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Guidance on Practice for Data Historian Systems

GP 30-41

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 30-41. It combines the different guides of the three merged companies, BP, Amoco, and Arco, into a comprehensive guide for the application of Data Historian System (DHS). In addition, reference is made to other standards and reports that provide guidance in the use of heritage documents or similar documents. Normative documents are mandatory to the extent that they are referenced and not superseded by this guide.

This GP has been created to reflect the current industry wide appreciation of DHS. This GP therefore contains abridged sections from previously released BP Group documents of the combined companies, as well as some additional sections and sub-sections (see Contents). It replaces the relevant parts of the technical portions of the documents listed below.

British Petroleum

RP 30-9	Instrumentation and Control Design of Instrument Database Systems
GS 130-3	Pre-Delivery Testing and Inspection of Instrumentation and Control Systems
GS 130-8	Guidance for Specification of Control Systems
GS 130-8	Guidance for the Supply of Control Systems

BP Gulf of Mexico Deep Water (GOMDW)

1400-20-IC-RP-5064	Data Historian Systems Design Guideline
1400-20-IC-RP-5068	CSH Reporting Design Guideline
1400-20-IC-RP-5070	Instrument Tag Numbering Guideline

BP Purified Terephthalic Acid (PTA)

PTA-AD-PEP-00-G	Administration—PTA Engineering Practices—Guide
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Arco Products Company

Engineering Standard 3	Project Closeout Documentation
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1. Scope

This GP provides the basis for the specification, selection, design, configuration and use of DHS systems and other control room equipment. This GP gives guidance on DHS strategy, and project development.

This GP discusses major application components of the primary DHS software and the general functionality required from each. It also discusses configuration for historical data points and the basic functionality that is required from the DHS user interface and its data access tools. Additionally it discusses the application development environment required either included within or compatible with the suite of application components provided by the primary DHS software Vendor. This GP provides a guide to the specification, selection, design, configuration and use of a Data Historian System (DHS). Given the earlier comments made, much of this GP is expected to be quite superfluous to many who already have selected a DHS.

In some cases, the DHS assists in operating the process safely, but its main purpose is the long-term storage of process information and its interface with different CSH or other users for the purpose of a centralized data management location.

This GP provides guidelines for the implementation of Plant Data Historians. Section 4 focuses on good practices on systems already selected. Section 5 brings more focus to projects evaluating and implementing Historians.

This GP is applicable for chemical plants gas plants, refineries and offshore facilities.

This GP covers a topic within the rapidly developing field of digital technology; it is therefore intended that this document be reviewed and updated at regular intervals. The value of this document is significantly enhanced by contributions to its improvement and updating. Users are urged to inform the BP Group custodian of their experience that could improve its application.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

American Petroleum Institute (API)

API RP 554 Process Instrument and Control.

3. Symbols and abbreviations

For the purpose of this GP, the following symbols and abbreviations apply:

CPU	Central Processing Unit
CSH	Control System Hardware
DCS	Distributed Control System



DHS	Data Historian System
ESD	Emergency Shutdown
I/O	Input/Output
ID	Identification
LAN	Local Area Network
LCN	Local Control Network
HMI	Human-Machine Interface
MTBF	Meantime Between Failures
OP	Output
PECS	Packaged Equipment Control System
PC	Personal Computer
PCN	Process Control Network
PLC	Programmable Logic Controller
PV	Process Measurement (e.g. temperature, pressure, etc.)
SCADA	Supervisory Control and Data Acquisition
SOR	Statement of Requirements
SP	Setpoint
SQL	Standard Query Language
UPS	Uninterruptible Power Supply

4. System use

4.1. Context

- a. The Data Historian System (DHS) stores historical process data values and values from associated systems (e.g. the laboratory system) for later use. While there may be a DSH provided by the CSH vendor to provide short-term data historisation (e.g. perhaps 2 days), this guideline focuses more on the historian providing long-term historical values. Because the DSH acquires the values it historises from various sources, the DSH typically has interfaces to many systems from different suppliers (e.g. analysers, lab systems, control systems, other DSH systems, etc.). Data is scanned at some frequency, and the data is subjected to some compression routine to reduce disk storage requirements while minimizing the loss of accuracy upon recalling that data. The HMI system contains operational data values and can contain a record of operator actions.

