ProHelp® EPM

Production & Process Monitoring System

Basic Database Overview
For ProHelp® EPM, Release 7.5

MANUAL #810-0003

REVISION – A

November 27, 2007
ATTENTION

You can obtain service support by visiting Mattec’s web site at http://www.mattec.com, by emailing the help desk at helpdesk@mattec.com, or by telephone at (800) 966-1301.

This manual is intended for advanced users only.
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1 Introduction

Mattec Corporation's ProHelp® EPM Production and Process Monitoring System is specifically designed for real-time monitoring of all types of production equipment. It is used extensively in the plastics injection molding, extrusion, blow molding, blown film, metal stamping, die casting, printing, painting, and assembly industries. The basis behind the benefits from the ProHelp® EPM system is the rationale that plant managers and operational people will take corrective actions to solve problems on production equipment when they are aware of such problems. ProHelp® EPM is the device to alert employees to problems immediately when the problems occur. Therefore, tremendous savings can occur in increased productivity and decreased scrap parts.

The ProHelp® EPM system combines computer hardware, computer software, and Machine Interface Units (MIUs) into an efficient system to provide real-time production and process monitoring, production reports, process alarms, job scheduling, preventive maintenance, and SPC/SQC process and part capability analysis. Floor personnel can make use of the machine-mounted terminals to signal different departments for help, to view production results at the machine site, and to enter downtime reasons or scrap reasons. Production, downtime, and scrap reports can be generated on a shift and daily basis, or the user can generate these reports for extended time periods by specifying a start and end date for the desired report. Job history data is continuously summarized and available for management's review.

ProHelp® EPM utilizes the Microsoft Windows Server 2003 operating system and the Microsoft SQL Server 2005 database. Users can connect to the system from most Microsoft Windows operating systems.

This document describes the most common database tables that are used in the ProHelp® EPM Production and Process Monitoring System. It will allow an advanced user to create their own custom reports using any compatible third-party report writer.

Information contained in this manual is subject to change without notice.
1.1 Document Conventions

Items that are not currently being used are labeled as OBSOLETE. These items should be ignored.

1.2 Time Formats

With few exceptions, all timestamps in the database are time_t values. This format stores the number of seconds since midnight, January 1, 1970 of GMT. It is a data type that is defined in the ISO C library.

Time zones offsets are only a display phenomenon. All database times are GMT. Thus, two events happening simultaneously at different points on Earth will have the same timestamp, regardless of their respective local time zone. These database timestamps will be one of three different user-defined types:

- NormalTime_type
- NormalTimePlus0_type
- NormalTimePlusInfinity_type

Each of these user-defined types uses the int type (32-bit long integer) as the underlying data type.
2 Database Tables

The following sections describe the most common database tables that are used in the ProHelp® EPM Production and Process Monitoring System.

2.1 JobDefect

These are the scrap reason code records for the job record. They hold the amount of scrap for each reason code during the job.

**PRIMARY KEY:** MachNo, JobSeq, DefNo

MachNo type (int)
Machine Number. Index into MachCon and MachInfo.

JobSeq type (int)
Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

DefNo type (int)
Defect Code Number. Index into DefCodes.

Qty float
Scrap production for this DefNo reported for the job.
2.2 JobDown

These are the down reason code records for the job record. They hold the amount of downtime and the number of downtime occurrences for each reason code during the job.

**PRIMARY KEY:** MachNo, JobSeq, DownNo

- **MachNo**  
  Machine Number. Index into MachCon and MachInfo.

- **JobSeq**  
  PositiveInt_type (int)  
  Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

- **DownNo**  
  PositiveInt_type (int)  
  Down Code Number. Index into DownCodes.

- **Qty**  
  PositiveInt_type (int)  
  Amount of downtime in seconds for this DownNo for the job.

- **WtQty**  
  PositiveFloat_type (int)  
  Weighted amount of downtime in seconds for this DownNo for the job.

- **NumOccur**  
  PositiveInt_type (int)  
  Number of occurrences of downtime for this DownNo for the job.

- **WtNumOccur**  
  PositiveFloat_type (smallint)  
  Weighted number of occurrences of downtime for this DownNo for the job.
## 2.3 JobProd

This is the main production record for each job. It holds the basic production counts, run times, down times, as well as statistics for Cycle Time, for the job.

