

The “Nearly” Perfect Corrective Maintenance Notification

*From a Reliability Engineering perspective, what
Notifications add the most value to my effort to help
increase Equipment Reliability*



The Classification of Information

Conceptually, it is important to know the structure of collecting data in a way that is retrievable in an organized way to develop effective reporting.

The best way to enter data is not free text, because the variability of entries would not allow the information to roll up correctly into collective reporting. The most effective way is to select preconfigured fields that are clear choices to the user, which means much preparation is needed to make the choices clear and understandable.

While not every field shown in this example is needed by everyone, this shows an SAP PM Notification that is executed to not only capture Reliability History, but to improve it.

This Notification contains readily available SAP PM functionality available through standard configuration options.



Short and Long Text

Notice the Tab Labels are clear and informative as to the Type of Information included to ease Navigation

Change PM Notification: Emergency Report

Notification: 100021 Z0 Drive will not Slow Down Properly

Notific. Status: NOPR ORAS CRTD

Order: 100041

Symptom Description Failure Impact and Coding What Was Done

Subject

How Detected: D090 On Demand

08/19/2019 11:48:20 CET M2B JHOKE (JHOKE)
08/13/2019 14:06:20 CET M2B JHOKE (JHOKE)
The variabel speed drive is not in control when decelerating

Reference object

Functional loc.: V101.01.002.0001 RM RCV Styrene Unloading

Equipment: 10000003 Siemens PM240-2 VFD

Responsibilities

Planner group: PRE / V101 Processing Elec

Main WorkCtr: PR_ELEC / V101 Processing Electrician

Reported by: JHOKE Notif.date: 01/31/2019 17:06:05

Start/End Dates

Required Start: 01/31/2019 17:06:05 Priority: 0-2 Days

Required End: 01/31/2019 17:06:05 Breakdown:

The **Short Text** in 40 Characters or Less, describes what the issue is, (not what the solution might be). When people complain about being limited to 40 characters here, please understand that this is the **Headline**, much like in a news article that quickly indicates what is going on. Headlines are to grab your attention when there are many notifications in a list display to choose from!

Long Text adds any additional information that the Planner and Craftsmen would deem useful. (Notice the long text says when the particular problem happens) This could be good information in determining root cause.



How was the Problem Discovered?

The screenshot shows the SAP PM notification form for 'Change PM Notification: Emergency Report'. The 'How Detected' field is set to 'D090 On Demand'. A callout box explains that this field is used to describe how the problem was discovered. Another callout points to a 'Catalog Selection' dialog box, which lists various detection methods with long, descriptive text for each code. A third callout points to a 'Display Long Text' dialog box, which shows a detailed description of the failure: 'Failure discovered during an on-demand attempt to activate an equipment unit (e.g. safety valve fails to close on ESD-signal, fail to start a gas turbine on demand, etc.)'. The main form includes fields for notification number, status, order, subject, reference object, responsibilities, and start/end dates.

As part of our effort to determine if our organization is effective at identification of Reliability issues, the How Detected field (the default field name is "Coding" which is too ambiguous) is completed on how the problem was detected.

To simplify the selection criteria for the user, the codes are well named and each selection has long text to add more detail. This will help ensure more accurate data input.



Identification of the Correct Equipment

The screenshot displays the SAP 'Change PM Notification: Emergency Report' interface. The notification number is 100021, with a status of 'NOPR ORAS' and a subject of 'Drive will not Slow Down Properly'. The order number is 100041. The 'Reference object' section shows the functional location 'V101.01.002.0001' (RM RCV Styrene Unloading) and the equipment '10000003' (Siemens PM240-2 VFD). The 'Responsibilities' section lists the planner group 'PRE / V101' (Processing Elec) and the main work center 'PR_ELEC / V101' (Processing Electrician). The notification was reported by 'JHOKE' on 01/31/2019 at 17:06:05. The 'Start/End Dates' section shows a required start of 01/31/2019 at 17:06:05 with a priority of '0-2 Days' and a required end of 01/31/2019 at 17:06:05 with the 'Breakdown' checkbox checked. The 'Subject' section contains a log of events: '08/19/2019 11:48:20 CET M2B JHOKE (JHOKE)', '08/13/2019 14:06:20 CET M2B JHOKE (JHOKE)', and the description 'The variabel speed drive is not in control when decelerating'. An arrow points from the text box to the equipment field.

