

Process Management

Introduction

The task of process management is to coordinate between the R/3 System and all the systems involved in process control and quality assurance when a process order is carried out. The following activities are involved here (see Fig. 8-1):

- ❑ Information relevant to control, which is stored in the process order in the form of process instructions, is found in process management in the **control recipes**. Control recipes are sent to process control or to the LIMS systems involved.
- ❑ In turn, process management receives process messages from process control and LIMS systems, with which actual process data is reported. Process messages are passed on to predefined destinations.

The information to be exchanged via process management as well as the destinations involved can be set in Customizing. Via this flexibility, process management can fulfill the requirements of all types of control scenarios, ranging from manually operated to partially or fully automated plants.

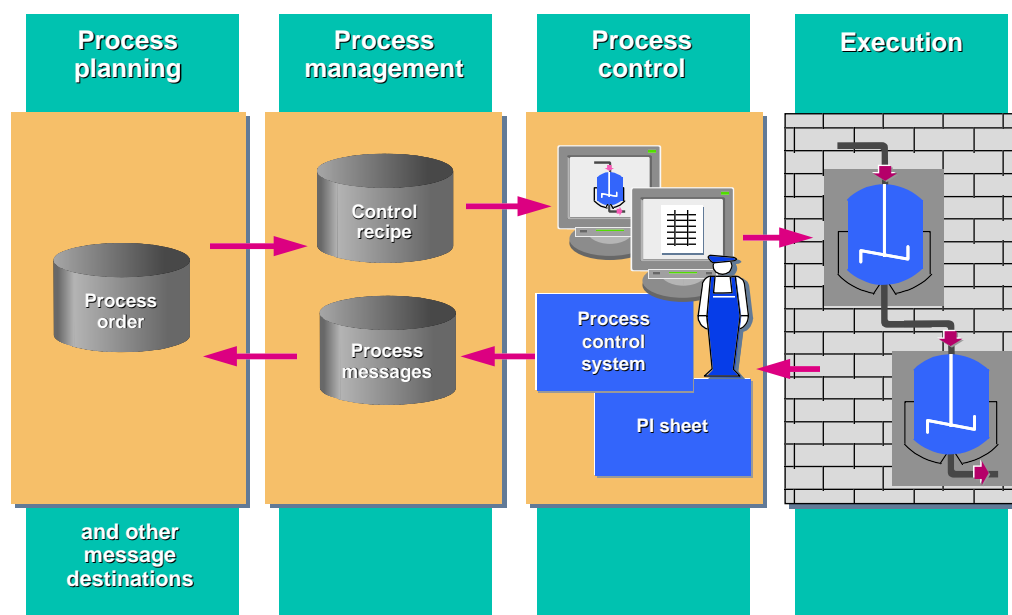


Fig. 8-1: The role of process management within PP-PI

Functions of Process Management

Process Instructions Process instructions are defined in the process order, where they are assigned to the phases. They contain precisely the information needed by process control to execute a phase. Their contents are specified via the assignment of characteristics (for example, material number or quantity) and characteristic values.

Process instructions are user-defined. This means that they can be adapted to the specific requirements of a process as well as to the systems involved in the execution. It is possible to have process instructions in which control parameters are transferred to automatic control systems, as well as process instructions to be displayed in natural language for process operators (line operators).

Process instruction categories set in Customizing facilitate the maintenance of process instructions in the order. They are copied when you create new process instructions, and then completed with line and process-specific information.

Depending on the type of information to be transferred, you can use various types of process instructions:

- A **process parameter** is used to transfer information to the process control module. In the case of manually operated lines, the process parameter contains a text for the line operator.
- A **process data request** specifies that process control is to send a process message with actual process data to PP-PI.
- A **process message subscription** specifies the unplanned events, such as alarms, exceeding of limits, etc. to be reported.
- A **process data calculation formula** specifies that a value must be calculated in the PI sheet. This value is then to be sent to specific destinations using a process message.
- An **inspection results request** specifies that inspection results are to be recorded for one or more operations during the production process.
- A **dynamic function call** enables the line operator to call a user-defined function module from within the PI sheet. Depending on the function module, this option can be used to start a dialog or retrieve data from internal or external applications.

Control Recipe Destination The control system or operator to receive the process instructions, and the type of data transfer involved (for example, transfer initiated by R/3 or by process control) is information stored for in the process order using the control recipe destination.