**PRIMARY KEY:** MachNo, JobSeq

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MachNo</td>
<td>MachNo_type</td>
<td>Machine Number. Index into MachCon and MachInfo.</td>
</tr>
<tr>
<td>JobSeq</td>
<td>PositiveInt_type</td>
<td>Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.</td>
</tr>
<tr>
<td>ShiftSeq</td>
<td>ShiftSeq_type</td>
<td>Shift Sequence Number. Encoded date and shift index within day for applicable ShiftBounds set (defines shift time frame of data).</td>
</tr>
<tr>
<td>TimeLogged</td>
<td>NormalTime_type</td>
<td>Timestamp of last update.</td>
</tr>
<tr>
<td>MinCycTm</td>
<td>real</td>
<td>Minimum value of Cycle Time parameter during the job.</td>
</tr>
<tr>
<td>MaxCycTm</td>
<td>real</td>
<td>Maximum value of Cycle Time parameter during the job.</td>
</tr>
<tr>
<td>SumCycTm</td>
<td>float</td>
<td>Sum of the cycle time parameter values during the job (used to calculate average).</td>
</tr>
<tr>
<td>SumSqCycTm</td>
<td>PositiveFloat_type</td>
<td>Sum of the squares of the cycle time parameter values during the job (used to calculate standard deviation).</td>
</tr>
<tr>
<td>CycCnt</td>
<td>PositiveInt_type</td>
<td>Total count of cycles within the job.</td>
</tr>
<tr>
<td>CycOutSpec</td>
<td>PositiveInt_type</td>
<td>Count of out-of-spec cycles within the job. Any cycle in which one or more process parameters are out-of-spec is said to be an out-of-spec cycle.</td>
</tr>
<tr>
<td>ExpProdQty</td>
<td>float</td>
<td>Expected production quantity calculated from process sheet expectations for the job.</td>
</tr>
<tr>
<td>CalProdQty</td>
<td>float</td>
<td>The MIU’s total production made for the job.</td>
</tr>
<tr>
<td>PakProdQty</td>
<td>float</td>
<td>Packed production reported for the job.</td>
</tr>
<tr>
<td>DefectQty</td>
<td>float</td>
<td>Scrap production quantity reported for the job.</td>
</tr>
</tbody>
</table>
TotTime  PositiveInt_type (int)
Total time in seconds for the job.

WtTotTime  PositiveFloat_type (float)
Weighted total time in seconds for the job.

DownTime  PositiveInt_type (int)
Down time in seconds during the job.

WtDownTime  PositiveFloat_type (float)
Weighted down time in seconds during the job.

NumDownTm  PositiveInt_type (int)
Number of downtime occurrences during the job.

WtNumDownTm  PositiveFloat_type (float)
Weighted number of downtime occurrences during the job.

LaborTime  PositiveInt_type (int)
Unused.

WtLaborTime  PositiveFloat_type (float)
Unused.

ShiftName  Nchar(2)
The current shift name if the job is running.

WtCycCnt  PositiveFloat_type (int)
Weighted total count of cycles within the job.

ActCavs  PositiveReal_type (int)
The number of active cavities for the tool if the job is running.

ActPctReg  PositiveInt_type (int)
The actual percent regrind for the materials in the Part ID if the job is running.

SetupCnt  PositiveInt_type (int)
The number of setup cycles for the job. Setup cycles are accumulated if Downtime Reason #10 is configured as a “forced down (npc)” downtime code.

WtSetupCycCnt  PositiveFloat_type (float)
The weighted number of setup cycles for the job.

NonProductionCnt  PositiveInt_type (int)
The non-production cycles for the job. Non-production cycles are accumulated if any Downtime Reason except Reason #10 is configured as a “forced down (npc)” downtime code.

WtNonProductionCycCnt  PositiveFloat_type (float)
The weighted non-production cycles for the job.

PartQualCycCnt  PositiveInt_type (int)
The number of machine cycles that were rejected for Part Qualification.
WtPartQualCycCnt  PositiveFloat_type (float)
The weighted number of machine cycles that were rejected for Part Qualification.
2.4 JobQueue

This is the list of completed, pending, or running jobs. It is the job descriptor record.

**PRIMARY KEY:** MachNo, JobSeq

- **MachNo** MachNo_type (int)
  Machine Number. Index into MachCon and MachInfo.

- **JobSeq** PositiveInt_type (int) [UNIQUE]
  Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

- **JobID** nchar (20)
  Alphanumeric tag for a particular run of a job. This field is not required to be unique unless you intend to use the Data Import program.

- **MoldNo** PositiveInt_type (int)
  Mold Number. Index into MoldIDs.

- **PartNo** PositiveInt_type (int)
  Part Number. Index into PartIDs.

- **StartTime** NormalTimePlus0_type (int)
  Timestamp of actual job start time (0 for pending jobs) recorded at the MIU.

- **StopTime** NormalTimePlus0_type (int)
  Timestamp of actual end of job (0 for currently running jobs) recorded at the MIU.

- **SchedStart** NormalTime_type (int)
  Timestamp of the Desired Start Date/Time.

- **SchedStop** NormalTime_type (int)
  Timestamp of Desired End Date/Time.

- **SchedQty** PositiveReal_type (real)
  Lot size.

- **CustomerID** nchar (18)
  Alphanumeric customer ID field for user purposes.

- **JobType** JobType_type (tinyint)
  Job type. This value is currently always set to 3.

- **MiscInto1** nchar (30)
  Miscellaneous comment field for additional user information.

- **MiscInfo2** nchar (30)
  Miscellaneous comment field for additional user information.

