CRTsoft

iEM System 培训
（四）健康状态监测

2018/10

系统的基本功能

CRTsoft

- 对机组的关键参数进行统一建模；
- 对机组的运行工况做实时在线评估（一根线）；
- 对机组的潜在故障给出早期预警；
- 对预警发生时的关联测点做在线分析。

iEM系统的故障早期预警功能是实现设备的全面状态检修的基础，通过对早期预警信息的分析，制定或调整维修计划，可以实现设备维修过程的不断优化。

培训说明

CRTsoft

- 针对iEM系统操作人员，内容包含使用iEM系统的主要常用操作；
- 以常见任务的方式说明如何使用iEM系统的各项功能；
- 对于每一个画面中的各个按钮的细节功能、显示字段的详细含义等，请查阅iEM客户端用户手册，其中对系统的各项功能有详尽的解释。

- 一：设备状态浏览；
- 二：预警确认和处理；
- 三：快速处理个人设备；
- 四：测点趋势分析；
- 五：自动报表及网页报表；
- 六：规则、知识、记录；
- 七：案例分析

一：设备状态浏览

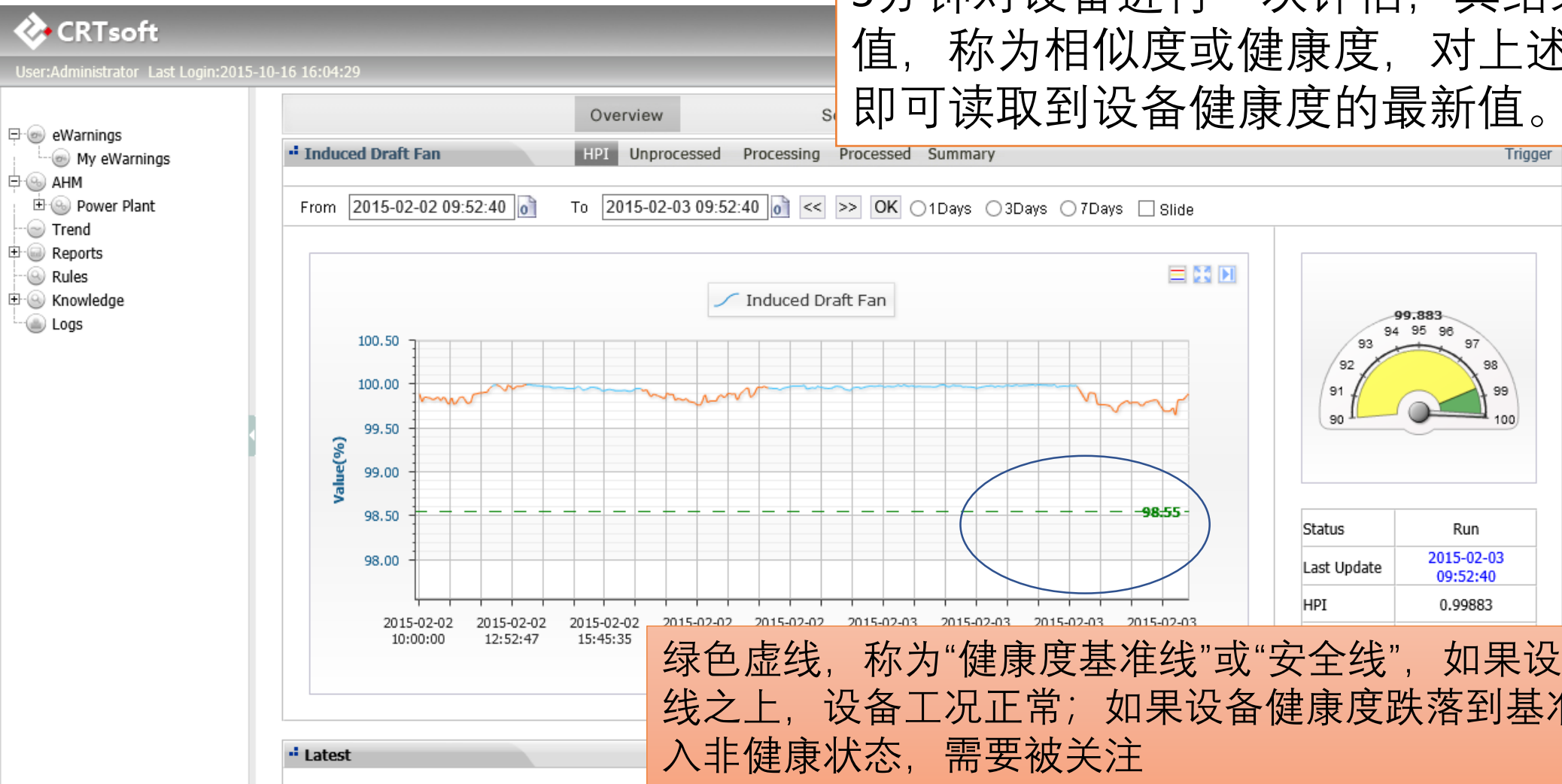
用户正常登录之后，默认打开的是系统的模型总览页面，在这个页面上，可以看到整个系统中各个设备的运行情况，是系统工况总览。

- 白色表示设备为停机状态，
- 绿色表示设备工况良好，
- 黄色表示有预警或异动。

点击设备方块，或从左边栏设备状态中选择相应的设备，即可打开单个设备的浏览页面：

一：设备状态浏览

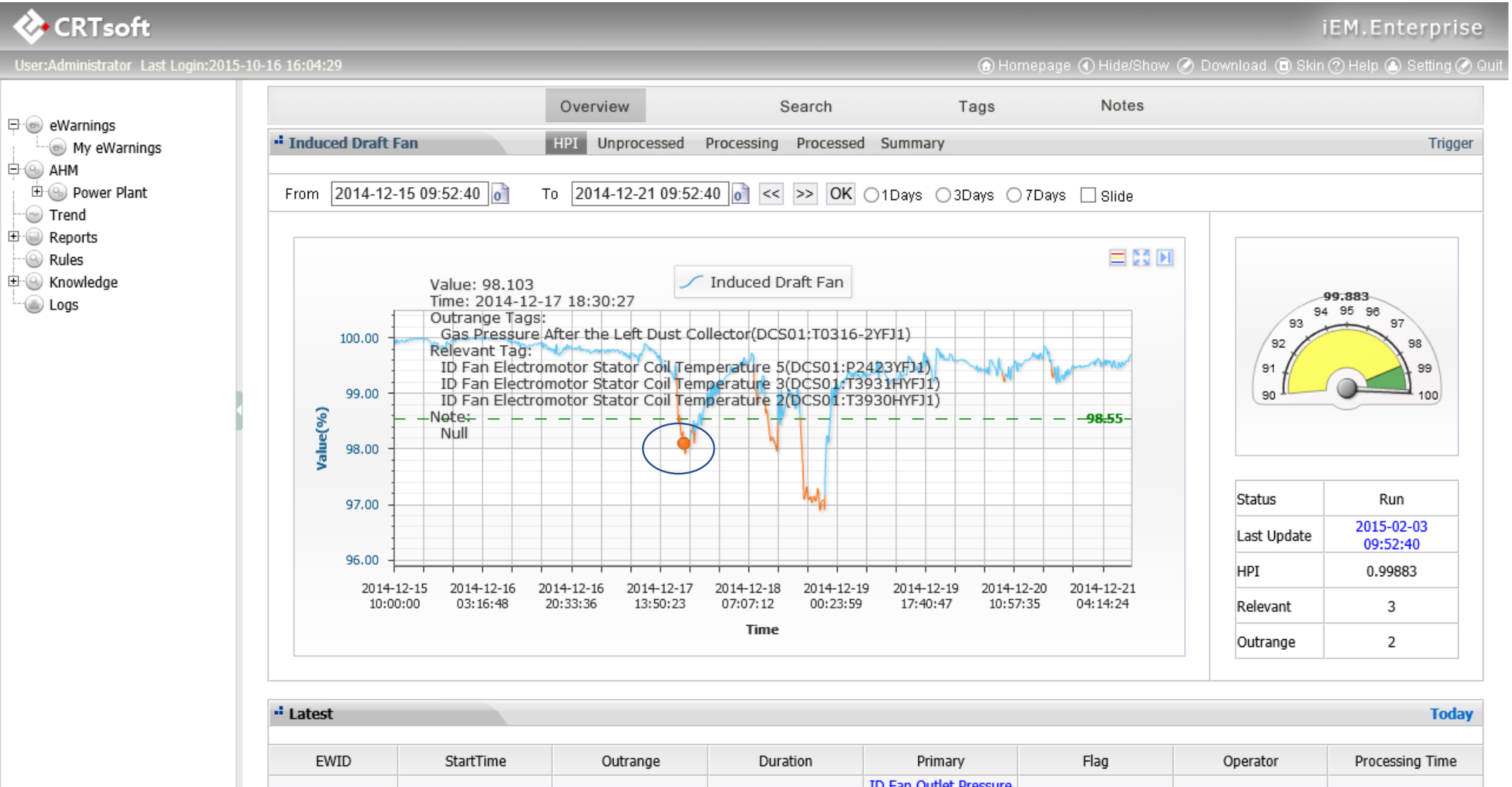
iEM系统是以“一条健康度曲线”的方式来实现对系统进行状态监测和评估的。在设备页面中，可以看到这条“健康度曲线”，也称为“相似度曲线”。这条曲线表示的是设备的实时运行状态，iEM系统每隔5分钟对设备进行一次评估，其结果为0-100%的数值，称为相似度或健康度，对上述画面刷新之后，即可读取到设备健康度的最新值。



