

Task

Alarm Management



Alarm systems alert operators to plant conditions, such as deviation from normal operating limits and to abnormal events, which require timely action or assessment. Alarms are key sources of information to guide operator actions to maintain safety.

Alarm: a signal or message to an operator (usually with a sound, blinking screen alert and/or a flashing light) indicating a problem requiring the operator's attention and action.

Alarm management is an issue for any site or process where there is reliance on human response to an alarm to prevent or control incidents, as well as major accident hazards. Alarm management is relevant to:

- simple sites as well as complex operating facilities;
- sites with a small number of alarms, for example simple storage sites or cylinder filling site;
- sites with a single control room with a DCS (distributed control system) such as an acetylene plant or stand-alone Air Separation plant;
- Remote Operating Centres (ROC) from which multiple distant facilities are controlled.



Photo: An example of a ROC controlling a variety of up to 50 operating plants – sometimes in different countries.

Principles of alarm management are the same in all types of sites – to raise operator awareness of the situation and to assure the correct and timely human response to alarms through:

- providing sufficient response time;

- good interface and system design, including well defined alarm priorities to aid fast and accurate
 - o understanding and diagnosis,
 - o Decision making, by providing explanations for alarm causes,
 - o Action taking, through well-defined corrective actions and procedures;
- monitoring and review,
- training and competence arrangements.

Poorly designed alarm systems may hinder rather than help the operator and may result in failure to identify a need to act, or failure to select an effective course of action, especially in emergency situations. Poor alarm management can also desensitise operators, for example from too many nuisance alarms or false alarms.

However, alarm systems can be improved by establishing and implementing a clear philosophy to reduce and prioritise alarms. Operator response can also be facilitated by clear procedures and training.

Companies should consider any changes which improve responses to alarms and therefore improve safety.

Learning more about alarm handling.

If the answer to any of the questions below is 'yes', then you need to take action

1.	Do operators sometimes not know what to do about a particular alarm (for example proper documentation displayed, causes and corrective actions to be taken, priority, limits, time delays, dead bands)?	☐
2.	Is the wording of some important alarm messages unclear?	☐
3.	Do operators just accept alarms without reading the message?	☐
4.	Is it often not clear what caused an alarm?	☐
5.	Are some alarms too quiet compared to the background noise?	☐
6.	Are some alarms so loud that they startle operators and make it hard for them to think or to hear what anyone else is saying?	☐
7.	Do operators turn off the sounder because it is sounding too often or is too loud?	☐
8.	Are too many alarms activated during a typical shift, even if there isn't a major problem?	☐
9.	When there is a problem, do lots of alarms activate?	☐
10.	Does one alarm seem to set off others until there are just too many to deal with?	☐
11.	Are many alarms always on display or valid?	☐
12.	Are some alarms false alarms?	☐
13.	Although alarms can be reset, do they just keep coming back?	☐
14.	Do alarm messages disappear from screens before anyone has a chance to read them?	☐
15.	Is it hard for operators to decide which alarm to deal with first when many appear at once?	☐
16.	Are alarm lists mixed in with other information?	☐
17.	Is alarm overload a particular problem during start up or shut down (or other normal changes of process)?	☐
18.	Do alarms require frequent or difficult operator action that could have been automated?	☐
19.	Do operators prefer to work with graphical trends rather than relying on alarm lists for some parameters?	☐

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If the answer to any of the questions below is 'no', then you need to take action

20. Are alarm lists arranged in an obvious logical order? ☐
21. Can operators clearly distinguish a single alarm on the interface? ☐
22. Are different alarm priorities distinguished on screen e.g. by colour/sound? (see examples below) ☐

Poor: shows multiple alarms over very short space of time - Alarm flood condition - due to incorrectly set up alarm bands as the process value is going through its alarm bands multiple times in a short space of time.

This alarm will "mask" an audible alarm from another alarm event due to the flood overload.

...	Date	Time	Priori	Source	Event	Status	Area	Type
142	05/29/18	15:12:46	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
143	05/29/18	15:12:54	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
144	05/29/18	15:12:54	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
145	05/29/18	15:13:20	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
146	05/29/18	15:14:00	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
147	05/29/18	15:14:00	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
148	05/29/18	15:16:29	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
149	05/29/18	15:18:51	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
150	05/29/18	15:18:51	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
151	05/29/18	15:20:05	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
152	05/29/18	15:26:19	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
153	05/29/18	15:26:19	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
154	05/29/18	15:26:51	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
155	05/29/18	15:26:05	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
156	05/29/18	15:26:05	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
157	05/29/18	15:26:39	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
158	05/29/18	15:26:59	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
159	05/29/18	15:28:09	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
160	05/29/18	15:27:14	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
161	05/29/18	15:29:16	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
162	05/29/18	15:29:16	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
163	05/29/18	15:30:07	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
164	05/29/18	15:30:46	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
165	05/29/18	15:30:46	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
166	05/29/18	15:31:13	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
167	05/29/18	15:31:51	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
168	05/29/18	15:31:51	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
169	05/29/18	15:32:07	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
170	05/29/18	15:52:37	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
171	05/29/18	15:52:37	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
172	05/29/18	15:55:49	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
173	05/29/18	16:08:34	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low
174	05/29/18	16:08:34	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	C ASU1	Warning Low
175	05/29/18	16:06:54	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	G ASU1	Warning Low
176	05/29/18	15:57:07	4	FI-3320	GAN EX K103B in Low Alarm at	NM3-H	Ack-SyrASU1	Warning Low

Better: Alarms come through when a process problem occurs – no alarm flood conditions present when a plant trips.