Field	Value
Notification	100021
Notific. Status	NOPR ORAS
Order	100041
Subject	Drive will not Slow Down Properly
How Detected	D090 On Demand
Reference object - Functional loc.	V101.01.002.0001 RM RCV Styrene Unloading
Reference object - Equipment	10000003 Siemens PM240-2 VFD
Planner group	PRE / V101 Processing Elec
Main WorkCtr	PR_ELEC / V101 Processing Electrician
Reported by	JHOKE
Notif.date	01/31/2019 17:06:05
Required Start	01/31/2019 17:06:05
Priority	0-2 Days
Required End	01/31/2019 17:06:05
Breakdown	<input checked="" type="checkbox"/>

In our particular instance, the Notifications are created from the Technical Object Hierarchical screen to allow the user to select the proper Equipment that has the problem. However if the user determines or enters the Equipment, it is imperative that this assignment is correct so that all of the history is recorded correctly and all of the administrative information defaults into the Notifications and Orders.



Who is Involved?

Change PM Notification: Emergency Report

Notification: 100021 Z0 Drive will not Slow Down Properly

Notific. Status: NOPR ORAS CRTD

Order: 100041

Symptom Description Failure Impact and Coding What Was Done

Subject

How Detected: D090 On Demand

08/19/2019 11:48:20 CET M2B JHOKE (JHOKE)
08/13/2019 14:06:20 CET M2B JHOKE (JHOKE)
The variabel speed drive is not in control when decelerating

Reference object

Functional loc.: V101.01.002.0001 RM RCV Styrene Unloading

Equipment: 10000003 Siemens PM240-2 VFD

Responsibilities

Planner group: PRE / V101 Processing Elec

Main WorkCtr: PR_ELEC / V101 Processing Electrician

Reported by: JHOKE Notif.date: 01/31/2019 17:06:05

Start/End Dates

Required Start: 01/31/2019 17:06:05 Priority: 0.2 Days

Required End: 01/31/2019 17:06:05 Breakdown

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If the correct Equipment is assigned to the Notification and we have done a good job keeping the Equipment Master Data Record information up to date and accurate, the Planner Group (the Planner assigned to that Equipment) and the Work Center (the Work Team and Supervisor that are responsible for that Equipment) is automatically assigned and therefore will appear in their backlogs without intervention.

While the person creating the Notification is not always the person that witnessed the Equipment Reliability Issue, it helps that the person who witnessed the issues name is located in the Reported By field for the Planner and Technician to get a first hand account if needed.



When is a Solution Required?

The screenshot shows the SAP Maintenance notification interface. The notification is titled "Change PM Notification: Emergency Report". Key fields include:

- Notification: 100021
- Drive will not Slow Down Properly
- Notific. Status: NOPR ORAS
- Order: 100041
- Subject: How Detected: D090 On Demand. Description: 08/19/2019 11:48:20 CET M2B JHOKE (JHOKE), 08/13/2019 14:06:20 CET M2B JHOKE (JHOKE). The variabel speed drive is not in control when decelerating.
- Reference object: Functional loc. V101.01.002.0001 RM RCV Styrene Unloading, Equipment 10000003 Siemens PM240-2 VFD.
- Responsibilities: Planner group PRE / V101 Processing Elec, Main WorkCtr PR_ELEC / V101 Processing Electrician, Reported by JHOKE, Notif.date 01/31/2019 17:06:05.
- Start/End Dates: Required Start 01/31/2019 17:06:05, Priority 0-2 Days, Required End 01/31/2019 17:06:05, Breakdown checked.

By Assigning a Priority, the Notification can signify a reasonable expectation of when this issue needs to be resolved. The Priorities are labeled in terms of date ranges, which are easily understandable and clear to all. Priorities like “High”, “Medium”, and “Low” are not clear and can be different by user. Setting the Priority will enter the Required Start / Required End Dates automatically.