绿色虚线，称为“健康度基准线”或“安全线”，如果设备的健康度在这条线之上，设备工况正常；如果设备健康度跌落到基准线之下，则系统进入非健康状态，需要被关注

一：设备状态浏览

在健康度曲线的每一个测点上，都可以读取关键的影响因素。如图，鼠标在曲线上停留，即可看到状态提示：



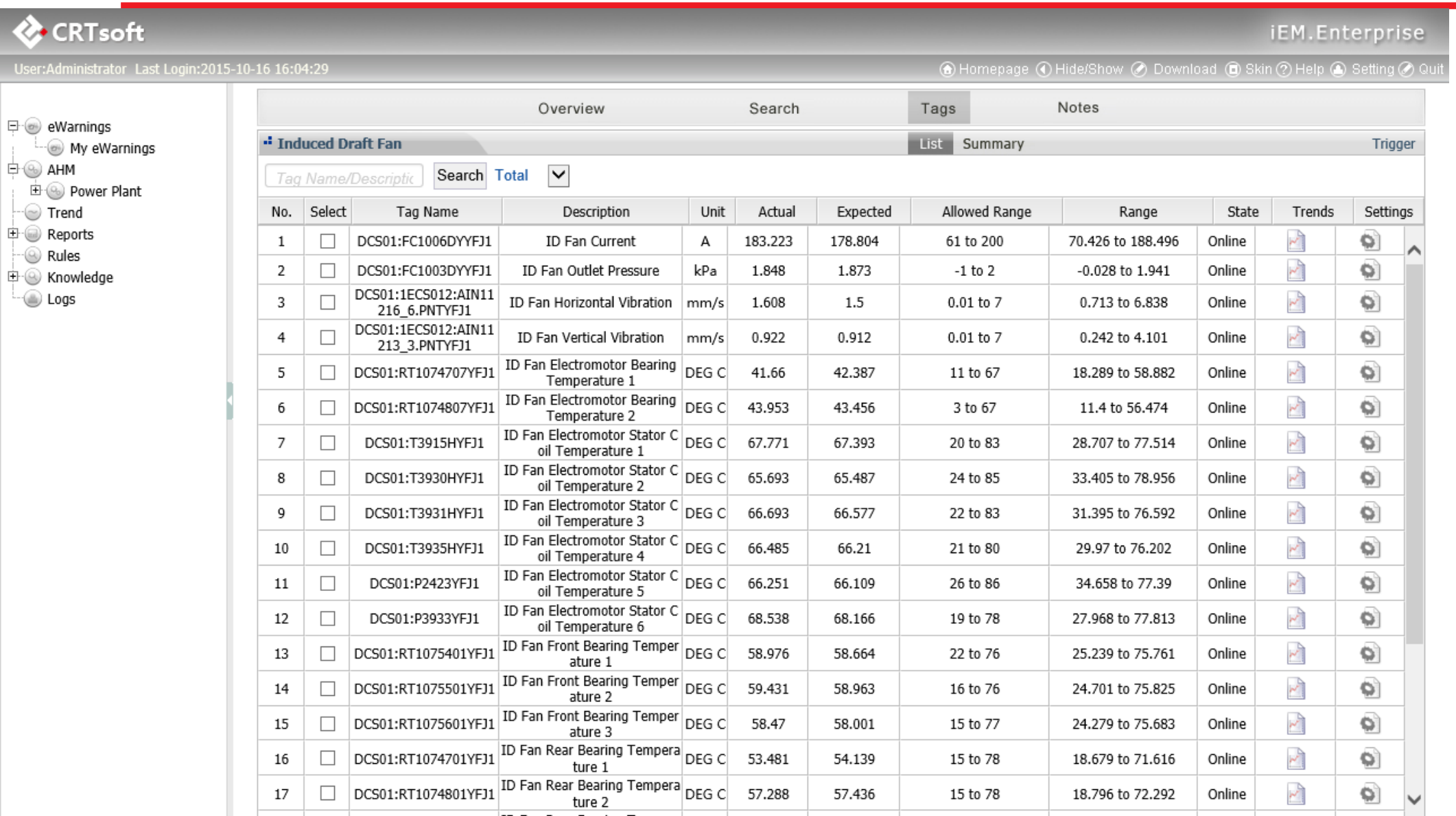
一：设备状态浏览

在健康度曲线的每一个测点上，都可以读取关键的影响因素。如图，鼠标在曲线上停留，即可看到状态提示：

如果健康度发生跌落，也可以在下面的预警信息表中读取到更多信息

一：设备状态浏览

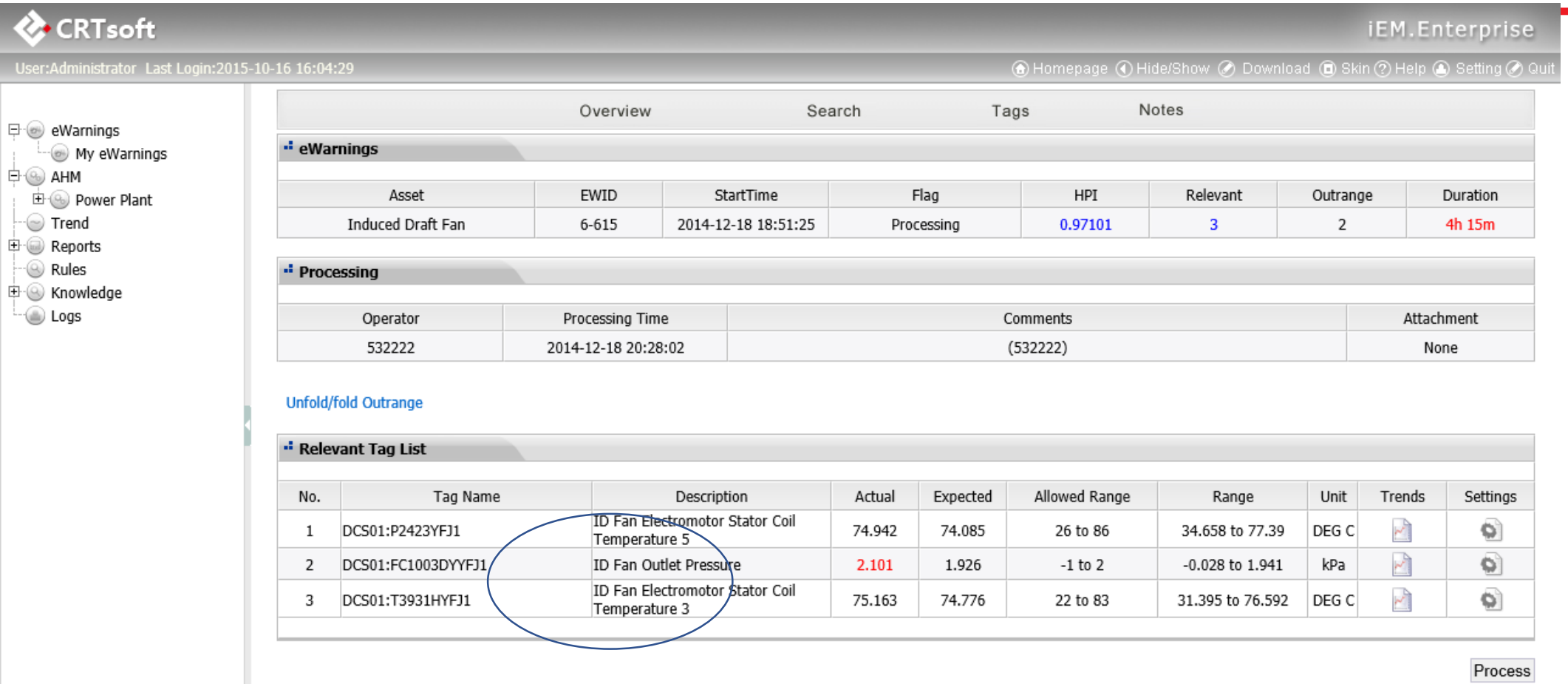
点击“测点信息”，则可以看到系统中所有测点的设置状态，并且在此处可对测点的限值做调整。



No.	Select	Tag Name	Description	Unit	Actual	Expected	Allowed Range	Range	State	Trends	Settings
1	☐	DCS01:FC1006DYYFJ1	ID Fan Current	A	183.223	178.804	61 to 200	70.426 to 188.496	Online		
2	☐	DCS01:FC1003DYYFJ1	ID Fan Outlet Pressure	kPa	1.848	1.873	-1 to 2	-0.028 to 1.941	Online		
3	☐	DCS01:1ECS012:AIN11216_6.PNTYFJ1	ID Fan Horizontal Vibration	mm/s	1.608	1.5	0.01 to 7	0.713 to 6.838	Online		
4	☐	DCS01:1ECS012:AIN11213_3.PNTYFJ1	ID Fan Vertical Vibration	mm/s	0.922	0.912	0.01 to 7	0.242 to 4.101	Online		
5	☐	DCS01:RT1074707YFJ1	ID Fan Electromotor Bearing Temperature 1	DEG C	41.66	42.387	11 to 67	18.289 to 58.882	Online		
6	☐	DCS01:RT1074807YFJ1	ID Fan Electromotor Bearing Temperature 2	DEG C	43.953	43.456	3 to 67	11.4 to 56.474	Online		
7	☐	DCS01:T3915HYFJ1	ID Fan Electromotor Stator Coil Temperature 1	DEG C	67.771	67.393	20 to 83	28.707 to 77.514	Online		
8	☐	DCS01:T3930HYFJ1	ID Fan Electromotor Stator Coil Temperature 2	DEG C	65.693	65.487	24 to 85	33.405 to 78.956	Online		
9	☐	DCS01:T3931HYFJ1	ID Fan Electromotor Stator Coil Temperature 3	DEG C	66.693	66.577	22 to 83	31.395 to 76.592	Online		
10	☐	DCS01:T3935HYFJ1	ID Fan Electromotor Stator Coil Temperature 4	DEG C	66.485	66.21	21 to 80	29.97 to 76.202	Online		
11	☐	DCS01:P2423YFJ1	ID Fan Electromotor Stator Coil Temperature 5	DEG C	66.251	66.109	26 to 86	34.658 to 77.39	Online		
12	☐	DCS01:P3933YFJ1	ID Fan Electromotor Stator Coil Temperature 6	DEG C	68.538	68.166	19 to 78	27.968 to 77.813	Online		
13	☐	DCS01:RT1075401YFJ1	ID Fan Front Bearing Temperature 1	DEG C	58.976	58.664	22 to 76	25.239 to 75.761	Online		
14	☐	DCS01:RT1075501YFJ1	ID Fan Front Bearing Temperature 2	DEG C	59.431	58.963	16 to 76	24.701 to 75.825	Online		
15	☐	DCS01:RT1075601YFJ1	ID Fan Front Bearing Temperature 3	DEG C	58.47	58.001	15 to 77	24.279 to 75.683	Online		
16	☐	DCS01:RT1074701YFJ1	ID Fan Rear Bearing Temperature 1	DEG C	53.481	54.139	15 to 78	18.679 to 71.616	Online		
17	☐	DCS01:RT1074801YFJ1	ID Fan Rear Bearing Temperature 2	DEG C	57.288	57.436	15 to 78	18.796 to 72.292	Online		

二：预警确认和处理

点击预警编号，即可进入预警细节浏览，对每一项设备预警，iEM系统默认提供三个最主要的关联点（如下图）：



点击关联测点行的趋势图标，可以打开一个单独的窗口，以观察相应的变量趋势：

二：预警确认和处理

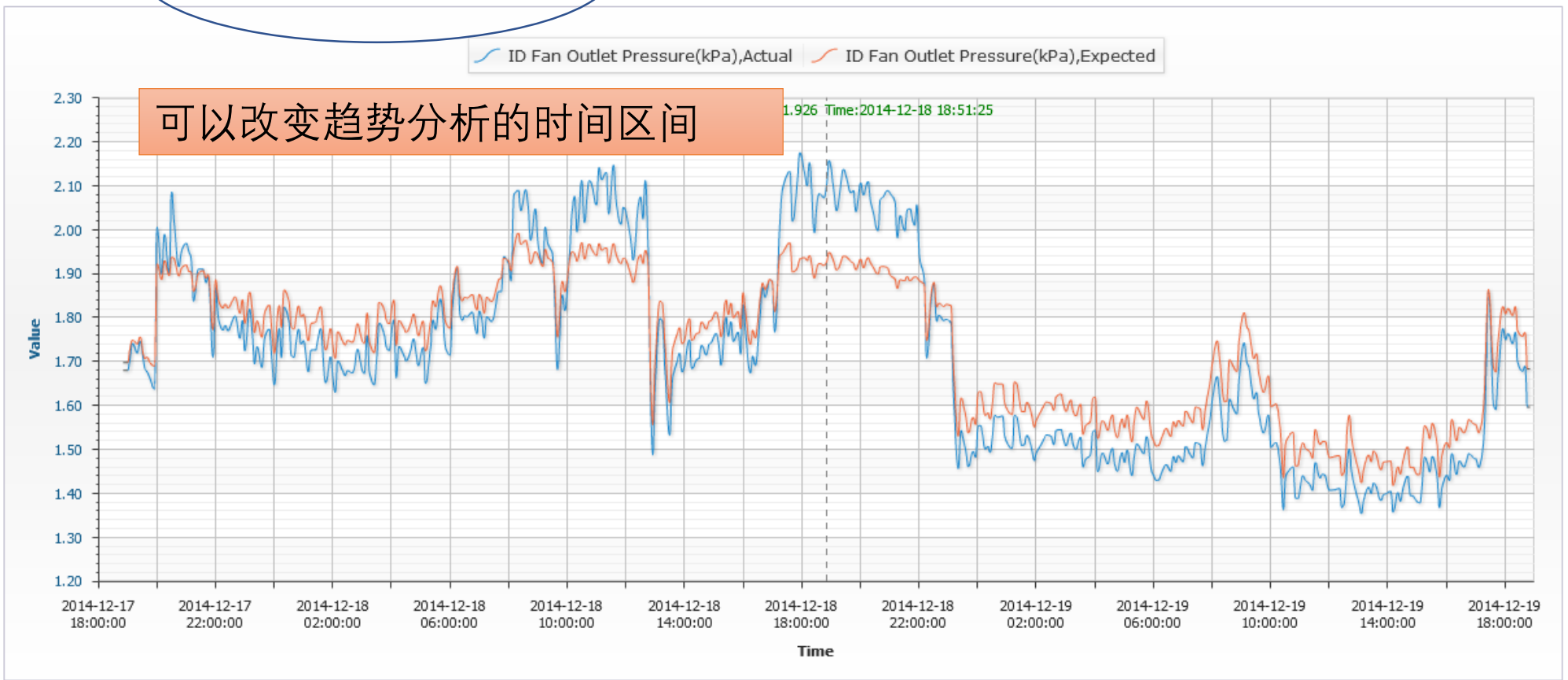
点击关联测点行的趋势图标，可以打开一个单独的窗口，以观察相应的变量趋势：

Actual&Expected | Actual | Expected | Residual | TRR

Tag Name	Description	Unit	Allowed Range	Range	State
DCS01:FC1003DYYFJ1	ID Fan Outlet Pressure	kPa	-1 to 2	-0.028 to 1.941	Online