A cross-business team compared available historians on the market in 1999 with the intent of standardizing on one across the corporation. They found that BP Chemical and Downstream use three, for the most part, and each has comparable functionality (compressing data to save disk space, convenient configuration tools,



interfaces to various systems, and good user interfaces). The three prominent historians were PI from OSI, PHD from Honeywell, and IP21 from AspenTech. PI was given preference because of its cost and widespread use within BP; the other two, however, were found quite acceptable. The BP PI COI website is located at <http://usabpw.bpweb.bp.com/pi/>. Elaboration on this can be found at the website <http://asm.bpweb.bp.com/amt/>

- b. The DHS server(s) collects and stores data from the CSH, the Process Safety System (PSS), Package Equipment (PECS), PLCs, Metering Systems, and Emergency Support Systems (ESS) on a continuous basis. It also collects manual or automated data from several other systems that support the daily operations of the facility (which in some cases can include other DSH systems).
- c. A single DHS server shall be sized to collect data for all process variables (process measurements, control loop setpoints and outputs) and associated salient laboratory and engineering variables and be readily available to replay that data online for a minimum of two years. Long-term data storage or archiving to some suitable backup media is also required. Long term data archiving shall be as automatic (run unattended) as practical.
- d. The DHS shall include functionality to provide a multi-levelled hierarchy of systems and sub-systems. A sub-system may correspond to a physical location or other process grouping of information. A system may have multiple physical locations (sub-systems) reporting to it. Each sub-system may automatically update one or more higher-level systems on a regular basis, such as a Master Historian Server for when a DSH is located at offshore locations or other combinations of one server data link to a real time system. It is expected that the master and its sub-systems will be deployed to distribute CPU work plus facilitate network security as described in GP 30-60.