- **FatherJobSeq** PositiveInt_type (int)
  Father JobSeq or NULL if this is a “bachelor” job. Index into FatherJobQueue.
Status
JobStatus_type (int)
A flag that indicates the job’s status. Index into JobStatus.

JobDesc
nchar (50)
Alphanumeric description of the job.

SequenceNumber
nchar (6)
Alphanumeric sequence number of the job, used by CMS.
2.5 LongTermEng

Automatic SPC Data that is accumulated for a job.

**PRIMARY KEY:** MachNo, LongTermSeq, JobSeq, ParmNo, LTCycleIndex

- **MachNo** (MachNo_type, int)
  Machine Number. Index into MachCon and MachInfo.

- **LongTermSeq** (LongTermSeq_type, int)
  Long Term Sequence Number. Encoded production date and Long Term index within day (defines the Long Term period time frame of data). The Long Term index, a 3-digit field, is the number of minutes since midnight for the start of the Long Term period divided by two (e.g., a Long Term period starting at noon would have a sequence number ending in 360, which is 720 minutes into the day).

- **JobSeq** (JobSeq_type, int)
  Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

- **ParmNo** (ParmNo_type, int)
  Parameter Number. Index into ParmSet.

- **LTCycleIndex** (LTCycleIndex_type, tinyint)
  Long Term Cycle Index for each Long Term period (0 for first cycle up to N-1, where N is the specified subgroup size), corresponding to the number of cycles to capture for the Long Term period.

- **Value** (real)
  The process parameter value in engineering units.

- **Flag** (TolFlag_type, tinyint)
  Tolerance flag for the value (see TolFlag_range rule for valid values).
2.6 MachCon

This is the primary configuration table for machines. It is maintained by the Machine Configuration Edit facility.

Related tables include MiuMach, MachAIU, MachInput, MachParm, MachSetupURL, SetupLinesMach, MachInfo, and MachOdometer.

The tool and machine compatibility values and options serve to define the available resources (i.e., maximum dimension and capacity values available and options present). These can currently be manually intersected with the values and options defined for machines to determine compatibility for defining processes and subsequently scheduling jobs.

**PRIMARY KEY: MachNo**

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MachNo</td>
<td>MachNo_type (int)</td>
<td>Machine Number.</td>
</tr>
<tr>
<td>MachID</td>
<td>nchar (6) [UNIQUE]</td>
<td>Unique name for each machine.</td>
</tr>
<tr>
<td>LoopNo</td>
<td>LoopNo_type (tinyint)</td>
<td>Loop Number. Index into Loop.</td>
</tr>
<tr>
<td>StationID</td>
<td>StationID_type (tinyint)</td>
<td>Loop address or station ID.</td>
</tr>
<tr>
<td>APName</td>
<td>nchar (10)</td>
<td>Obsolete.</td>
</tr>
<tr>
<td>IMACType</td>
<td>IMACType_type (tinyint)</td>
<td>MIU type.</td>
</tr>
<tr>
<td>MachDesc</td>
<td>nchar (50)</td>
<td>Alphanumeric description of machine.</td>
</tr>
<tr>
<td>MachCost</td>
<td>PositiveReal_type (real)</td>
<td>Cost of one hour of machine’s time used for reporting.</td>
</tr>
<tr>
<td>LastUpdt</td>
<td>NormalTime_type (int)</td>
<td>Timestamp of last update.</td>
</tr>
<tr>
<td>SampRate</td>
<td>SampRate_type (tinyint)</td>
<td>Obsolete.</td>
</tr>
<tr>
<td>CycTmOutVal</td>
<td>PositiveReal_type (real)</td>
<td>Obsolete.</td>
</tr>
<tr>
<td>CycTmOutFlag</td>
<td>OnOffFlag_type (tinyint)</td>
<td>Obsolete.</td>
</tr>
</tbody>
</table>
DeptNo DeptNo_type (tinyint)
Department Number. Index into Departments.

OKOOS_LogFlag OnOffFlag_type (tinyint)
Boolean flag for enabling Process Exception logging.

GroupNo tinyint
Obsolete.

ShiftBoundsNo ShiftBoundsNo_type (tinyint)
Shift Bounds Number. Index into ShiftBoundsInfo/Shift Bounds. If this has the special value of 255, then the Department default shift boundary definition will be used.

GropuNo1-4 tinyint
The four machine groups that can be used as a filter on the Real-Time Display.

MiscInfo1 nchar(30)
Miscellaneous comment field for additional user information.

MiscInfo2 nchar (30)
Miscellaneous comment field for additional user information.

MoldMachCompVal real
0-11
Numeric values for the 12 Tool and Machine Compatibility Values. The names of these items are defined in the System Configuration Edit facility.

MoldMachCompOptions smallint
Enables for the 12 Tool and Machine Compatibility Options. The names of these options are defined in the System Configuration Edit facility.

OrderNo MachNo_type (int)
Obsolete.

IconType PositiveInt_type (int)
The icon that will be used on the graphical Plant Floor display.