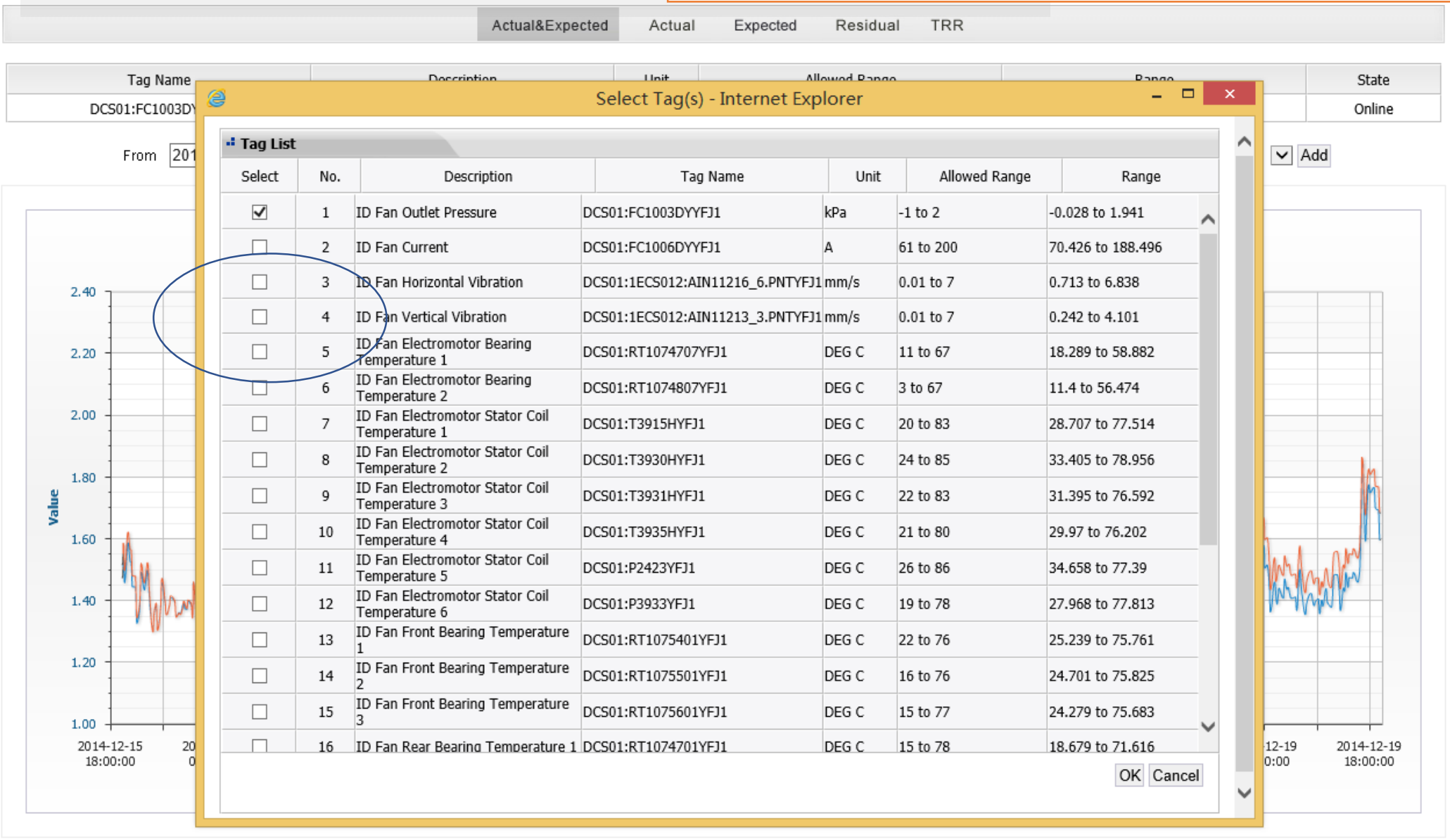
From 2014-12-17 18:51:25 To 2014-12-19 18:51:25 << >> OK Export 1Days 3Days 7Days Slide --Second axis-- Add

可以改变趋势分析的时间区间



二：预警确认和处理

为了方便测点分析，在这个窗口中，也可以选择添加更多变量作趋势对比：



Select	No.	Description	Tag Name	Unit	Allowed Range	Range
☑	1	ID Fan Outlet Pressure	DCS01:FC1003DYYFJ1	kPa	-1 to 2	-0.028 to 1.941
☐	2	ID Fan Current	DCS01:FC1006DYYFJ1	A	61 to 200	70.426 to 188.496
☐	3	ID Fan Horizontal Vibration	DCS01:1ECS012:AIN11216_6.PNTYFJ1	mm/s	0.01 to 7	0.713 to 6.838
☐	4	ID Fan Vertical Vibration	DCS01:1ECS012:AIN11213_3.PNTYFJ1	mm/s	0.01 to 7	0.242 to 4.101
☐	5	ID Fan Electromotor Bearing Temperature 1	DCS01:RT1074707YFJ1	DEG C	11 to 67	18.289 to 58.882
☐	6	ID Fan Electromotor Bearing Temperature 2	DCS01:RT1074807YFJ1	DEG C	3 to 67	11.4 to 56.474
☐	7	ID Fan Electromotor Stator Coil Temperature 1	DCS01:T3915HYFJ1	DEG C	20 to 83	28.707 to 77.514
☐	8	ID Fan Electromotor Stator Coil Temperature 2	DCS01:T3930HYFJ1	DEG C	24 to 85	33.405 to 78.956
☐	9	ID Fan Electromotor Stator Coil Temperature 3	DCS01:T3931HYFJ1	DEG C	22 to 83	31.395 to 76.592
☐	10	ID Fan Electromotor Stator Coil Temperature 4	DCS01:T3935HYFJ1	DEG C	21 to 80	29.97 to 76.202
☐	11	ID Fan Electromotor Stator Coil Temperature 5	DCS01:P2423YFJ1	DEG C	26 to 86	34.658 to 77.39
☐	12	ID Fan Electromotor Stator Coil Temperature 6	DCS01:P3933YFJ1	DEG C	19 to 78	27.968 to 77.813
☐	13	ID Fan Front Bearing Temperature 1	DCS01:RT1075401YFJ1	DEG C	22 to 76	25.239 to 75.761
☐	14	ID Fan Front Bearing Temperature 2	DCS01:RT1075501YFJ1	DEG C	16 to 76	24.701 to 75.825
☐	15	ID Fan Front Bearing Temperature 3	DCS01:RT1075601YFJ1	DEG C	15 to 77	24.279 to 75.683
☐	16	ID Fan Rear Bearing Temperature 1	DCS01:RT1074701YFJ1	DEG C	15 to 78	18.679 to 71.616

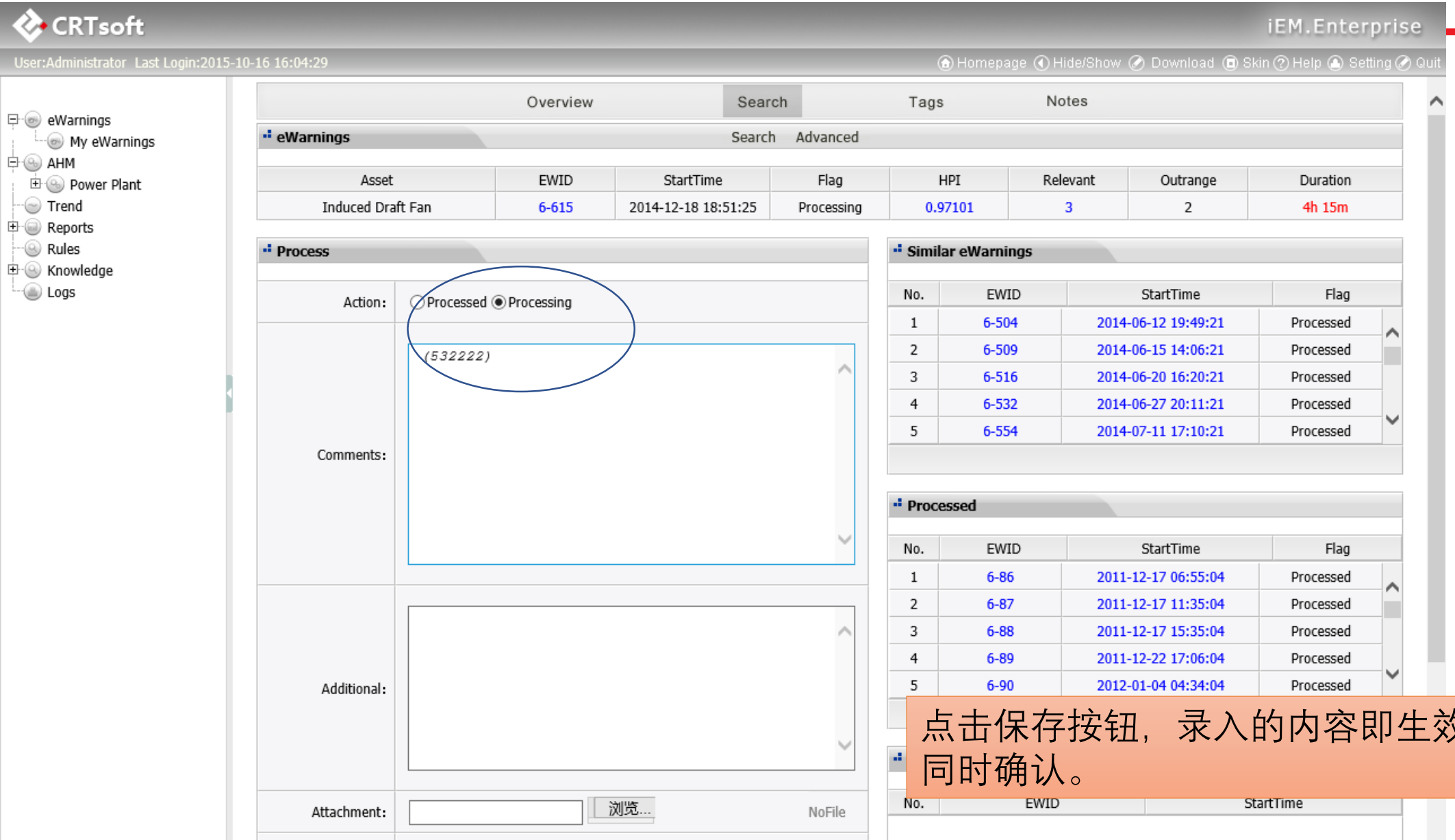
二：预警确认和处理

iEM系统以早期预警的形式将系统的异常变化通知给操作人员，因此在看到预警信息是，操作人员应及时浏览系统的细节，根据系统的情况做出判断以及处理计划。同时，也应该同时在系统中确认预警并做预警处理记录。
通过“My eWarnings”打开预警列表之后，在预警关联点页面设置有“预警处理（Process）”按钮：

点击 “预警处理”按钮，即可进入预警处理表单页

二：预警确认和处理

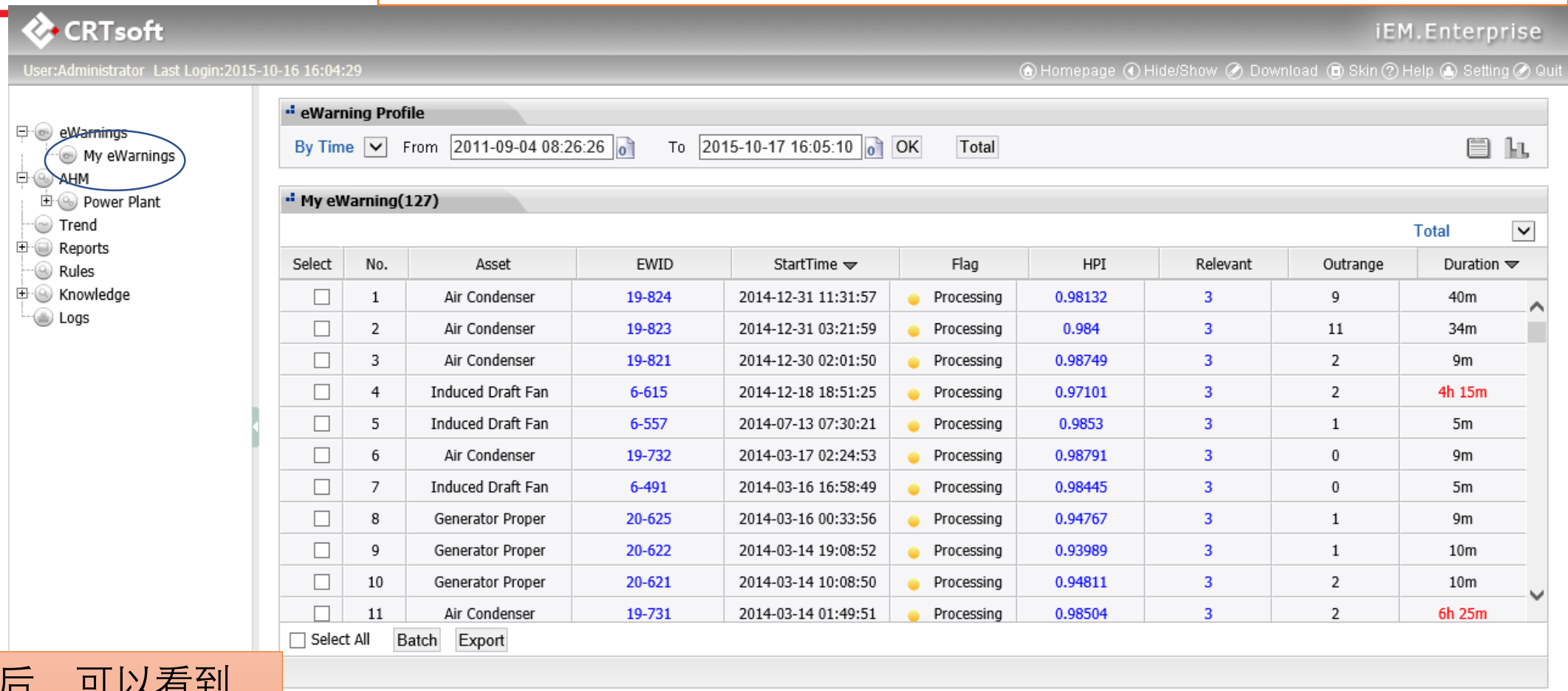
操作人员可以将对本项预警的基本情况做判断，并将意见录入本表单中：



点击保存按钮，录入的内容即生效，本项预警也被同时确认。

三：快速处理个人设备

iEM系统可以对设备进行多项分析功能，为了简化用户的操作，在左边功能栏功能树中设置了“My eWarnings”功能项，操作人员应以“My eWarnings”为操作的入口：