One of our more important Equipment Performance Metrics is **Mean Time Between Failure** and **Mean Time to Repair**. This helps us determine Risk and Reliability Impact when faced with making decisions on Priorities. When the **Breakdown** box is checked, we know that the Equipment has failed and the clock for those metrics has started.



What Affect Does this Failure Have?

The screenshot displays the SAP Maintenance notification interface for a 'Change PM Notification: Emergency Report'. The notification number is 100021, and the symptom is 'Drive will not Slow Down Properly'. The equipment affected is 'Goulds 3298 Pump' (Equipment affected: 10000001). The effect is '3 Prod Rate = 0 (Downtime)'. The item affected is 'Braking Resistor' (EQ SubDiv: VFD, EQ Fail Mode: ELEC). The malfunction data shows a start time of 01/31/2019 17:06:05 and a breakdown duration of 3.90 hours.

Effect on the system

Funct. loc. affected	V101.01.002.0001	RM RCV Styrene Unloading
Equipment affected	10000001	Goulds 3298 Pump
Effect	3	Prod Rate = 0 (Downtime)

System availability

Cond.bef.malfunctn	1	EQ Operating as Design...
Cond.aft.malfunctn	1	EQ Operating as Design...

Item

EQ SubDiv	VFD	BV04	Braking Resistor
EQ Fail Mode	ELEC	CE02	Erractic Output
Text	VFD will not Slow Down Correctly		
Root Cause	OP/MAINT	5035	Maintenance Error - Inspection Failure
Cause text	Connection on Resistor was loose		

Malfunction data

Malfunct. start	01/31/2019	17:06:05	<input checked="" type="checkbox"/> Breakdown
Malfunct. end	01/31/2019	21:00:00	Breakdown dur. 3.90

Effect on Operation (1) 3 Entries found

Restrictions	
1	Prod Rate Not Impacted
2	Prod Rate Restricted (Slowback)
3	Prod Rate = 0 (Downtime)

Many times an Equipment Failure affects other Key Equipment. For instance, the Variable Frequency Drive here influences the Pump identified here, which happens to be a bottleneck of the process. Affecting a bottleneck process makes this a high risk Equipment.

And to solidify the Production Impact, it is indicated here that the Equipment Failure actually shuts down Production. We will use this field later to determine Production Total Impact.



Were there Preconditions or Follow-ups?

System, or Equipment Availability is important from a Reliability perspective. Was the Equipment already at risk and not operating as design prior to the current Malfunction?

Using the same criteria, was the Equipment Repaired to the Design State, or is there a risk continuing after this Work Order was closed?

Notification: 100021 Z0 Drive will not Slow Down Properly
Notific. Status: NOPR ORAS CRTD
Order: 100041

Effect on the system
Funct. loc. affected: V101.01.002.0001 RM RCV Styrene Unloading
Equipment affected: 10000001 Goulds 3298 Pump
Effect: 3 Prod Rate = 0 (Downtime)

System availability
Cond.bef.malfunctn: 1 EQ Operating as Design...
Cond.aft.malfunctn: 1 EQ Operating as Design...

Item
EQ SubDiv: VFD BV04 Braking Resistor
EQ Fail Mode: ELEC CE02 Erractic Output
Text: VFD will not Slow Down Correctly
Root Cause: OP/MAINT 5035 Maintenance Error - Inspection Failure
Cause text: Connection on Resistor was loose

Malfunction data
Malfunct. start: 01/31/2019 17:06:05 Breakdown
Malfunct. end: 01/31/2019 21:00:00 Breakdown dur.: 3.90

System Condition Before Malfunction (1) 4 Entries found
Restrictions
SCn C
1 EQ Operating as Designed
2 EQ Operating at Reduced Capacity
3 EQ Operating Erractically
4 EQ Non-Functional



What Functional Part of the Equipment Failed?

Change PM Notification: Emergency Report

Notification: 100021 Z0 Drive will not Slow Down Properly
Notific. Status: NOPR ORAS CRTD
Order: 100041

Effect on the system
Funct. loc. affected: V101.01.002.0001 RM RCV Styrene Unloading
Equipment affected: 10000001 Goulds 3298 Pump
Effect: 3 Prod Rate = 0 (Downtime)

System availability
Cond.bef.malfuncn: 1 EQ Operating as Design...
Cond.aft.malfuncn: 1 EQ Operating as Design...