PrinterNo PositiveInt_type (int)
The Printer for On-Demand Barcode Printing. Index into Printer.

PrintServerNo PositiveInt_type (int)
The Printer Server for On-Demand Barcode Printing. Index into PrintServer.

RemoteScrap Bool_type (bit)
Enable flag for the Remote Scrap Pushbutton feature.
2.7 MoldIDs

This is the primary Tool ID information table.

Related tables include MoldSetupURL, SetupLinesMold and MoldOdometer.

**PRIMARY KEY: MoldNo**

- **MoldNo**
  PositiveInt_type (int)
  Mold Number.

- **MoldID**
  nchar (20) [UNIQUE]
  Unique name for each tool.

- **MoldDesc**
  nchar (50)
  Alphanumeric description of the tool.

- **MachReq**
  char (20)
  Alphanumeric field for user purposes.

- **NumCavs**
  PositiveReal_type (float)
  Total cavities for the tool.

- **Maker**
  nchar (20)
  Alphanumeric field for user purposes.

- **Location**
  nchar (20)
  Alphanumeric field for user purposes.

- **MoldFlag**
  MoldFlag_type
  Obsolete.

- **LastUpdt**
  NormalTime_type
  Timestamp of last update.

- **MoldMachCompVal0-7**
  real
  Numeric values for the first 8 Tool and Machine Compatibility Values. The names of these items are defined in the System Configuration Edit facility.

- **MoldMachCompOptions**
  smallint
  Enables for the 12 Tool and Machine Compatibility Options. The names of these options are defined in the System Configuration Edit facility.

- **GroupNo1**
  tinyint
  The GroupNo for the group.

- **GroupNo2-4**
  tinyint
  Obsolete.

- **MoldMachCompVal8-11**
  real
  Numeric values for the last 4 Tool and Machine Compatibility Values. The names of these items are defined in the System Configuration Edit facility.
MiscInfo1 nchar (30)
Miscellaneous comment field for additional user information.

MiscInfo2 nchar (30)
Miscellaneous comment field for additional user information.

SetupTime PositiveInt_type (int)
Setup time, in seconds, for the tool.

TearDownTime PositiveInt_type (int)
Tear down time, in seconds, for the tool.

RunnerWt PositiveReal_type
Runner weight, stored in the database in grams, displayed in SysCon selected units.

Active Bool_type (bit)
Active flag for the tool.
### 2.8 PartIDs

This is the primary Part ID information table.

Related tables include PartKanban, PartLabel, PartMaterial, PartSetupURL, and SetupLinesPart.

**PRIMARY KEY:** PartNo

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PartNo</td>
<td>PositiveInt_type (int)</td>
<td>Part Number.</td>
</tr>
<tr>
<td>PartID</td>
<td>nchar (25) [UNIQUE]</td>
<td>Unique name for each part.</td>
</tr>
<tr>
<td>PartDesc</td>
<td>nchar (50)</td>
<td>Alphanumeric description for the part.</td>
</tr>
<tr>
<td>PctReg</td>
<td>PositiveReal_type (real)</td>
<td>Percentage regrind of total material requirement.</td>
</tr>
<tr>
<td>PcsPerCtn</td>
<td>PositiveInt_type (int)</td>
<td>Parts per Case.</td>
</tr>
<tr>
<td>Partcost</td>
<td>PositiveReal_type (real)</td>
<td>Part cost used for reporting.</td>
</tr>
<tr>
<td>MatlCost</td>
<td>PositiveReal_type (real)</td>
<td>Material cost used for reporting.</td>
</tr>
<tr>
<td>PartInfo</td>
<td>nchar (40)</td>
<td>Miscellaneous comment field for additional user information.</td>
</tr>
<tr>
<td>LastUpdt</td>
<td>NormalTime_type (int)</td>
<td>Timestamp of last update.</td>
</tr>
<tr>
<td>ColorID</td>
<td>char (25)</td>
<td>Alphanumeric description of color material for part. This is a variable length field; a System Configuration item controls the active length between 4 and 25 characters long.</td>
</tr>
<tr>
<td>GroupNo1</td>
<td>tinyint</td>
<td>The GroupNo for the group.</td>
</tr>
<tr>
<td>GroupNo2-4</td>
<td>tinyint</td>
<td>Obsolete.</td>
</tr>
<tr>
<td>MiscInfo1</td>
<td>nchar (30)</td>
<td>Miscellaneous comment field for additional user information.</td>
</tr>
<tr>
<td>MiscInfo2</td>
<td>nchar (30)</td>
<td>Miscellaneous comment field for additional user information.</td>
</tr>
</tbody>
</table>
**SetupMaterial**  PositiveReal_type (real)
The standard amount of setup material that is used for the part.