Control recipe destinations are user-defined in Customizing. Their assignment to a process order takes place on the phase level. This assignment is independent of the bundling of phases in operations carried out from the planning view, i.e. when the master recipe is defined. This means that the control recipe destination can be assigned according to the technical aspects controlling the process.

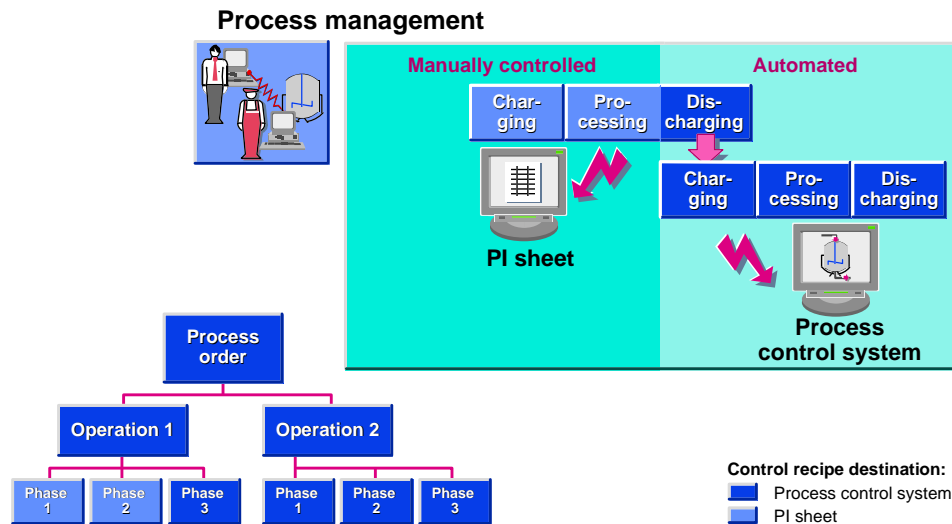


Fig. 8-2: Allocation of control recipe destinations to phases

In the example above, a substance is pumped from Operation 1 to Operation 2 without intermediate storage. The phases "Discharging" (Operation 1) and "Charging" (Operation 2) are therefore closely linked. This means that they have to be assigned to the same control recipe destination. Their process instructions are sent to the same control system for execution.

Control recipes are generated from the process instructions of the process order. The prerequisite for this is that the process order or at least its phases, whose process instructions are used to generate the control recipe, have been released for production.

Control Recipes

Process management generates and sends a control recipe for each control recipe destination specified in the process order.

If the destination is an external system (for example, a process control system or an external process instruction sheet), the transfer of the control recipe takes place via RFC (Remote Function Call) in the form of Program-to-Program Communication. Depending on the control system involved, it can be initiated by PP-PI or by process control.

For partially automated or manual process control systems, process management offers the possibility of editing control recipes for the line operator in the form of a process instruction sheet. This means that the control recipe data is transferred internally to the process instruction sheet.

Process Instruction Sheet (PI Sheet)

The process instruction sheet represents an electronic form in which the process instructions of a control recipe are edited for display and maintenance at the screen. Depending on the process instructions involved, the following functions are available:

- Display of *control instructions* in natural language.
- By providing input fields, the system enables the line operator to enter requested *actual process data*. The entries of the line operator are checked immediately for validity and if a value has been exceeded, the system will display a message to this effect. The entries are reported using process messages, which are sent to predefined destinations.
- Using predefined formulas from the control recipe, *quantity calculations* are carried out. The results are sent to predefined recipients via process messages.
- The line operator can branch directly from the PI sheet into the R/3 QM module, in order to enter the *results of in-process control/inspection runs*.
- The line operator can call up a user-defined function module directly from the PI sheet. In this way, it is possible to *initiate a dialog with a function module*, or call *data from internal or external applications*.

Fig. 8-3: PI sheet

The transfer of information from process control to PP-PI is carried out via process messages. Process messages are normally requested via a process instruction. They are then generated by an automated control system, a LIMS system or by manual data entry in the PI sheet. In the case of unplanned events, such as malfunctions, it is also possible to manually generate and send process messages, without their having been requested.

Process Messages

The contents of a process message are determined by the assignment of characteristics and characteristic values (for example, measured values and units of measure). Depending on the type of information transferred, various message categories exist. Message categories used to transfer data to SAP components are pre-defined by SAP. The user can however also define company-specific message categories in Customizing (for example, for external functions or for user-defined ABAP/4 tables).

All process messages are first sent to process management. Here they are checked and sent to all the destinations specified for the corresponding message category.