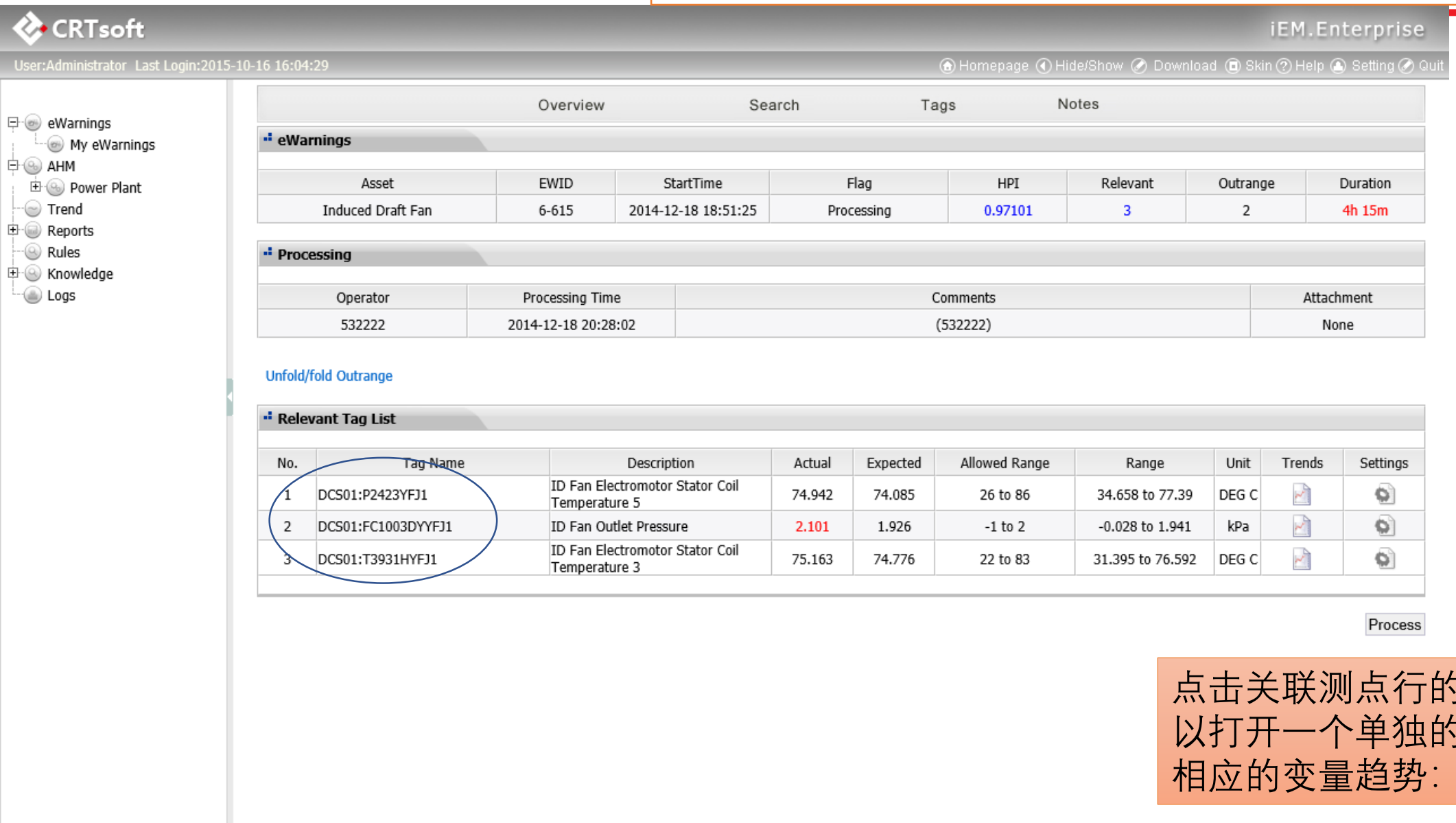


Select	No.	Asset	EWID	StartTime	Flag	HPI	Relevant	Outrange	Duration
☐	1	Air Condenser	19-824	2014-12-31 11:31:57	Processing	0.98132	3	9	40m
☐	2	Air Condenser	19-823	2014-12-31 03:21:59	Processing	0.984	3	11	34m
☐	3	Air Condenser	19-821	2014-12-30 02:01:50	Processing	0.98749	3	2	9m
☐	4	Induced Draft Fan	6-615	2014-12-18 18:51:25	Processing	0.97101	3	2	4h 15m
☐	5	Induced Draft Fan	6-557	2014-07-13 07:30:21	Processing	0.9853	3	1	5m
☐	6	Air Condenser	19-732	2014-03-17 02:24:53	Processing	0.98791	3	0	9m
☐	7	Induced Draft Fan	6-491	2014-03-16 16:58:49	Processing	0.98445	3	0	5m
☐	8	Generator Proper	20-625	2014-03-16 00:33:56	Processing	0.94767	3	1	9m
☐	9	Generator Proper	20-622	2014-03-14 19:08:52	Processing	0.93989	3	1	10m
☐	10	Generator Proper	20-621	2014-03-14 10:08:50	Processing	0.94811	3	2	10m
☐	11	Air Condenser	19-731	2014-03-14 01:49:51	Processing	0.98504	3	2	6h 25m

点击“我的任务”之后，可以看到系统当前的关键警告，是需要用户关注的内容。

三：快速处理个人设备

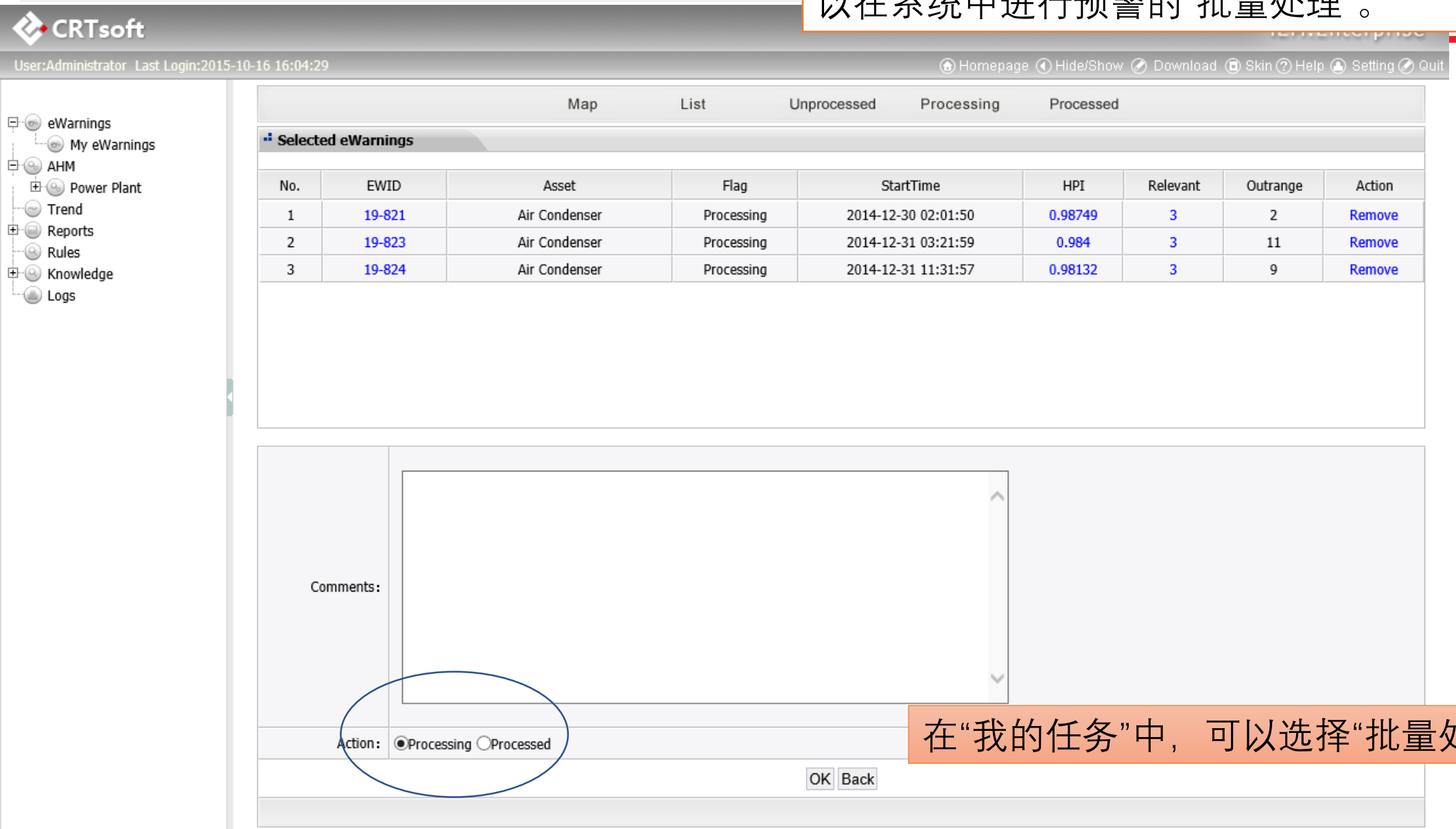
在“My eWarnings”中列出的是所有设备的异动或预警信息。点击预警编号，即可进入预警细节浏览，对每一项设备预警，iEM系统默认提供三个最主要的关联点（如下图）：



点击关联测点行的趋势图标，可以打开一个单独的窗口，以观察相应的变量趋势：

三：快速处理个人设备

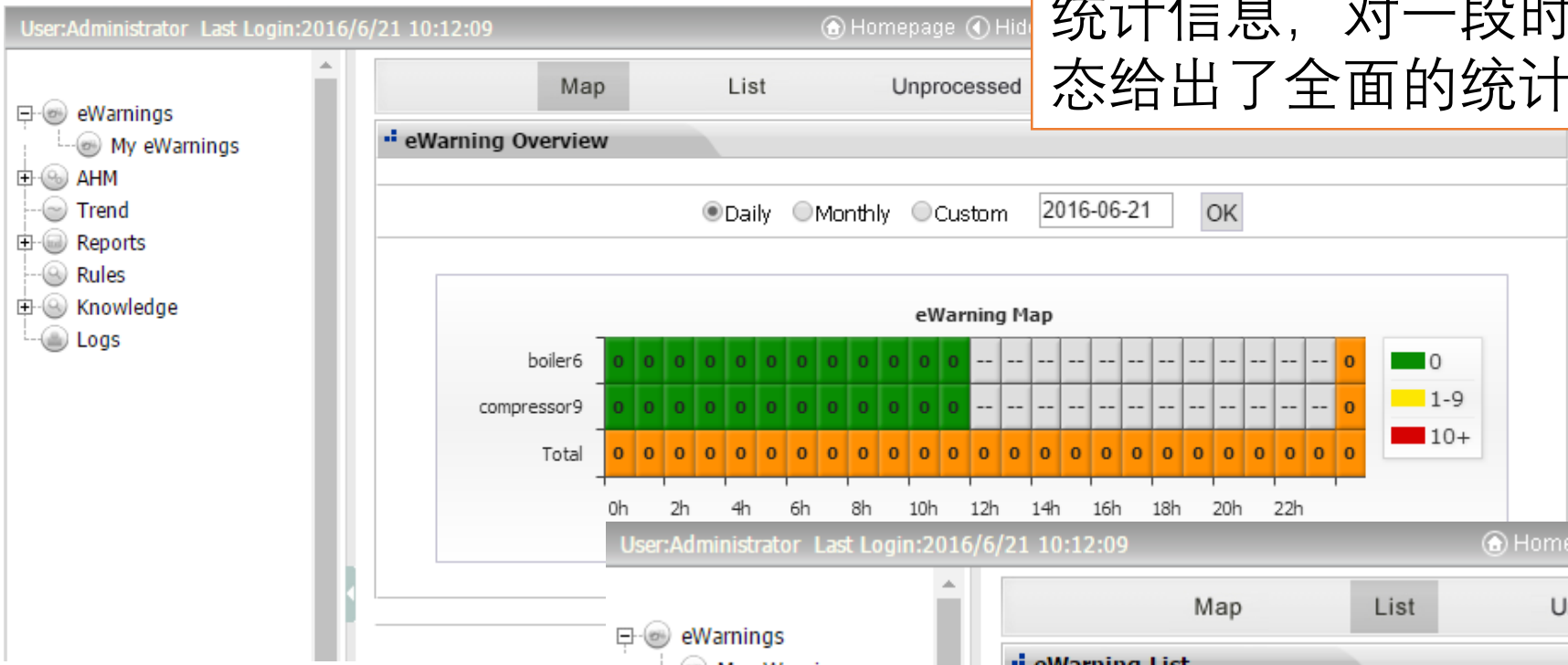
如果在系统的试运行期间，或当设备的开停机期间，系统报出的预警信息比较多，操作人员明确理解其原因，则可以在系统中进行预警的“批量处理”。