**MaterialColorRating**  PositiveInt_type (int)
The color rating for the material list.

**EnableOnDemandBarcode**  PositiveInt_type (int)
Flag that enabled On-Demand barcode printing.

**EnableAutomaticBarcode**  PositiveInt_type (int)
Flag that enables automatic barcode printing.

**AutomaticCycleCount**  PositiveInt_type (int)
The frequency to print barcode labels automatically.

**AutomaticBarcodeIndex**  PositiveInt_type (int)
The index of the barcode label to print automatically.

**SerialTypeNo**  PositiveInt_type (int)
The type of serial number mechanism to use when printing barcode labels automatically.

**Active**  Bool_type (bit)
Active flag for the part.
2.9 PSEng

This is the process parameter-specific portion of the process sheet. It contains the specification limits and related data.

**PRIMARY KEY: MachNo, MoldNo, PartNo, ParmNo**

- **MachNo**
  Machine Number. Index into MachCon and MachInfo.
- **MoldNo**
  Mold Number. Index into MoldIDs.
- **PartNo**
  Part Number. Index into PartIDs.
- **ParmNo**
  Parameter Number. Index into ParmSet.

- **UpperLim**
  Upper specification limit for a process parameter for a process sheet.
- **NomVal**
  Nominal specification value for a process parameter for a process sheet.
- **LowerLim**
  Lower specification limit for a process parameter for a process sheet.
- **DelayVal**
  Delay value for a process parameter.
- **CycValThold**
 Obsolete.
- **SpcEnable**
  Flag that enables Automatic SPC for the process parameter.
- **SpcControlAlarm**
  ControlAlarm_type (int)
  Flag that enables Control Alarms for the process parameter.
- **SpcRunAlarm**
  RunAlarm_type (int)
  Flag that enables Run Alarms for the process parameter.
- **ProcessSpecAlarm**
  Bool_type (bit)
  Flag that enables Process Specification Alarms for the process parameter.
- **ProcessControlAlarm**
  Bool_type (bit)
  Flag that enables Process Control Alarms for the process parameter.
- **PartQualSpecEnable**
  Bool_type (bit)
  Flag that enables Part Qualification for specification limit violations for the process parameter.
**PartQualControlEnable**  
*Bool_type (bit)*  
Flag that enables Part Qualification for control limit violations for the process parameter.
2.10 PSProd

This is the main table for the process sheet. It contains basic data.

**PRIMARY KEY: MachNo, MoldNo, PartNo**

- **MachNo**: Machine Number. Index into `MachCon` and `MachInfo`.
- **MoldNo**: Mold Number. Index into `MoldIDs`.
- **PartNo**: Part Number. Index into `PartIDs`.
- **SampNo**: Sample Sheet Number. Index into `QCSheet`.
- **ExpPctUp**: Expected Percent Uptime.
- **ExpCycTm**: Expected Cycle Time
- **ExpGood**: Expected Percent Good Parts.
- **HistPctUp**: Historical Percent Uptime.
- **HistCycTm**: Historical Cycle Time.
- **HistGood**: Historical Percent Good Parts.
- **LaborFactor**: Standard direct labor required.
- **LaborCost**: Cost per unit time of direct labor.
- **LastUpdt**: Timestamp of last update.
- **Flags**: Obsolete.
- **MiscInfo1**: Miscellaneous comment field for additional user information.
**MiscInfo2**

Miscellaneous comment field for additional user information.

**NonProductionLimit**

Non-production limit.

**CavityPsiTransfer**

Cavity pressure transfer value if cavity pressure transfer is enabled in the Machine Configuration.

**AutoSpcEnable**

Flag that enables Automatic SPC data collection.

**AutoSpcPeriod**

The Automatic SPC sample period, in seconds.

**AutoSpcSubgroup**

The Automatic SPC subgroup size.

**PartQualEnable**

Flag that enables Part Qualification.

**IndirectLaborFactor**

Standard indirect labor required.

**SetupLaborFactor**

Standard setup time required, in seconds.

**ParameterRecordingFrequency**

The Parameter Record Frequency, in cycles.

**Active**

Active flag for the process sheet.
2.11 QCCycle

This table holds the process parameter data ("Manual SPC Sample") that is automatically collected with each SQC sample.

**PRIMARY KEY:** MachNo, JobSeq, SampSeq, CycleIndex, ParmNo

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MachNo</td>
<td>MachNo_type (int)</td>
<td>Machine Number. Index into MachCon and MachInfo.</td>
</tr>
<tr>
<td>JobSeq</td>
<td>PositiveInt_type (int)</td>
<td>Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.</td>
</tr>
<tr>
<td>SampSeq</td>
<td>PositiveInt_type (int)</td>
<td>Sample Sequence Number. Unique machine-job-specific QC sample identifier. Along with MachNo and JobSeq, indexes into QCSample.</td>
</tr>
<tr>
<td>CycleIndex</td>
<td>CycleIndex_type (tinyint)</td>
<td>Cycle Index for each QC sample (0 for first cycle up to N-1, where N is the specified subgroup size).</td>
</tr>
<tr>
<td>ParmNo</td>
<td>PositiveInt_type (int)</td>
<td>Parameter Number. Index into ParmSet.</td>
</tr>
<tr>
<td>ParmTime</td>
<td>NormalTime_type (int)</td>
<td>Timestamp of end of machine cycle.</td>
</tr>
<tr>
<td>Value</td>
<td>real</td>
<td>The process parameter value in engineering units.</td>
</tr>
<tr>
<td>Flag</td>
<td>TolFlag_type (tinyint)</td>
<td>Tolerance flag for the value (see TolFlag_range rule for valid values).</td>
</tr>
</tbody>
</table>
2.12 QCDefect

This table holds the Attribute SQC data associated with a SQC sample.