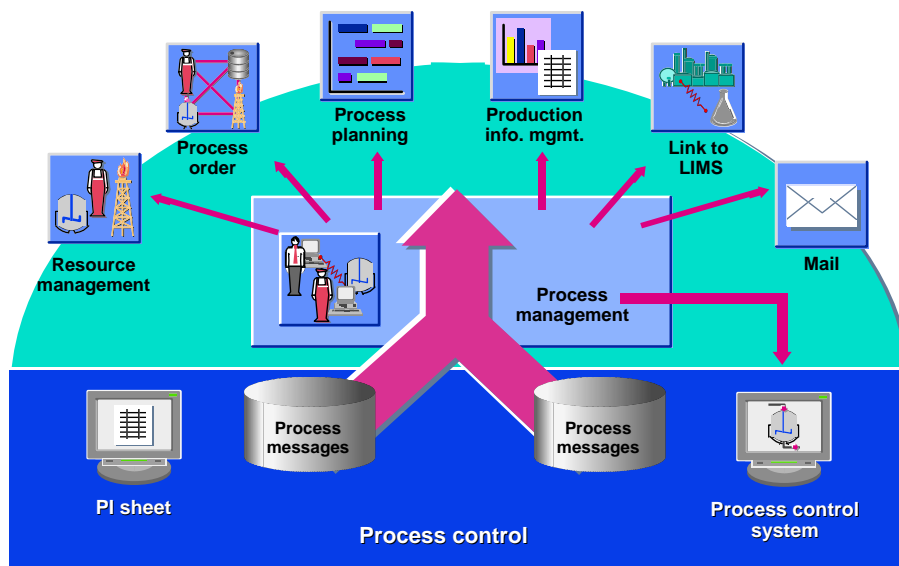


Fig. 8-4: Transfer of data from process control

Some R/3 functions are predefined by SAP as message destinations:

- R/3 function module
- External function
- Users of SAPoffice mail system
- ABAP/4 tables in which the contents of a message can be stored

Process messages to **R/3 function modules** are processed immediately upon receipt by the function module in question. The following are some examples of this:

Process Message Destinations

- ❑ The process control system sends information on the amount of ingredients which have been charged. The change in stock is posted to the inventory control module of materials management (MM).
- ❑ The status of an operation is sent and displayed in the planning table.
- ❑ A process message contains data on product quality which is transferred to the batch record for long-term archiving.

In the case of process messages to **external functions**, the process management component has a primarily coordinating function, sending information between the persons and systems involved in the control of the process, who/which would otherwise be acting independently of one another.

For the sake of example, let us assume that in a partially automated plant line, a line operator reports via the PI sheet that a vessel has been charged manually. The message is transferred to the process control system and there initiates the execution of a control recipe for further processing.

Process messages to **mail destinations** are sent via the SAPoffice mail system. It enables those within and outside of the plant to obtain information on the current status of production at any time, depending on the process events or operator actions involved.

Process messages can also be stored in **user-defined data tables**, which are then available for further evaluations.

Data Transfer to Message Destinations

Process messages can be sent to any number of destinations. The predefined destinations are assigned to the message categories in Customizing. If individual messages of a message category are also to be sent to a further destination, it is possible to assign the destination to precisely these messages.

The sending of process messages, i.e. their transfer by process management, is carried out in the same way as the transfer of control recipes: either internally within R/3 or via RFC. The action is initiated by the sender (that is, by process control), or when passing on a message, by process management.