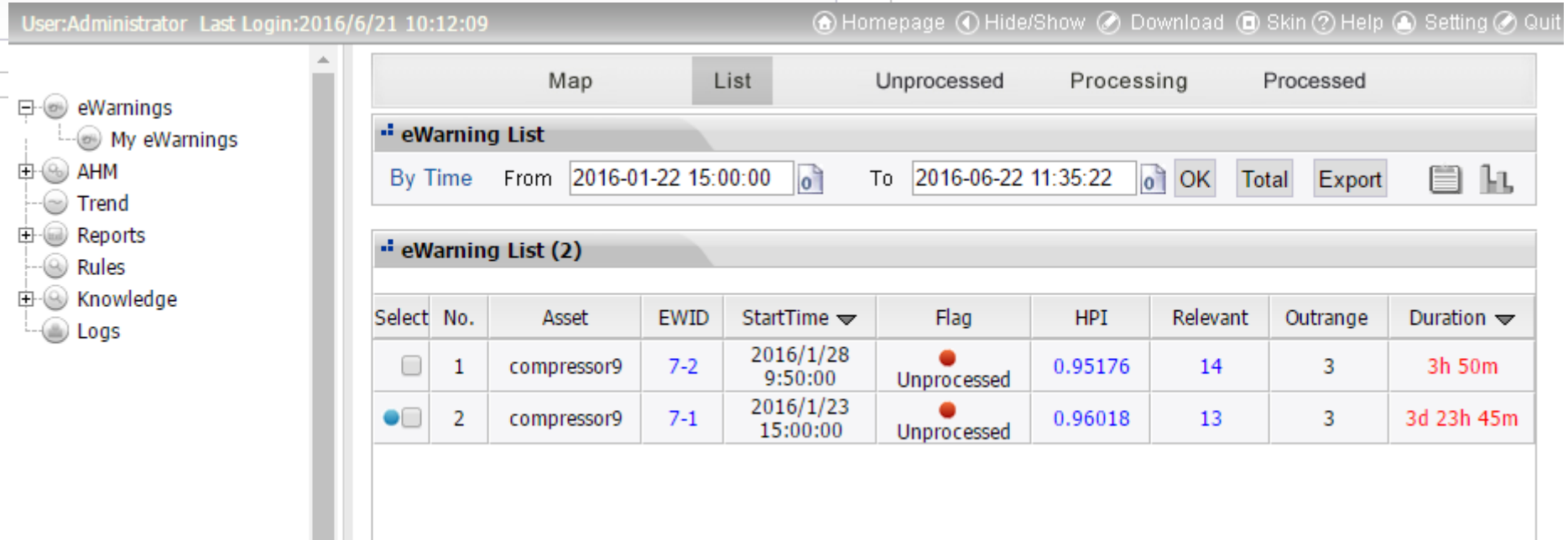


在“我的任务”中，可以选择“批量处理”按钮

三：快速处理个人设备

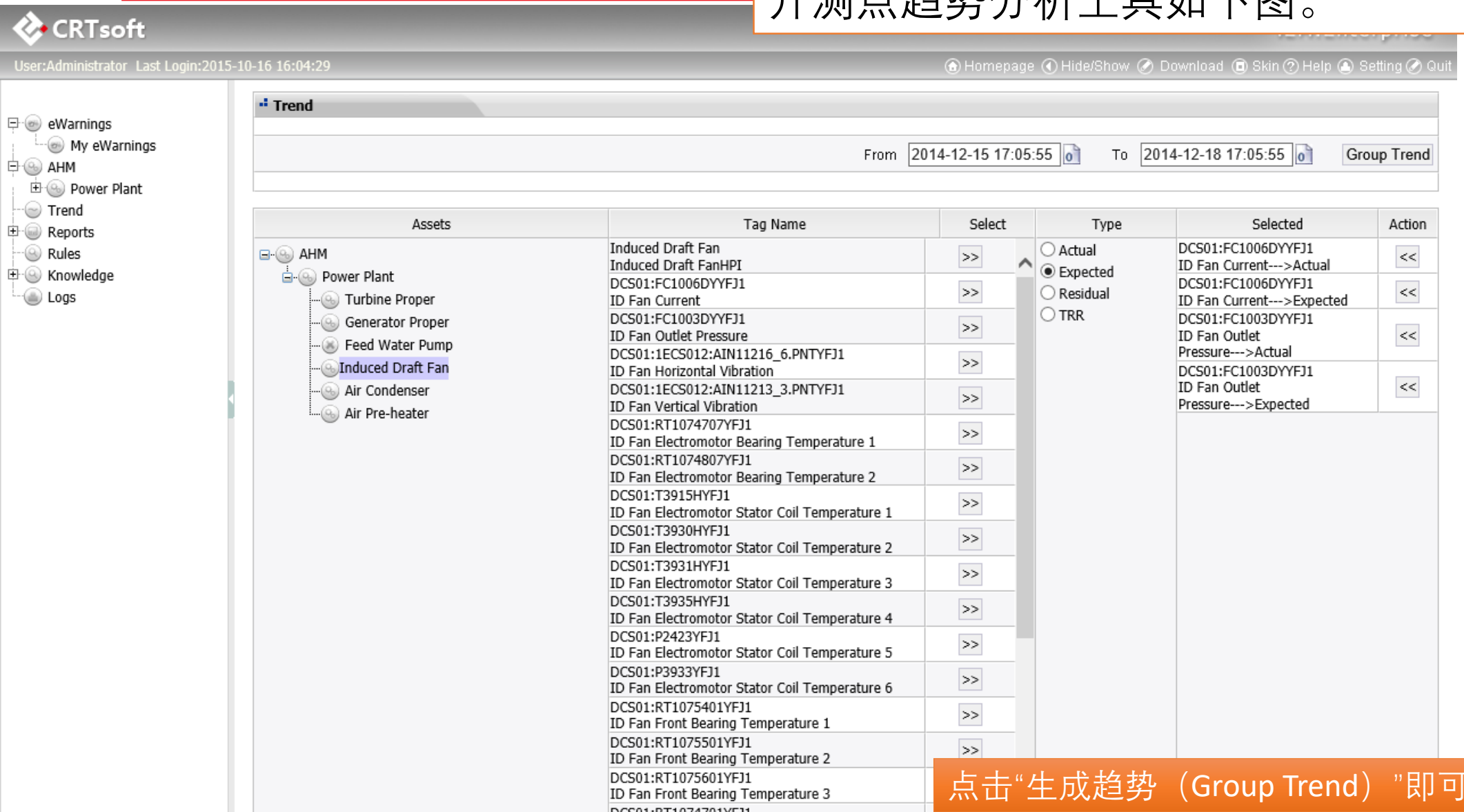
在设备状态页的上端，选择“预警信息（eWarnings）”→“Map”or“List”即可看到如下的统计信息，对一段时间以内的设备异动和预警状态给出了全面的统计信息





四：测点趋势分析

iEM系统提供了测点趋势分析工具，以方便操作人员对系统的细节分析，通过左边栏的“Trend”即可打开测点趋势分析工具如下图。



点击“生成趋势（Group Trend）”即可弹出趋势窗口，

四：测点趋势分析

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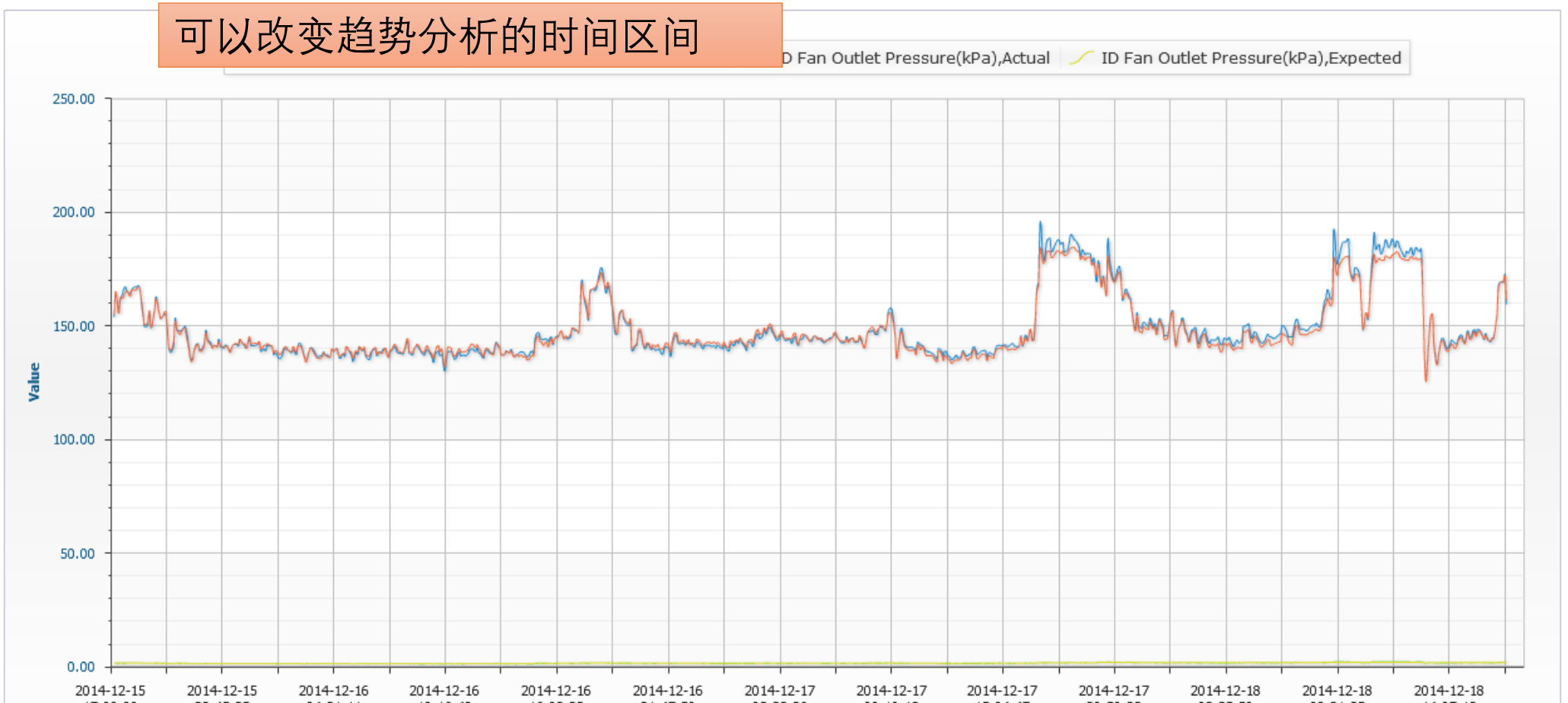
From 2014-12-15 17:05:5 To 2014-12-18 17:05:5 << >> OK Export 1Days 3Days 7Days Slide Second axis

Asset	Description	Tag Name	Allowed Range	Range	State
Induced Draft Fan	ID Fan Current	DCS01:FC1006DYYFJ1	61 to 200	70.42578 to 188.49609	Online
Induced Draft Fan	ID Fan Outlet Pressure	DCS01:FC1003DYYFJ1	-1 to 2	-0.0285 to 1.94121	Online