Item
EQ SubDiv: VFD BV04 Braking Resistor
EQ Fail Mode: ELEC CE02 Erractic Output
Text: VFD will not Slow Down Correctly
Root Cause: OE/MAINT 5035 Maintenance Error - Inspection Failure
Cause text: Connection on Resistor was loose

Malfunction data
Malfuncn. start: 01/31/2019 17:06:05 Breakdown
Malfuncn. end: 01/31/2019 21:00:00 Breakdown dur.: 3.90

Catalog Selection
EQ SubDiv: Equipment Subdivision
VFD: Variable Frequency Drive Object Parts
BV01: Line Supply Connection
BV02: Power Electronics
BV03: Controller and Sensor
BV04: Braking Resistor

Display Long Text
- 1 -
This includes the Braking Resistor and wiring.

As we look systemically across the plant with like Equipment, there is real value having a field that pinpoints the part that failed. Maybe there are resistors in other Equipment that contain the same risk.

Hopefully we can provide to the user good identification of Object Parts for the Equipment that are clear to the user. Here we have invested the time to specifically isolate the Variable Frequency Drive Object Parts and also provided long text help to clarify. This minimizes confusion and eliminates selections that are not applicable.



How did the Equipment Fail?

Change PM Notification: Emergency Report

Notification: 100021 Z0 Drive will not Slow Down Properly

Notific. Status: NOPR ORAS CRTD

Order: 100041

Symptom Description Failure Impact and Coding What Was Done

Effect on the system

Funct. loc. affected: V101.01.002.0001 RM RCV Styrene Unloading

Equipment affected: 10000001 Goulds 3298 Pump

Effect: 3 Prod Rate = 0 (Downtime)

System availability

Cond.bef.malfunctn: 1 EQ Operating as Design...

Cond.aft.malfunctn: 1 EQ Operating as Design...

Item

EQ SubDiv: VFD BV04 Braking Resistor

EQ Fail Mode: ELEC CE02 Erratic Output

Text: VFD will not Slow Down Correctly

Root Cause: OP/MAINT 5035 Maintenance Error - Inspection Failure

Cause text: Connection on Resistor was loose

Malfunction data

Malfunct. start: 01/31/2019 17:06:05 Breakdown

Malfunct. end: 01/31/2019 21:00:00 Breakdown dur.: 3.90

EQ Fail Mode Failure Mode (Damage)

- ELEC Electrical General Damage Codes
 - CE01 Abnormal Instrument Reading
 - CE02 Erratic Output
 - CE03 Voltage Out of Tolerance
 - CE04 Current Limited
 - CE05 Power Feed / Supply Malfunction
 - CE0Y Other - Detail in Damage Text
 - CE0Z Unknown
- MECH Mechanical General Damage Codes

Display Long Text

- 1 -

The output of the Electrical Device is not stable when put in manual mode.

Obviously there is value in documenting what type of Failure occurred. This one is especially interesting to note that erratic output of the drive did cause Production to shut down, which means this type of failure has high impact.

Hopefully we can provide to the user good identification of Damage Codes for the Equipment that are clear to the user. In this case, we have used more generic Damage Codes, but feel that it is reasonable to expect these generic Electrical Damage codes to be more than adequate. Here we have also invested the time to provide long text help to clarify. This minimizes confusion and eliminates selections that are not applicable.



Why did the Equipment Fail?

Change PM Notification: Emergency Report

Notification: 100021 Z0 Drive will not Slow Down Properly

Notific. Status: NOPR ORAS CRTD

Order: 100041

Effect on the system

Funct. loc. affected: V101.01.002.0001 RM RCV Styrene Unloading

Equipment affected: 10000001 Goulds 3298 Pump

Effect: 3 Prod Rate = 0 (Downtime)

System availability

Cond.bef.malfunctn: 1 EQ Operating as Design...

Cond.aft.malfunctn: 1 EQ Operating as Design...