**PRIMARY KEY:** MachNo, JobSeq, SampSeq, CycleIndex, PartIndex, DefNo

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MachNo</td>
<td>MachNo_type (int)</td>
<td>Machine Number. Index into MachCon and MachInfo.</td>
</tr>
<tr>
<td>JobSeq</td>
<td>PositiveInt_type (int)</td>
<td>Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.</td>
</tr>
<tr>
<td>SampSeq</td>
<td>PositiveInt_type (int)</td>
<td>Sample Sequence Number. Unique machine-job-specific QC sample identifier. Along with MachNo and JobSeq, indexes into QCSample.</td>
</tr>
<tr>
<td>CycleIndex</td>
<td>CycleIndex_type (tinyint)</td>
<td>Cycle Index for each QC sample (0 for first cycle up to N-1, where N is the specified subgroup size).</td>
</tr>
<tr>
<td>PartIndex</td>
<td>PartIndex_type (tinyint)</td>
<td>Part Index for each part of a cycle of a QC sample (0 for the first part up to P-1, where P is the specified number of parts per cycle to capture – often corresponding to the cavitation).</td>
</tr>
<tr>
<td>DefNo</td>
<td>PositiveInt_type (int)</td>
<td>Defect Code Number. Index into DefCodes.</td>
</tr>
<tr>
<td>NumDefects</td>
<td>PositiveInt_type (int)</td>
<td>The number of defects for this DefNo.</td>
</tr>
</tbody>
</table>
2.13 QCMeasure

This tables holds the Variable SQC data associated with a SQC sample.

<table>
<thead>
<tr>
<th>PRIMARY KEY: MachNo, JobSeq, SampSeq, CycleIndex, PartIndex, MeasIndex</th>
</tr>
</thead>
<tbody>
<tr>
<td>MachNo MachNo_type (int) Machine Number. Index into MachCon and MachInfo.</td>
</tr>
<tr>
<td>JobSeq PositiveInt_type (int) Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.</td>
</tr>
<tr>
<td>SampSeq PositiveInt_type (int) Sample Sequence Number. Unique machine-job-specific QC sample identifier. Along with MachNo and JobSeq, indexes into QCSample.</td>
</tr>
<tr>
<td>CycleIndex CycleIndex_type (tinyint) Cycle Index for each QC sample (0 for first cycle up to N-1, where N is the specified subgroup size).</td>
</tr>
<tr>
<td>PartIndex PartIndex_type (tinyint) Part Index for each part of a cycle of a QC sample (0 for the first part up to P-1, where P is the specified number of parts per cycle to capture – often corresponding to the cavitation).</td>
</tr>
<tr>
<td>MeasIndex MeasIndex_type (Tinyint) Measurement Index. Index into QCSpecs.</td>
</tr>
<tr>
<td>Measure real The part variable characteristic value in engineering units.</td>
</tr>
<tr>
<td>Flag TolFlag_type (tinyint) Tolerance flag for the value (see TolFlag_range rule for valid values).</td>
</tr>
</tbody>
</table>
2.14 QCSample

This table holds the header information for an SQC sample, including the timestamp.

**PRIMARY KEY:** MachNo, JobSeq, SampSeq

- **MachNo** MachNo_type (int)
  Machine Number. Index into MachCon and MachInfo.

- **JobSeq** PositiveInt_type (int)
  Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

- **SampSeq** PositiveInt_type (int)
  Sample Sequence Number. Unique machine/job-specific QC sample identifier. Along with MachNo and JobSeq, indexes into QCSample.

- **SampTime** NormalTime_type (int)
  Timestamp of the beginning of the QC sample.

- **SampFlag** OnOffFlag_type (tinyint)
  Boolean flag for QC sample’s validity (1 for valid, 0 for ignore). This can be manually set in the QC Sample Data Edit facility.

- **LastUpdt** NormalTime_type (int)
  Timestamp of last update.

- **SampSize** SampSize_type (tinyint)
  Total sample size equal to the product of the number of cycles and the number of parts per cycle. Limited to a total of 320 parts for IMAC measurement entry.

- **InspectorID** char(18)
  An ID entered at the IMAC whenever a QC sample is taken. This is a variable length field. A System Configuration item controls the active length between 4 and 18 characters long.

- **SampCycle**
  “Cycle-stamp” of QC Sample within job, that is, the total cycle count for the job when the QC sample was initiated.
2.15 QCSheet

This is the primary record for a QC sample sheet and defines the details the QC sampling scheme as it pertains to the ProHelp® EPM system. It is pointed to (referenced by) the process sheet. Thus, it is indirectly linked to a scheduled job once the process sheet is specified.