可以改变趋势分析的时间区间



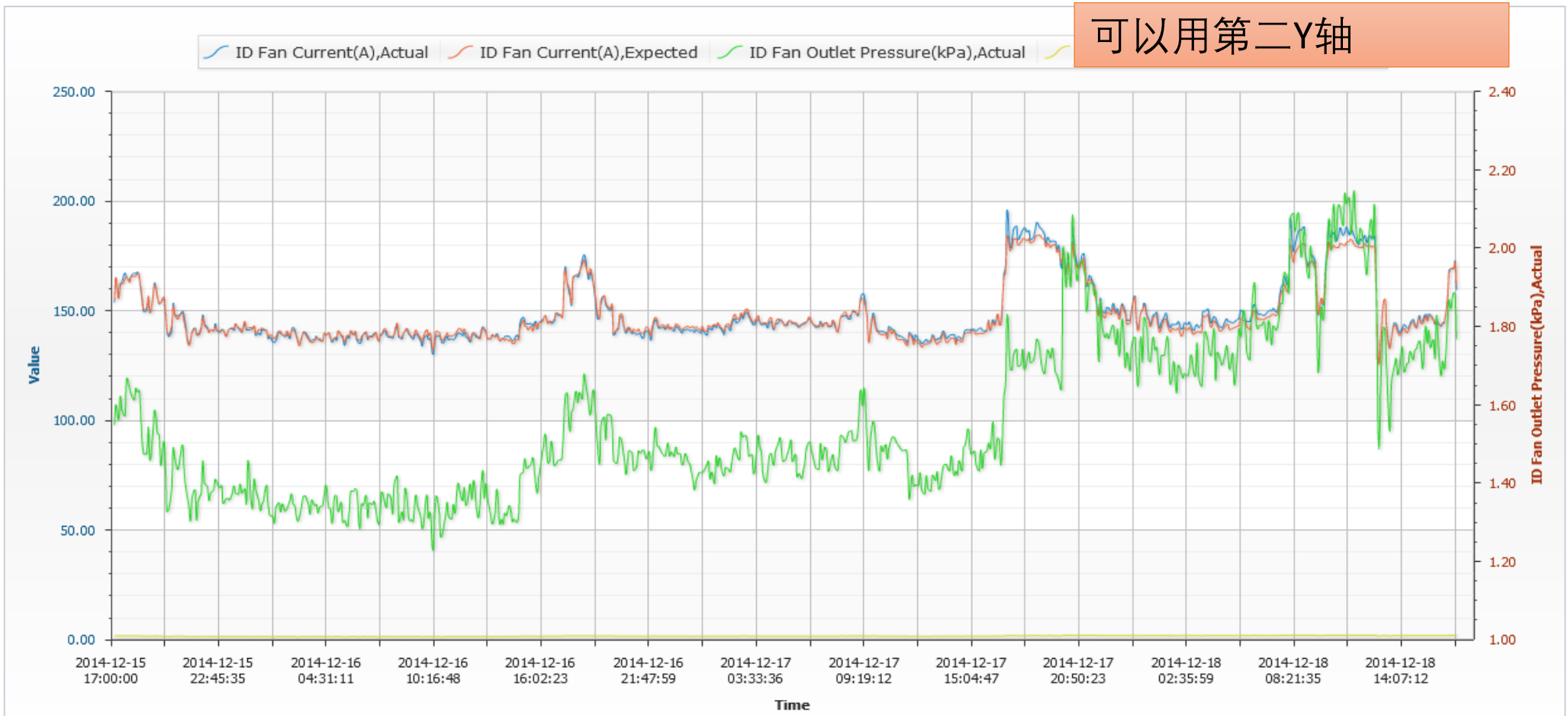
四：测点趋势分析

CRTsoft

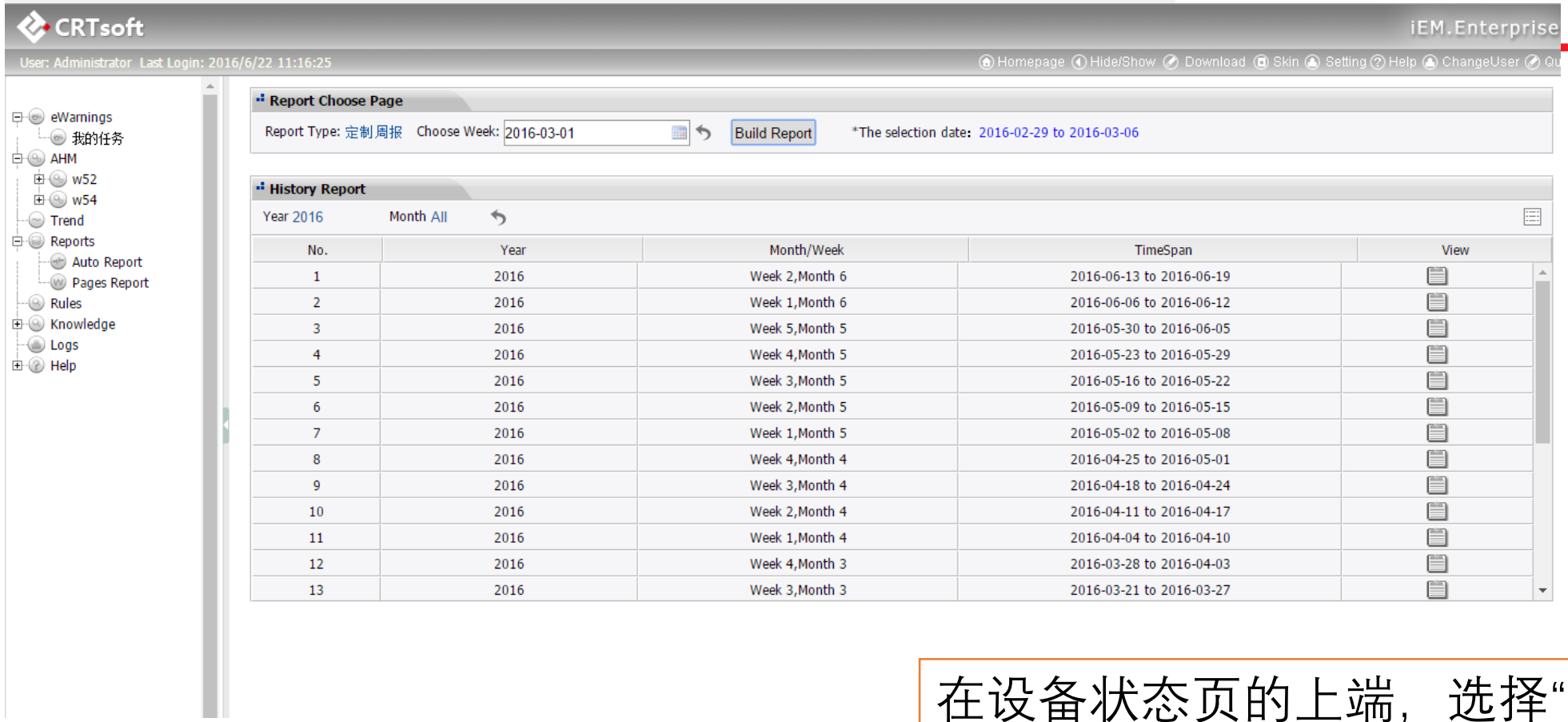
From 2014-12-15 17:05:5 To 2014-12-18 17:05:5 << >> OK Export 1Days 3Days 7Days Slide ID Fan Outlet Pressure(kPa),Actual

Asset	Description	Tag Name	Allowed Range	Range	State
Induced Draft Fan	ID Fan Current	DCS01:FC1006DYYFJ1	61 to 200	70.42578 to 188.49609	Online
Induced Draft Fan	ID Fan Outlet Pressure	DCS01:FC1003DYYFJ1	-1 to 2	-0.0285 to 1.94121	Online

可以用第二Y轴



五：网页报表



No.	Year	Month/Week	TimeSpan	View
1	2016	Week 2,Month 6	2016-06-13 to 2016-06-19	
2	2016	Week 1,Month 6	2016-06-06 to 2016-06-12	
3	2016	Week 5,Month 5	2016-05-30 to 2016-06-05	
4	2016	Week 4,Month 5	2016-05-23 to 2016-05-29	
5	2016	Week 3,Month 5	2016-05-16 to 2016-05-22	
6	2016	Week 2,Month 5	2016-05-09 to 2016-05-15	
7	2016	Week 1,Month 5	2016-05-02 to 2016-05-08	
8	2016	Week 4,Month 4	2016-04-25 to 2016-05-01	
9	2016	Week 3,Month 4	2016-04-18 to 2016-04-24	
10	2016	Week 2,Month 4	2016-04-11 to 2016-04-17	
11	2016	Week 1,Month 4	2016-04-04 to 2016-04-10	
12	2016	Week 4,Month 3	2016-03-28 to 2016-04-03	
13	2016	Week 3,Month 3	2016-03-21 to 2016-03-27	

在设备状态页的上端，选择“Reports”→“Pages Report”即可看到iEM系统网页报表，此报表需用户指定日期后手动生成，内容为选定时间内的各项统计信息，此报表如需文本格式需要打印网页。

五：网页报表

在设备状态页的上端，选择“Reports”→“Pages Report”即可看到iEM系统网页报表，此报表需用户指定日期后手动生成，内容为选定时间内的各项统计信息，此报表如需文本格式需要打印网页。