You can see the vibration alarms when a high vibration event occurs is activated, prompting the operator to investigate.

...	Date	Time	Priori	Source	Event	Message Durat	Status	Info	Comm E
319	08-05-18	08:23:30.797	4	YSHH8026A	K601 O2 Compressor A Vibration High Alarm	28:30:36	QS		
320	08-05-18	08:23:34.703	4	PDAL6009_CL	Plant Alarm Supply Compressor A	40:05:50	QS		
321	08-05-18	10:09:40.462	8	SD1	PLANT SHUTDOWN BY OPERATOR INTERFACE	0:00:00	C		
322	08-05-18	10:09:40.508	4	MANUALSD	O2 COMPRESSOR SHUTDOWN	0:00:00	C		
323	08-05-18	10:09:41.508	8	SD3	REPRESSURISATION FAILURE TRIP	0:00:00	C		
324	08-05-18	10:09:51.522	4	UA1829	SD1 LOW PRESSURE INLET ABSORBER VESSELS	0:00:00	C		
325	08-05-18	10:09:51.522	4	fsll6051	O2 COMPRESSOR SHUTDOWN	2:41:04	QS		
326	08-05-18	12:50:45.795	8	SD3	VSA SHUTDOWN	2:41:11	QS		
327	08-05-18	12:50:51.982	8	SD1	PLANT SHUTDOWN BY OPERATOR INTERFACE	2:41:11	QS		
328	08-05-18	12:50:51.998	4	MANUALSD	REPRESSURISATION FAILURE TRIP	2:41:00	QS		
329	08-05-18	12:50:51.998	4	UA1829	SD1 LOW PRESSURE INLET ABSORBER VESSELS	2:41:00	QS		
330	08-05-18	12:50:51.998	4	fsll6051	BED B CALIBRATION PDT1836 ALARM	166:47:27	G		
331	08-05-18	12:50:59.904	4	BEDBCALALM	PLANT SHUTDOWN BY OPERATOR INTERFACE	2:49:48	G		
332	08-05-18	12:59:29.182	4	MANUALSD	VSA SHUTDOWN	2:49:37	G		
333	08-05-18	12:59:29.182	8	SD1	REPRESSURISATION FAILURE TRIP	2:49:37	G		
334	08-05-18	12:59:29.182	4	UA1829	SD1 LOW PRESSURE INLET ABSORBER VESSELS	3:09:20	G		
335	08-05-18	13:19:02.442	8	SD3	GOX COMP SUCTION PRESSURE LOW TRIP TIMER A:0:00:00	0:00:00	C		
337	08-05-18	13:19:20.458	4	PSLL6002	GOX COMP SUCTION PRESSURE LOW TRIP TIMER A:0:00:02	0:00:00	C		
338	08-05-18	13:19:22.458	4	PSLL6002	GOX COMP SUCTION PRESSURE LOW TRIP TIMER A:0:00:12	0:00:00	C		
339	08-05-18	13:19:32.692	4	PSLL6002	Vibration High Alarm	0:00:01	G		
340	09-05-18	00:30:20.266	4	YSHH8026A	Vibration High Alarm	6:23:41	QS		
341	09-05-18	00:30:21.266	4	YSHH8026A	Vibration High Alarm	0:00:00	C		
342	09-05-18	06:54:01.700	4	YSHH8026A	Vibration High Alarm	2:24:43	QS		
343	11-05-18	04:03:17.412	4	YSHH8026A	Vibration High Alarm	0:00:01	G		
344	11-05-18	04:03:18.412	4	YSHH8026A	Vibration High Alarm	0:00:00	C		
345	11-05-18	06:28:00.851	4	YSHH8026A	Vibration High Alarm	0:00:01	G		
346	12-05-18	02:21:35.096	4	YSHH8026A	Vibration High Alarm	0:00:00	C		
347	12-05-18	02:21:36.096	4	YSHH8026A	Vibration High Alarm	0:00:01	G		
348	12-05-18	15:52:01.951	4	PDSHH1841	BED B ENTIRE BED DP HIGH TRIP	0:00:00	C		
349	12-05-18	15:52:01.951	8	SD1	O2 COMPRESSOR SHUTDOWN	0:00:00	C		
350	12-05-18	15:52:01.951	8	SD3	HIGH K111 DP AT BEGINNING OF FEED STEP4	0:00:00	C		
351	12-05-18	15:52:02.044	4	hidp_strt_feed_b	SD1 LOW PRESSURE INLET ABSORBER VESSELS	0:00:00	C		
352	12-05-18	15:52:02.044	4	fsll6051	PLANT SHUTDOWN BY OPERATOR INTERFACE	0:00:00	C		
353	12-05-18	15:53:58.091	4	MANUAL SD					

23. Do operators find alarm prioritisation appropriate? (safety-critical, high, medium and low priority) ☐
24. Are safety-critical alarms clearly distinguished and separately displayed? ☐

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