**PRIMARY KEY:** SampNo

- **SampNo** SmallNo_type (smallint)
  Sample Sheet Number. Index into QCSheet.

- **SampID** char (18) [UNIQUE]
  Alphanumeric name of the QC sample sheet. This is a variable length field; a System Configuration item controls the active length between 4 and 18 characters long.

- **SampDesc** char (20)
  Alphanumeric description of the QC sample sheet.

- **SampPeriod** PositiveSmall_type (smallint)
  Sampling period value, either in machine cycles or in relative minutes.

- **NumParts** NumParts_type (tinyint)
  Number of parts to collect from each cycle.

- **SampPeriodFlag** OnOffFlag_type (tinyint)
  Boolean flag to indicate if the sampling period will be defined in machine cycles (0) or in relative minutes (1).

- **NumMeas** NumMeas_type (tinyint)
  Number of variable characteristics defined.

- **NumCycles** NumCycles_type (tinyint)
  Number of cycles for sample (number of cycles to automatically collect process parameter data for and the number of cycles from which **NumParts** parts will be captured).

- **LastUpdt** NormalTime_type (int)
  Timestamp of last update.

- **MiscInfo1** char (20)
  Miscellaneous field for additional user information

- **MiscInfo2** char (20)
  Miscellaneous field for additional user information
2.16 QCSpecs

This is the QCSheet’s companion table to hold the specification limits and other information specific to each variable characteristic.

**PRIMARY KEY: SampNo, MeasIndex**

- **SampNo** SmallNo_type (smallint)
  Sample Sheet Number. Index into QCSheet.

- **MeasIndex** MeasIndex_type (tinyint)
  Measurement Index. Index into QCSpecs. This sequential index doubles as part of the key.

- **Prompt** char (20)
  Alphanumeric description of measurement.

- **Units** char (5)
  Alphanumeric string showing the desired units of the measurements. These will be used to interpret the values entered. The actual numeric values of the variable characteristic entered are stored in the database; thus, they must be entered in the units displayed in this field for the system to be consistent.

- **IMACEntry** OnOffFlag_type (tinyint)
  Boolean flag to determine if a measurement may be entered at the MIU or not (1 to allow entry at the MIU and optional entry via QC Sample Data Edit, 0 to preempt MIU entry, allowing entry only at the computer level via QC Sample Data Edit).

- **UpperLim** real
  Engineering upper specification limit for each variable characteristic of QC Sample Sheet.

- **NomVal** real
  Engineering nominal value for each variable characteristic of QC Sample Sheet.

- **LowerLim** real
  Engineering lower specification limit for each variable characteristic of QC Sample Sheet.
2.17 ShiftDefect

These are the defect reason code breakdown records for each shift of the machine job record. They hold the number of defects for each reason code within the shift of the machine job.

**PRIMARY KEY:** MachNo, ShiftSeq

- **MachNo** MachNo_type (int)
  Machine Number. Index into MachCon and MachInfo.

- **ShiftSeq** ShiftSeq_type (int)
  Shift Sequence Number. Encoded date and shift index within day for applicable ShiftBounds set (defines shift time frame of data).

- **Defno** PositiveInt_type (int)
  Defect Code Number. Index into DefCodes.

- **JobSeq** PositiveInt_type (int)
  Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

- **Qty** float
  Number of defects of DefNo reason code during shift.
2.18 ShiftDown

These are the down reason code breakdown records for each shift of the machine job record. They hold the amount of downtime and the number of downtimes for each reason code within the shift of the machine job.

**PRIMARY KEY:** MachNo, ShiftSeq, DownNo, JobSeq

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MachNo</td>
<td>MachNo_type (int)</td>
<td>Machine Number. Index into MachCon and MachInfo.</td>
</tr>
<tr>
<td>ShiftSeq</td>
<td>ShiftSeq_type (int)</td>
<td>Shift Sequence Number. Encoded date and shift index within day for applicable ShiftBounds set (defines shift time frame of data).</td>
</tr>
<tr>
<td>DownNo</td>
<td>PositiveInt_type (int)</td>
<td>Down Code Number. Index into DownCodes.</td>
</tr>
<tr>
<td>JobSeq</td>
<td>PositiveInt_type (int)</td>
<td>Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.</td>
</tr>
<tr>
<td>Qty</td>
<td>PositiveInt_type (int)</td>
<td>Amount of downtime in seconds of DownNo reason code during job.</td>
</tr>
<tr>
<td>WtQty</td>
<td>PositiveFloat_type (float)</td>
<td>Weighted amount of downtime in seconds of DownNo reason code during job.</td>
</tr>
<tr>
<td>NumOccur</td>
<td>PositiveInt_type (int)</td>
<td>Number of occurrences of DownNo reason code during job.</td>
</tr>
<tr>
<td>WtNumOccur</td>
<td>PositiveFloat_type (float)</td>
<td>Weighted number of occurrences of DownNo reason code during job.</td>
</tr>
</tbody>
</table>
2.19 ShiftEng

These are the parameter specific (engineering) records for each shift of each machine job record. They hold the statistics and cycle counts for each process parameter.