示例：Secco_Pages Report.pdf

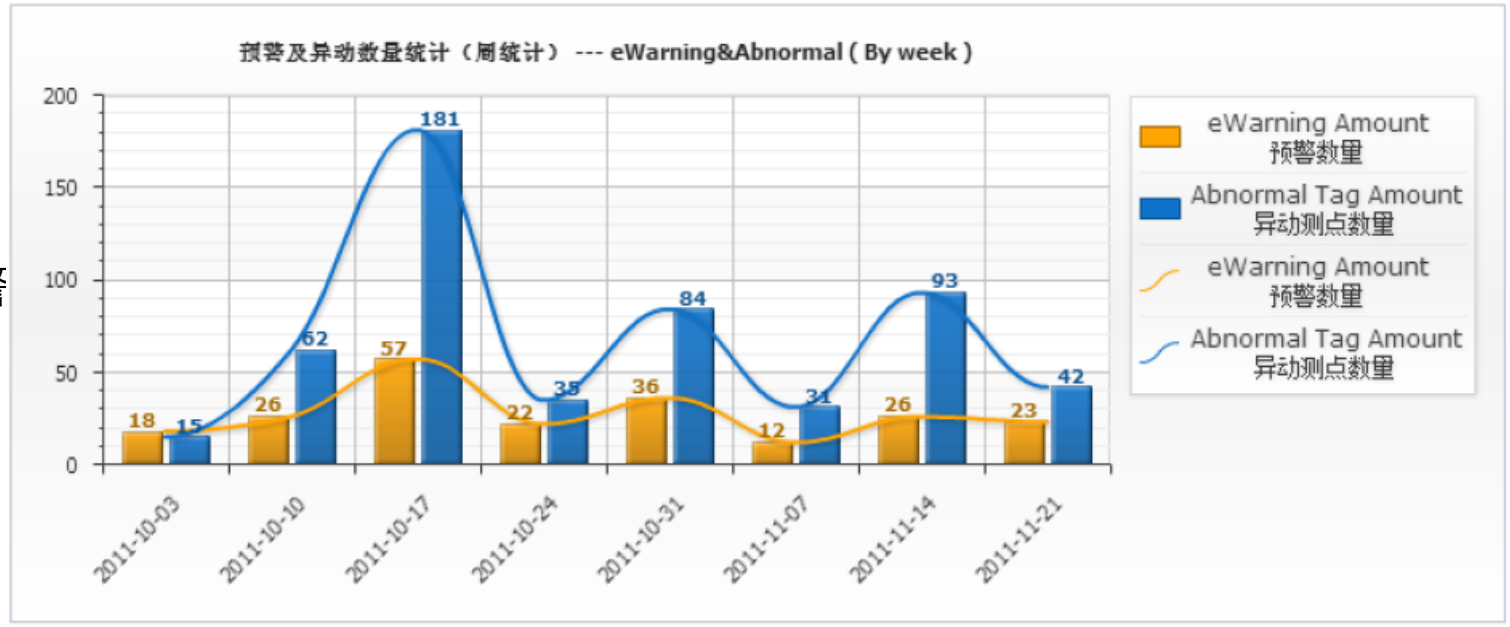
五：网页报表

CRTsoft

示例：Secco_Pages Report.pdf

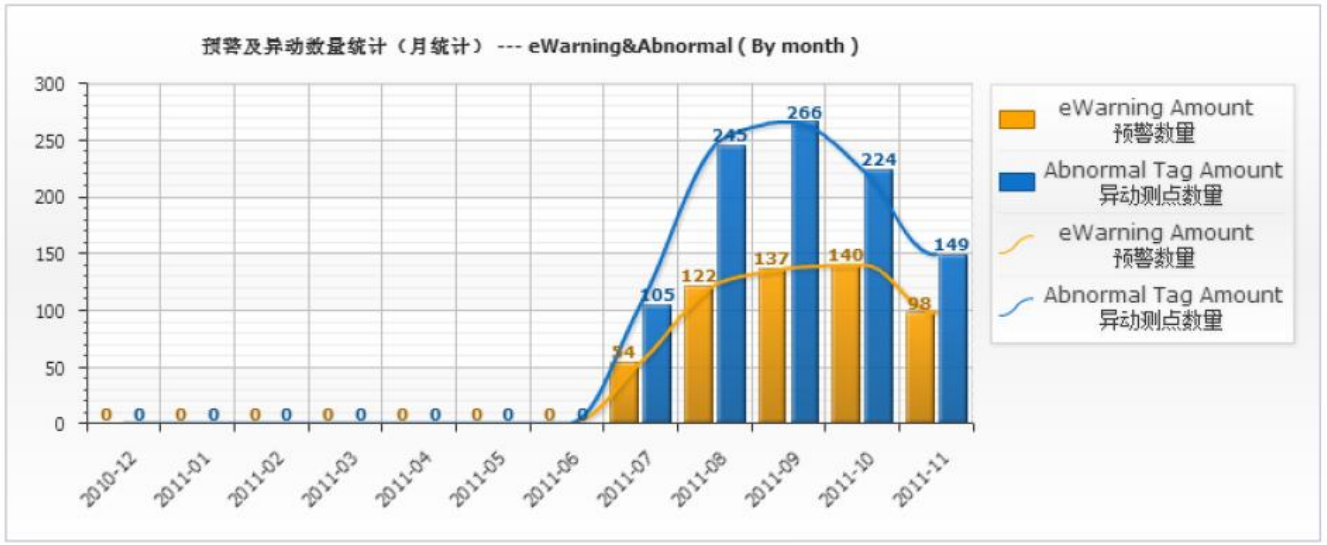
设备状态概览：生成报表时刻iEM系统基本信息

预警及异动数量统计：报表当周的预警及异动数量与前七周数量对比及趋势



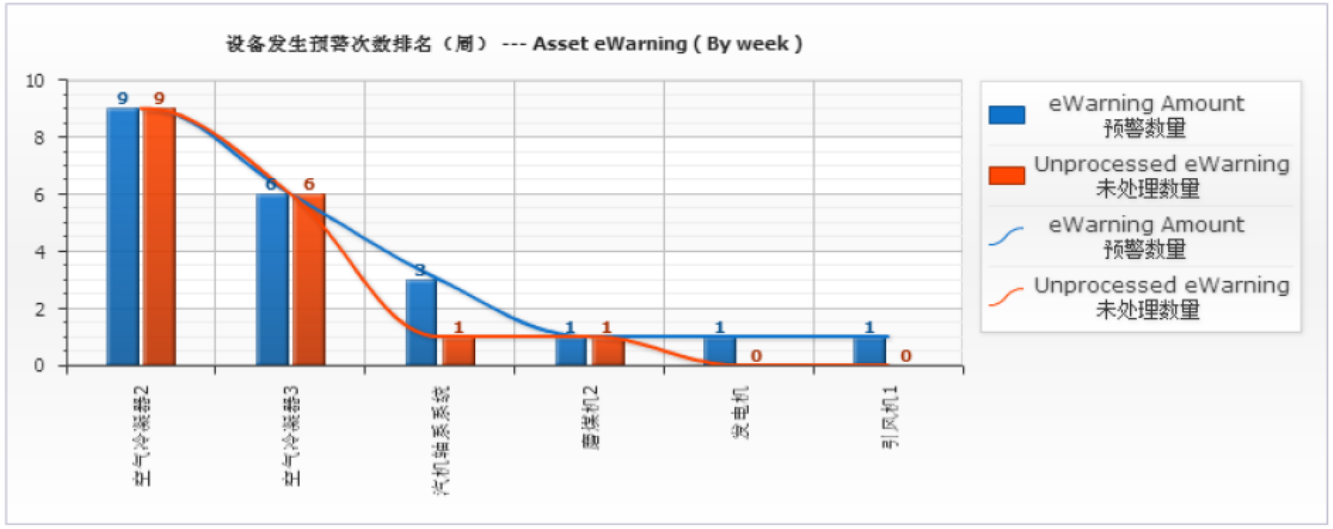
五：网页报表

示例：Secco_PagesReport.pdf

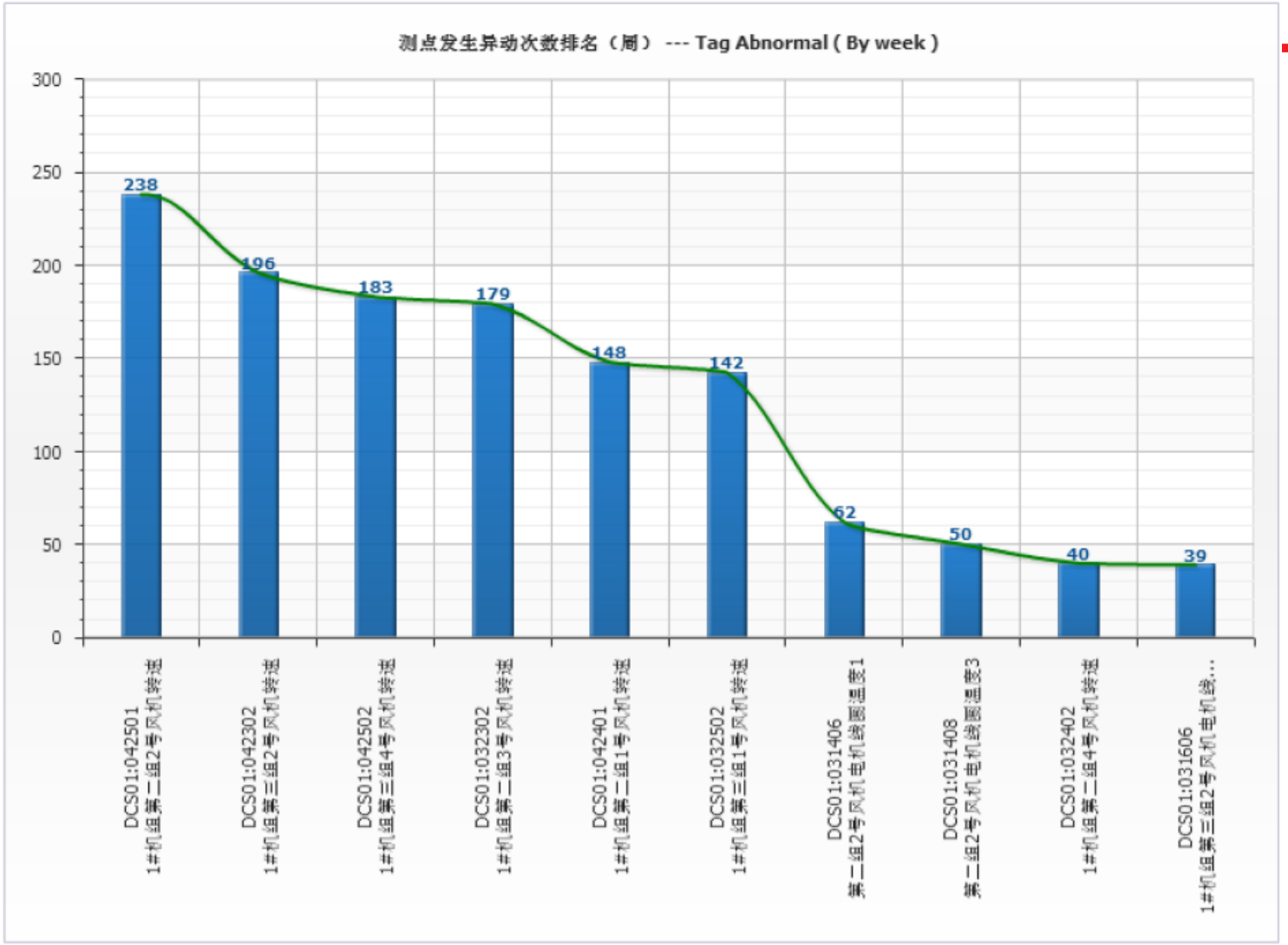


预警及异动数量统计：报表当月的预警及异动数量与前11个月数量对比及趋势

预警次数排名：报表周期内，设备按预警数量的排名



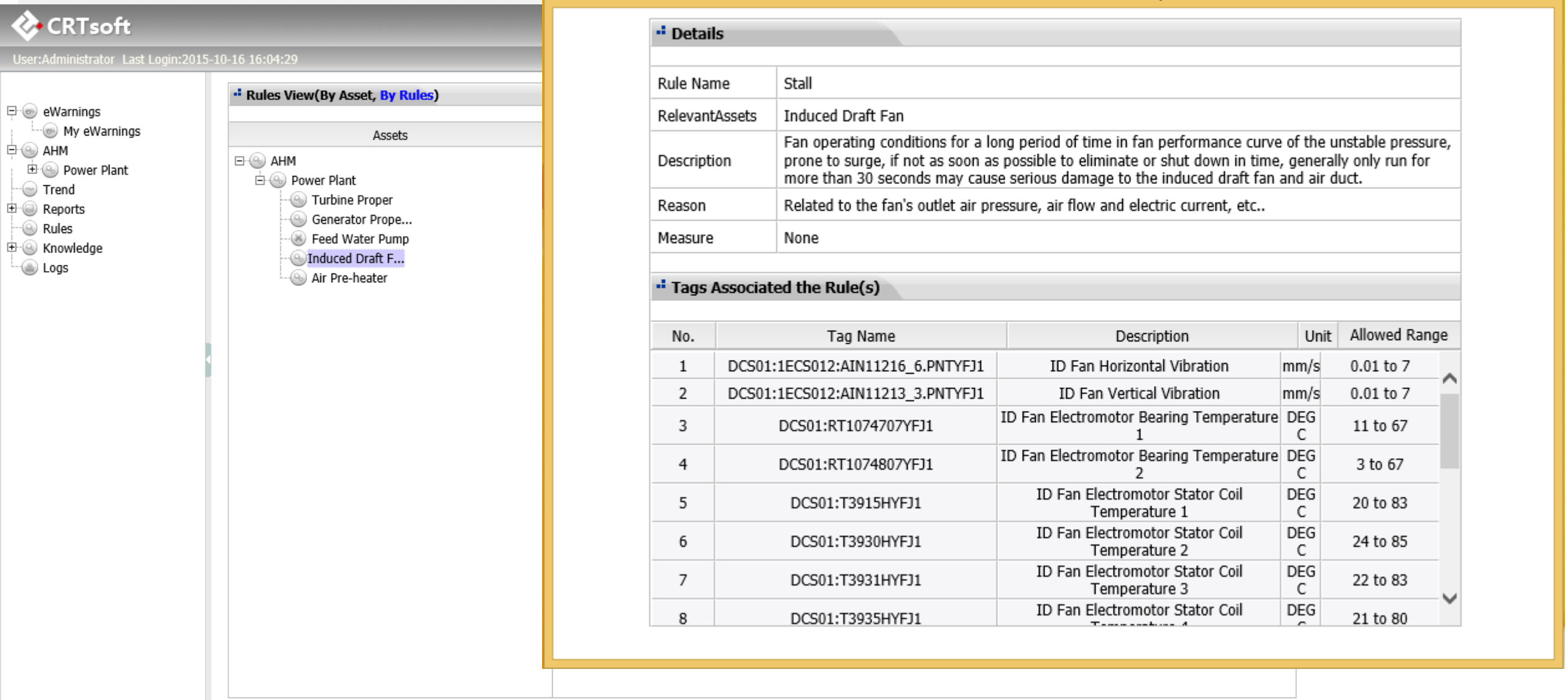
五：网页报表



测点异动排名：此处统计异动次数最多的10个测点，设备预警后会产生相关的异动测点。

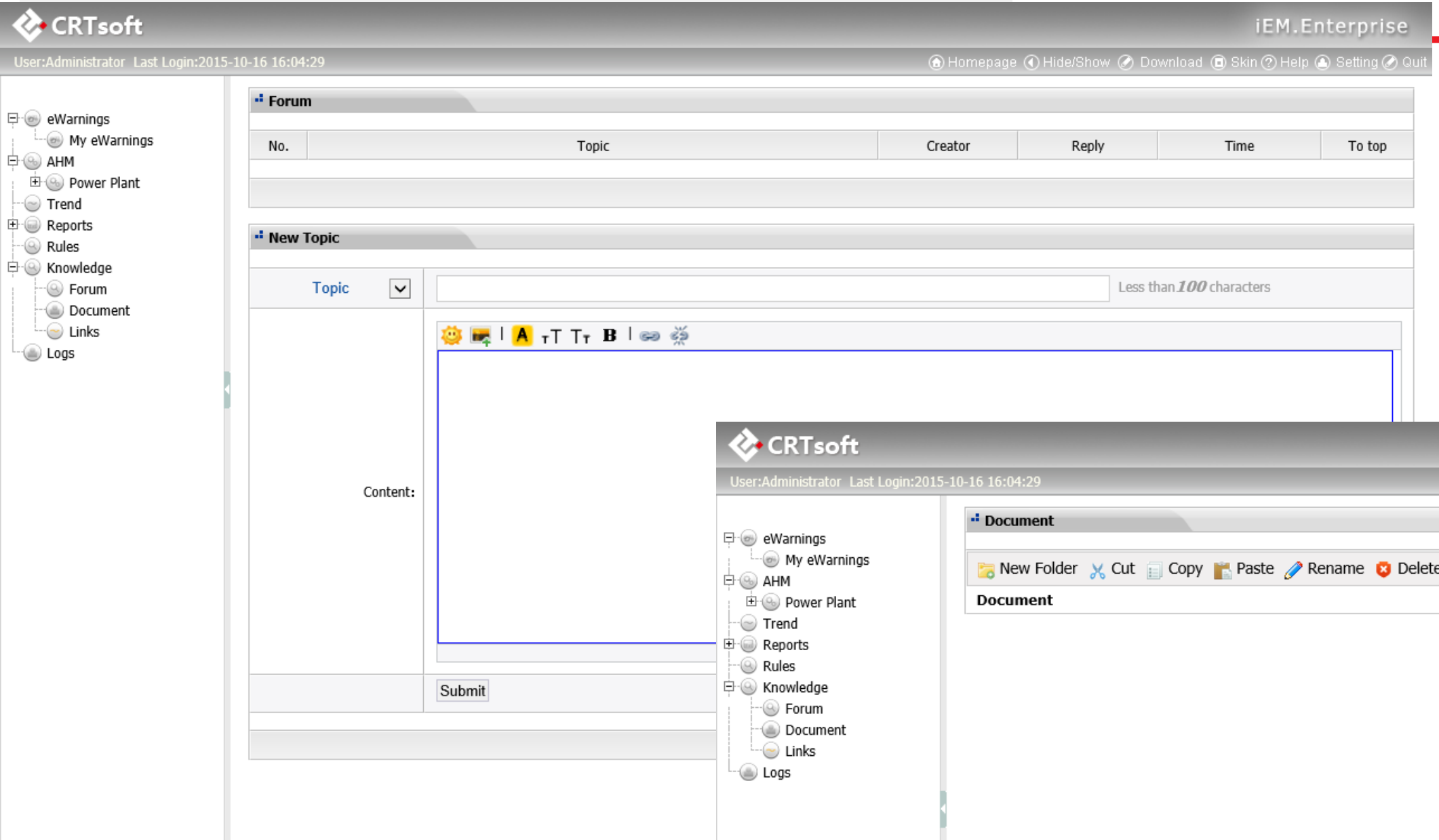
示例：Secco_Pages Report.pdf

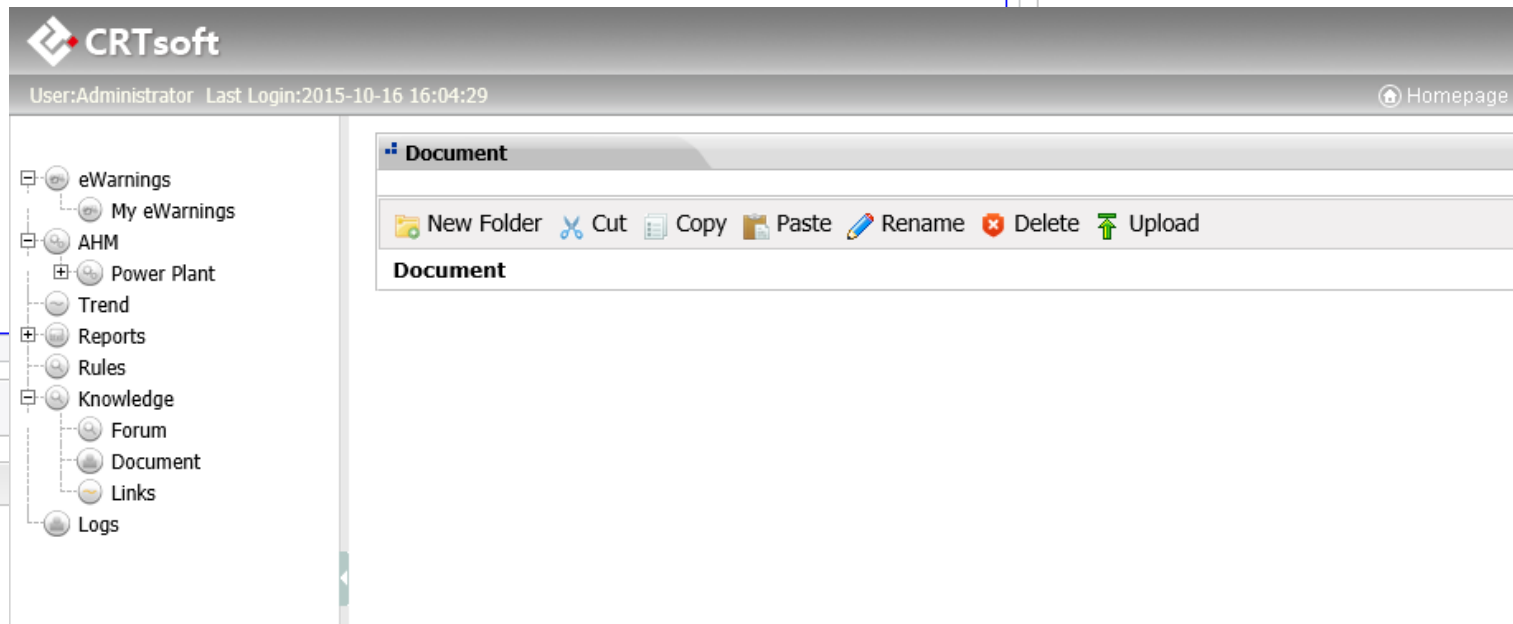
规则


CRTsoft
User:Administrator Last Login:2015-10-16 16:04:29
eWarnings
My eWarnings
AHM
Power Plant
Trend
Reports
Rules
Knowledge
Logs
Rules View(By Asset, By Rules)
Assets
AHM
Power Plant
Turbine Proper
Generator Prope...
Feed Water Pump
Induced Draft F...
Air Pre-heater
Rules Infomation - Internet Explorer
Details
Rule Name
Stall
RelevantAssets
Induced Draft Fan
Description
Fan operating conditions for a long period of time in fan performance curve of the unstable pressure, prone to surge, if not as soon as possible to eliminate or shut down in time, generally only run for more than 30 seconds may cause serious damage to the induced draft fan and air duct.