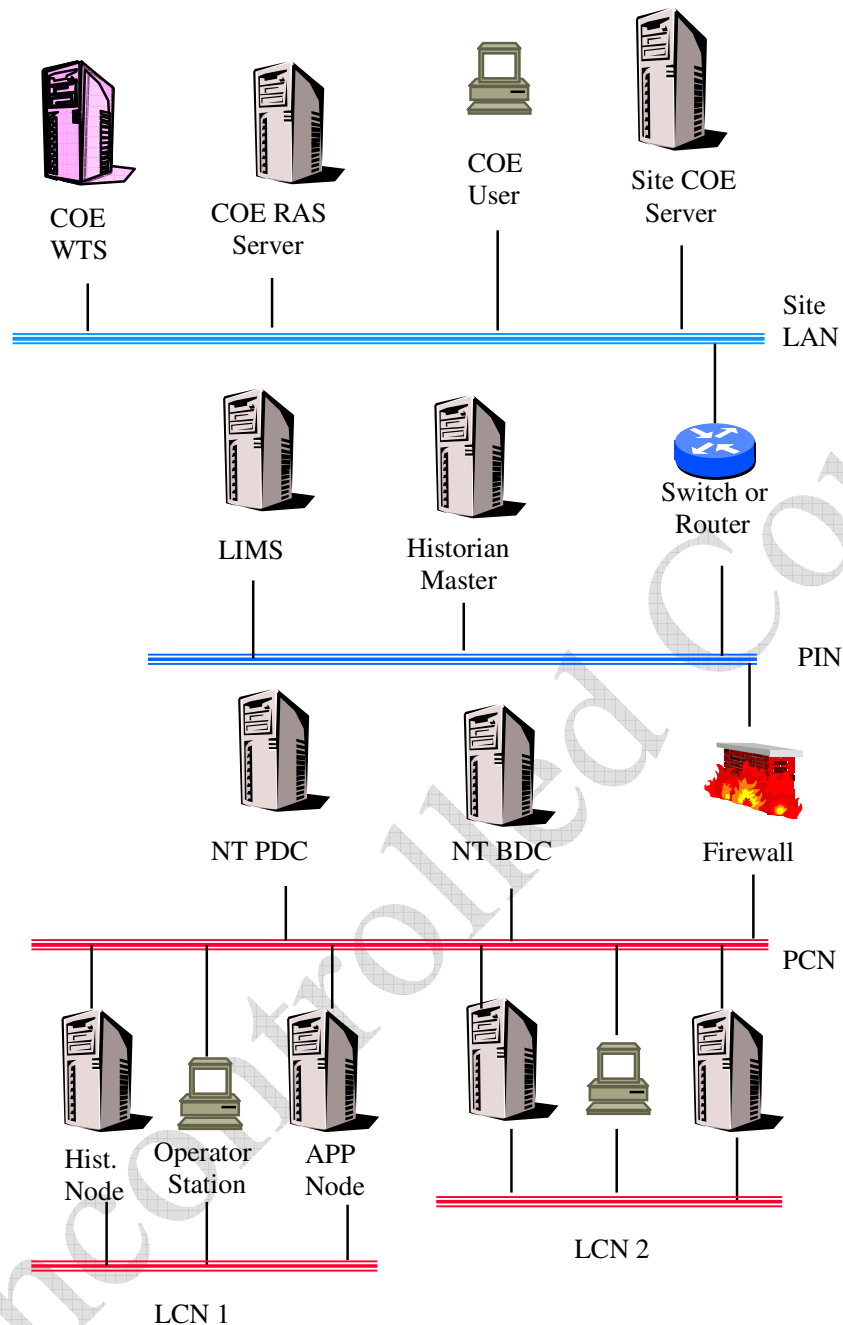


Figure 1 - Example network topology

- e. In the example hierarchy sketched in Figure 1, the Historian Master (server and data repository) may receive data from any of the lower level (or sub-systems) servers below it. The higher level data transfers may be configured with considerably slower scan times than lower level systems connected to a real time CSH.
- f. The functional or business requirement for data at the higher level shall be considered in setting the scan times for this data. As examples, some applications monitoring equipment performance may operate on data with 15-second frequency, or perhaps with hourly data.
- g. The DSH servers operating at the PCN level are expected to serve data to the 'Historian Master' on some frequency. Any COE-based client application or user of the data or the



DSH tools is expected to access the data from the Historian Master, and not gather that data from the underlying control system. Any operator already on the PCN is expected to obtain the desired data from either the PCN or Historian Master. Connections between process control networks and COE networks shall comply with the BP stream code of connection requirements.

4.2. Operational issues

- a. The users of the DHS databases and their needs are many and varied. They may include personnel from Planning, Operations, and Maintenance—looking for daily averages or studying an upset.
- b. Along with the required acquisition, storage, and access of data, any final DHS implemented shall place significant importance on the overall performance impact on the real time data system(s). Emphasis should be placed on satisfying user requirements for speed and accuracy—not efficiency of data storage. Operational or business requirements desire all data points at the quickest scan rate possible. Placement of the data repository and server relative to the Firewall impacts speed of response and compression settings dictate accuracy of retrieved data. The DHS data acquisition from the real time data system(s), although simple, still requires processor time and can create significant network traffic. Specific numbers of tags or time scan limits are dependent on the actual hardware and conditions in place connecting the DHS to a real time system. In some cases, the network connection causes a constraint on the total number of tags processed per second. These factors shall be weighed together to provide for DHS data acquisition while not adversely impacting the real time system performance. The requirements on processor time and network traffic shall be maintained to a manageable limit allowing maximum performance of the real time system.

4.3. Data conditioning and compression

4.3.1. Required precision

- a. Data conditioning, compression options, and time scan settings are chosen based primarily on the required precision for a particular tag and on how often it might change. While the required precision for temperature data may be high, temperature is often slow to change, and in some circumstances, a longer scan period still maintains accurate average data. However, one does not know a priori just how the data may be used. Planning functions may be satisfied with good daily averages, but Operations may need high frequency data (e.g. 60-second frequency) to replay and study upsets. Although a discrete change of state needs no real precision (it is either open or closed), it requires a relatively fast scan rate to provide a complete picture of data as the switch can quickly cycle open and closed quickly.
- b. Each data point shall be scanned at a sufficient scan rate to allow future reproductions of data to present an accurate representation of the process variable or situation it is intended to measure.
- c. The DHS system shall provide for interpolation of values between stored data values. When accessing historical data for viewing or otherwise the DHS shall provide some indication of the precision or confidence in the interpolated values.

4.3.2. Data compression

- a. Different types of data points require different precision. Some regulatory compliance issues or otherwise critical data values shall use no compression whatever and have the fastest scan rate available. This approach provides the highest precision available in the DHS. Most data values however, can and should be compressed to some degree.
- b. Compression options should be available for the elimination of redundant values from data storage. Any value which holds a steady state value for long periods is only stored when