Item

EQ SubDiv: VFD BV04 Braking Resistor

EQ Fail Mode: ELEC CE02 Erractic Output

Text: VFD will not Slow Down Correctly

Root Cause: OP/MAINT 5035 Maintenance Error - Inspection Failure

Cause text: Connection on Resistor was loose

Entry: 1 frm 1

Malfunction data

Malfuncnt. start: 01/31/2019 17:06:05 Breakdown

Malfuncnt. end: 01/31/2019 21:00:00 Breakdown dur.: 3.90

Root Cause (Failure Mechanism)

- DESIGN Design Related Causes
- FAB/INST Fabrication/Installation Related Causes
- MGMT Management Related Causes
- MISC Miscellaneous Causes
- OP/MAINT Causes Related to Operation/Maintenance
 - 5030 General
 - 5031 Off-Design Service
 - 5032 Operating Error
 - 5035 Maintenance Error - Inspection Failure
 - 5036 Maintenance Error - Repair Failure
 - 5037 Maintenance Error - Lubrication Failure
 - 5040 Expected Wear and Tear

Display Long Text

- 1 -

Maintenance Error - Inspection Failure - A proper and timely inspection would have detected an issue prior to failure. Either no Preventive Inspections exists, or was not executed properly.

Obviously to remove the recurrence of this issue in this and other Equipment, the Root Cause of the problem must be determined! Measuring the Root Causes determines our Reliability Improvement Work Priorities!

Hopefully we can provide to the user good identification of Cause Codes for the Equipment that are clear to the user. In this case, we have used more generic Cause Codes, but feel that it is reasonable to expect these generic Cause Codes to be more than adequate. Here we have also invested the time to provide long text help to clarify. This minimizes confusion and eliminates selections that are not applicable. Because the user was honest in saying that the problem should have been caught during an inspection, a real solution can be implemented.



Measuring the Impact

The screenshot displays the SAP Maintenance notification interface for a 'Change PM Notification: Emergency Report'. The notification details include:

- Notification: 100021
- Drive: Drive will not Slow Down Properly
- Notific. Status: NOPR ORAS
- Order: 100041

The 'Malfunction data' section is highlighted, showing the following information:

Field	Value
Malfunction start	01/31/2019 17:06:05
Malfunction end	01/31/2019 21:00:00
Breakdown dur.	3.90

The 'Item' section provides details about the affected equipment:

- EQ SubDiv: VFD
- EQ Fail Mode: ELEC
- Text: VFD will not Slow Down Correctly
- Root Cause: OE/MAINT 5035 Maintenance Error - Inspection Failure
- Cause text: Connection on Resistor was loose

Because the Malfunction Start and End was filled out – The issue was noticed around 5 PM and the drive was returned to service at 9 PM, we can measure that there was an impact of around 3.9 hours to Production since we saw earlier that this issue created Production Downtime. If the failure had not impacted production, we would still have the data to calculate Mean Time Between Failure and Mean Time to Repair for this Equipment and this type of Equipment.



What Was Done

The screenshot displays the SAP 'Change PM Notification: Emergency Report' interface. The notification details include: Notification 100021, Z0, Drive will not Slow Down Properly, Notific. Status NOPR ORAS, Order 100041, and CRTD. The 'Activities' table shows two entries:

Item	Code gro...	Activity co...	Activity code text	Activity text	LT	Start date	Time	End date	Time
1	ELEC	AE02	Part Repair	Tightened Connection		01/31/2019	18:01:00	01/31/2019	19:54:00
1	PMIMPROV	AP02	Existing Task List U...	Group IRINSP01 Ctr.03		03/13/2019	00:00:00	03/13/2019	00:00:00

The 'Catalog Selection' window shows a tree structure with 'Part Repair' selected under 'ELEC'.

Annotations: A callout box points to the 'Part Repair' activity code and text, stating: 'Here we have classified the remedy of the Malfunction, by selecting that the Object Part identified in the Failure Codes was repaired, and in the Activity Text gave a little detail.' Another callout box points to the end time of the first activity, stating: 'Here we have Interestingly enough, it was documented the repair was completed by 8 PM (remember the Malfunction stated the Malfunction End was 9 PM). Both entries are correct, but often there is value in knowing when the Equipment was turned back over to Production, and when they were actually able to get the Equipment productive again.'