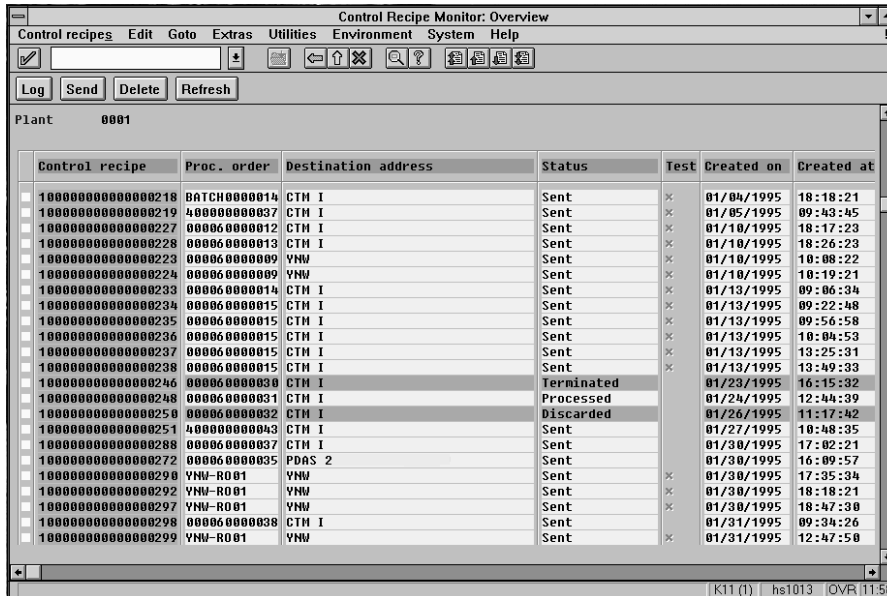
In the case of the destination types R/3 function module and ABAP/4 table, you can transfer message characteristics to specific data fields of the destination. This assignment is also user-defined in Customizing for the respective message category.

Monitoring: Control Recipes and Process Messages

Control recipes and process messages are controlled via so-called monitors. These contain an overview as well as logs with detailed information on the history of each process message or control recipe. The control recipe monitor displays the current status of the control recipe from its generation up until its completion (see Fig. 8-5).

The process message monitor in turn displays the status of process messages from their receipt by process management until they are sent to their destinations. If a destination does not exist or is temporarily not accessible, the process message is stored temporarily. After the malfunction has been removed, the message can be sent directly from the monitor. Incomplete process messages can be completed in the message monitor and then sent.

The following screen shows a control recipe monitor with various statuses displayed. All changes and malfunctions are documented in the corresponding log.



Control recipe	Proc. order	Destination address	Status	Test	Created on	Created at
10000000000000218	BATCH000014	CTH I	Sent	x	01/04/1995	18:18:21
10000000000000219	40000000037	CTH I	Sent	x	01/05/1995	09:43:45
10000000000000227	00006000012	CTH I	Sent	x	01/10/1995	18:17:23
10000000000000228	00006000013	CTH I	Sent	x	01/10/1995	18:26:23
10000000000000223	00006000009	YHW	Sent	x	01/10/1995	10:08:22
10000000000000224	00006000009	YHW	Sent	x	01/10/1995	10:19:21
10000000000000233	00006000014	CTH I	Sent	x	01/13/1995	09:06:34
10000000000000234	00006000015	CTH I	Sent	x	01/13/1995	09:22:48
10000000000000235	00006000015	CTH I	Sent	x	01/13/1995	09:56:58
10000000000000236	00006000015	CTH I	Sent	x	01/13/1995	10:04:53
10000000000000237	00006000015	CTH I	Sent	x	01/13/1995	13:25:31
10000000000000238	00006000015	CTH I	Sent	x	01/13/1995	13:49:33
10000000000000246	00006000030	CTH I	Terminated		01/23/1995	16:15:32
10000000000000248	00006000031	CTH I	Processed		01/24/1995	12:44:39
10000000000000250	00006000032	CTH I	Discarded		01/26/1995	11:17:42
10000000000000251	40000000043	CTH I	Sent	x	01/27/1995	10:48:35
10000000000000288	00006000037	CTH I	Sent	x	01/30/1995	17:02:21
10000000000000272	00006000035	PDAS 2	Sent	x	01/30/1995	16:09:57
10000000000000290	YHW-RO01	YHW	Sent	x	01/30/1995	17:35:34
10000000000000292	YHW-RO01	YHW	Sent	x	01/30/1995	18:18:21
10000000000000297	YHW-RO01	YHW	Sent	x	01/30/1995	18:47:30
10000000000000298	00006000038	CTH I	Sent	x	01/31/1995	09:34:26
10000000000000299	YHW-RO01	YHW	Sent	x	01/31/1995	12:47:50

Fig. 8-5: Control recipe monitor

Process management is fully integrated in the data flows of process planning. Via process instructions and messages, process management supports the exchange of information between PP-PI and fully automated, partially automated and manual process control systems.

What are the tasks of process management?

Process management serves as an interface between PP-PI and the systems involved in process control. Via process management, control recipes are sent to process control systems and actual process data is sent back in the form of process messages.

What are the main functions of process management?

- The receipt of released process orders from process planning
- The generation of control recipes from process orders
- The distribution of control recipes to the line operators or process control systems involved
- The receipt, checking and transfer of process messages
- The manual creation of process messages