**PRIMARY KEY:** MachNo, ShiftSeq, ParmNo, JobSeq

- **MachNo** MachNo_type (int): Machine Number. Index into MachCon and MachInfo.

- **ShiftSeq** ShiftSeq_type (int): Shift Sequence Number. Encoded date and shift index within day for applicable ShiftBounds set (defines shift time frame of data).

- **ParmNo** PositiveInt_type (int): Parameter Number. Index into ParmSet.

- **JobSeq** PositiveInt_type (int): Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

- **ValMin** real: Minimum value of the parameter during the shift.

- **ValMax** real: Maximum value of the parameter during the shift.

- **ValSum** float: Sum of the parameter values during the shift (used to calculate average).

- **ValSumSq** PositiveFloat_type (float): Sum of Squares of the parameter values during the shift (used to calculate standard deviation).

- **TotCyc** PositiveInt_type (int): Total count of cycles within the shift for which there was a valid parameter value calculated.

- **OutSpecCyc** PositiveInt_type (int): Count of out-of-spec cycles of the parameter within the shift.

- **LastVal** real: Value of the parameter from the last cycle completed during the shift.

- **LastTolFlag** TolFlag_type (tinyint): Tolerance flag for the value (see TolFlag_range rule for valid values).
2.20 ShiftProd

This is the main production record for each shift. It holds the basic production counts, run times, down times, as well as statistics for Cycle Time for each job run during the shift.

**PRIMARY KEY:** MachNo, ShiftSeq, JobSeq

**MachNo**  MachNo_type (int)
Machine Number. Index into MachCon and MachInfo.

**ShiftSeq**  ShiftSeq_type (int)
Shift Sequence Number. Encoded date and shift index within day for applicable ShiftBounds set (defines shift time frame of data).

**JobSeq**  PositiveInt_type (int)
Job Sequence Number. Unique machine-specific job identifier. Along with MachNo, indexes into JobQueue.

**TimeLogged**  NormalTime_type (int)
Timestamp of last update.

**MinCycTm**  real
Minimum value of Cycle Time parameter during the shift.

**MaxCycTm**  real
Maximum value of Cycle Time parameter during the shift.

**SumCycTm**  float
Sum of Cycle Time parameter values during the shift (used to calculate average).

**SumSqCycTm**  PositiveFloat_type (float)
Sum of Squares of Cycle Time parameter values during the shift (used to calculate standard deviation).

**CycCnt**  PositiveInt_type (int)
Total count of cycles within shift.

**CycOutSpec**  PositiveInt_type (int)
Count of out-of-spec cycles within the shift. Any cycle in which one or more process parameters are out-of-spec is said to be an out-of-spec cycle.

**ExpProdQty**  int
Expected quantity calculated from process sheet expectations for the shift.

**CalProdQty**  int
The MIU’s calculated total quantity (based on cycles monitored) for the shift.

**PakProdQty**  int
Packed good quantity reported for the shift.

**DefectQty**  int
Defect quantity reported for the shift.
**TotTime**    **PositiveInt_type** (int)
Total time in seconds (excluding suspended time) for the shift.

**WtTotTime**    **PositiveFloat_type** (float)
Weighted total time in seconds (excluding suspended time) for the shift.

**DownTime**    **PositiveInt_type** (int)
Down time in seconds during shift.

**WtDownTime**    **PositiveFloat_type** (float)
Weighted down time in seconds during the shift.

**NumDownTm**    **PositiveInt_type** (int)
Number of downtimes that occurred during the shift.

**WtNumDownTm**    **PositiveFloat_type** (float)
Weighted number of downtimes that occurred during the shift.

**LaborTime**    **PositiveInt_type** (int)
Amount of labor time in seconds calculated for the shift.

**WtLaborTime**    **PositiveFloat_type** (float)
Weighted amount of labor time in seconds calculated for the shift.

**WtCycCnt**    **PositiveFloat_type** (float)
Weighted total count of cycles within the shift.

**SetupCycCnt**    **PositiveInt_type** (int)
Number of setup cycles that occurred during the shift.

**WtSetupCycCnt**    **PositiveFloat_type** (float)
Weighted number of setup cycles that occurred during the shift.

**NonProductionCycCnt**    **PositiveInt_type** (int)
Number of non-production cycles that occurred during the shift.

**WtNonProductionCycCnt**    **PositiveFloat_type** (float)
Weighted number of non-production cycles that occurred during the shift.

**PartQualCycCnt**    **PositiveInt_type** (int)
Number of part qualification cycles that occurred during the shift.

**WtPartQualCycCnt**    **PositiveFloat_type** (float)
Weighted number of part qualification cycles that occurred during the shift.