can be selected for individual tags:

- Real Time (no compression)
- Average (configurable time)
- Total (configurable time)
- Min (configurable time)
- Max (configurable time)

Access to the data is independent from the physical location of the desired values. Trends, reports and, in general, all data access functions will look for data in the real-time database and, if it cannot be found there, it will switch to the historical database.

Both real-time and historical database are kept on the server hard-drive, for easy access to the information. Backup/Restore facilities are provided to download the archives to offline media such as tapes, optical disks, and in general every type of offline device supported by the operating system.

Interfaces with business and planning systems
The value of plant data is increased by the possibility of sharing these data, in real time, with Enterprise Resource Planning (ERP) systems.

The Tenore PIMS Extensions provide an infrastructure for easy integration of third-party interfaces to commercial ERP systems.

Currently (version 2.1), an interface to SAP/PM, based on SAP Business Objects, is available for the integration of Enterprise Asset Management (EAM) applications. More are planned for the near future (MRO Maximo, IFS).

Fig. 5: Supported archival policies

Interfaces for application development and integration
One of the main functions of a PIMS is to be the platform for advanced applications, both commercial and ABB proprietary. To this purpose, Tenore provides a set of standard interfaces:

- OPC Server and Client
  - DA 2.0
  - AE 1.2
  - HAD
- DDE
- ODBC Server and Client (Tested with MS SQL Server and Oracle)
- ODBC Mirroring (creates a real-time replica of the database on an external, ODBC-compliant database)
- Public API
  - Standard “C”
  - Dual COM (Visual C++ and Visual Basic)
**Maintenance Counters**

Maintenance counters can be associated to Boolean tags to record maintenance information related to dual state devices like motors, pumps, breakers, etc. These counters collect the number of activations (i.e., the changes from a steady to a operational condition), the operating time (sum of times in the operational condition) and the total time elapsed from the last service performed on the associated device. The counter value can be compared to operational limits defined by the service personnel, and an alarm can be generated when these limits are reached. These alarms can also be forwarded to an external Computerized Maintenance Management System (CMMS) using one of the supported interfaces (SAP/PM, MRO Maximo, IFS).

**Events Management**

The alarm/event function can process up to three types of event (information events, return-to-normal events and alarm events) and to provide notification to plant and management personnel by a wide range of displays and peripheral devices, such as LADs (Latest Alarm Displays), printers, OJ (Operations Journal) and audible alarms. All these events may be accessed by the available interfaces. There is virtually no limit to the number of events.

In the event of disrupted plant operations, the Tenore Event Management provides sophisticated analysis capabilities like filtering of alarm/event lists and frequency distribution of events over time. One particular type of report is the **Sequence of Events**, which Tenore can produce automatically as a result of a trip condition. Tenore has the ability of integrating in the same SOE report events coming from different sources, and sorting them according to their time stamp. If the time stamp is provided by the source, it will be preserved. For those cases where the source is not capable of providing a time stamp, Tenore will provide its own.

Tags can also be associated to numeric accumulators (totalisers). These will integrate the tag values over selectable periods of time. The totalised value can be checked for alarm limits, and can be reset both manually and automatically. These function are useful if there is a need, for example, to integrate measurements like flow rate.
Reports
The Tenore reporting function is based on Microsoft Excel. Users can define report templates taking advantage of the powerful Excel features, and integrate these templates with real-time and historical values from the Tenore database by means of an ABB plug-in. Once the plug-in is installed, the Tenore functions can be used like all other Excel functions, including support from the Excel Function Wizard. Additionally, it is possible to drag and drop tags from a Tenore Explorer (the client environment) graphical page to the Excel spreadsheet. As a result of the operation, the tag name will be inserted in the destination cell, saving configuration time to the management personnel.

Calculation Engine
It often happens that information about the process are not completely provided by available field measurements, but need to be obtained by combinations of existing process values. To support this requirement, the Tenore PIMS Extensions provide an embedded calculation engine which, using a complete set of standard arithmetic and logical operators and extensive libraries of advanced functions, enable management personnel to create “virtual” calculated tags. These tags are equivalent to actual tags, in the sense that they can be stored, archived, trended, visualized like all other process values. The calculation of these tags can be scheduled based on time or events.

The language provided for the definition of the formulas supports, in a basic-like format, the definition of complex control structures like conditional statements and loops.

The library functions are also accessible through Excel, allowing the computation of virtual process values directly in a report.

The available operators include:
- Arithmetic operators (+, -, *, /, module, exponential)
- Logical operators (AND, OR, NOT)
- Relational Operators (<, >, =, >=, <=, ! =)
- Mathematical Functions (trigonometric functions, logarithmic functions, and more)
- Tag access functions
- Time functions
- Steam tables according to the ASME standard
- Gas property library
- Sea water library
- Fuel combustion library
- Wet Air library
- Data file functions
- Historical functions

Summary
Whether your need is heterogeneous data integration, historical recording, platform for value-added application or integration with ERP systems, the Tenore PIMS extensions is the perfect choice to bring together the plant automation domain and the information management domain. With ABB and Tenore, customer will finally be able to optimize the value of information.