Reason
Related to the fan's outlet air pressure, air flow and electric current, etc..
Measure
None
Tags Associated the Rule(s)
No.
Tag Name
Description
Unit
Allowed Range
1
DCS01:1ECS012:AIN11216_6.PNTYFJ1
ID Fan Horizontal Vibration
mm/s
0.01 to 7
2
DCS01:1ECS012:AIN11213_3.PNTYFJ1
ID Fan Vertical Vibration
mm/s
0.01 to 7
3
DCS01:RT1074707YFJ1
ID Fan Electromotor Bearing Temperature 1
DEG C
11 to 67
4
DCS01:RT1074807YFJ1
ID Fan Electromotor Bearing Temperature 2
DEG C
3 to 67
5
DCS01:T3915HYFJ1
ID Fan Electromotor Stator Coil Temperature 1
DEG C
20 to 83
6
DCS01:T3930HYFJ1
ID Fan Electromotor Stator Coil Temperature 2
DEG C
24 to 85
7
DCS01:T3931HYFJ1
ID Fan Electromotor Stator Coil Temperature 3
DEG C
22 to 83
8
DCS01:T3935HYFJ1
ID Fan Electromotor Stator Coil
DEG
21 to 80

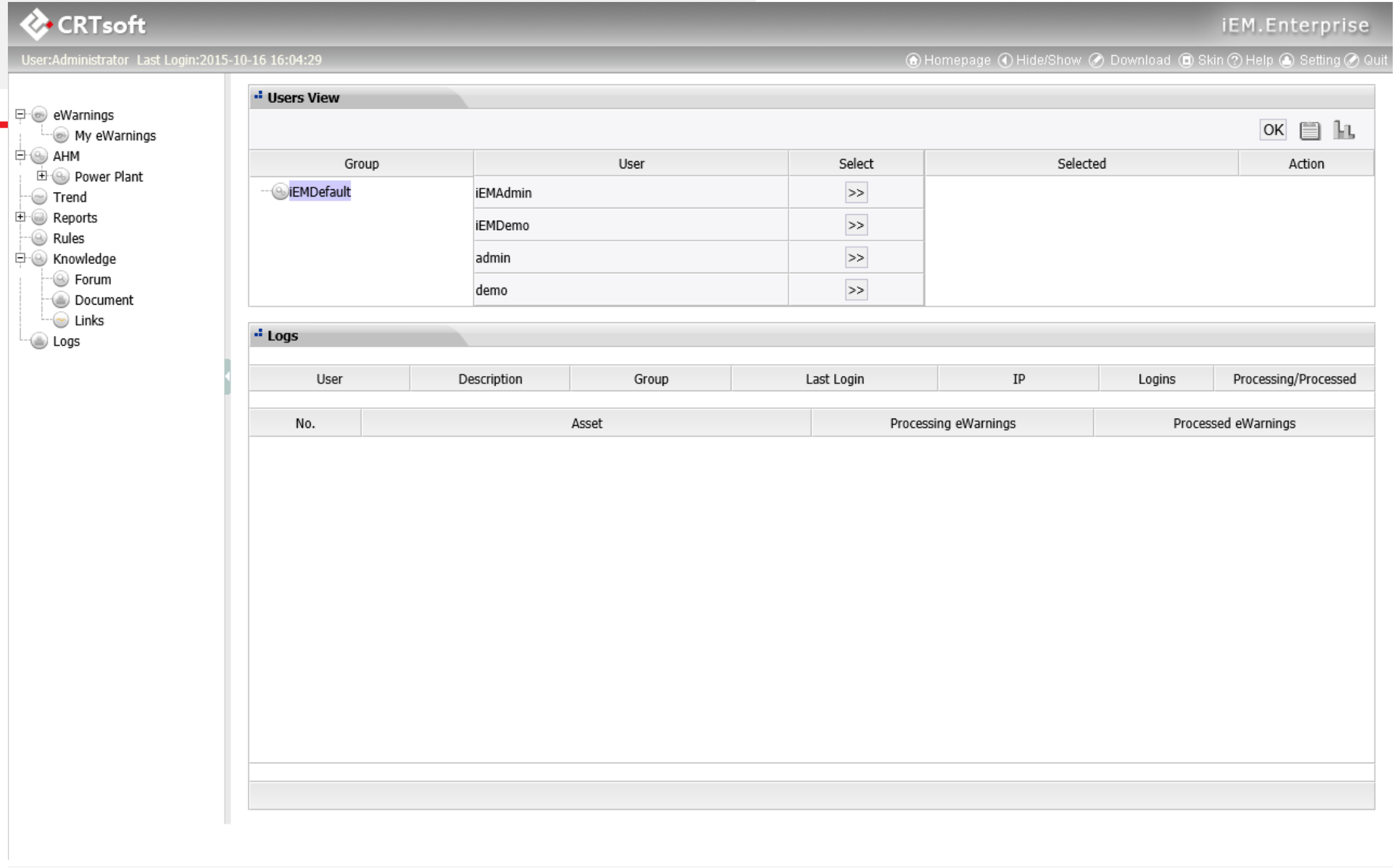
知识

CRTsoft


CRTsoft
iEM.Enterprise
User:Administrator Last Login:2015-10-16 16:04:29
Homepage Hide/Show Download Skin Help Setting Quit
eWarnings
My eWarnings
AHM
Power Plant
Trend
Reports
Rules
Knowledge
Forum
Document
Links
Logs
Forum
No.
Topic
Creator
Reply
Time
To top
New Topic
Topic
Less than 100 characters
Content:
Submit

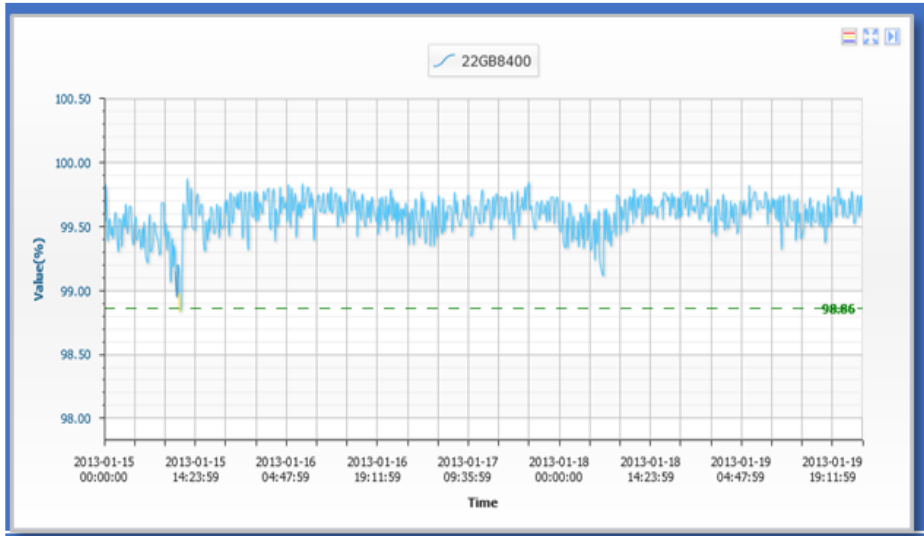
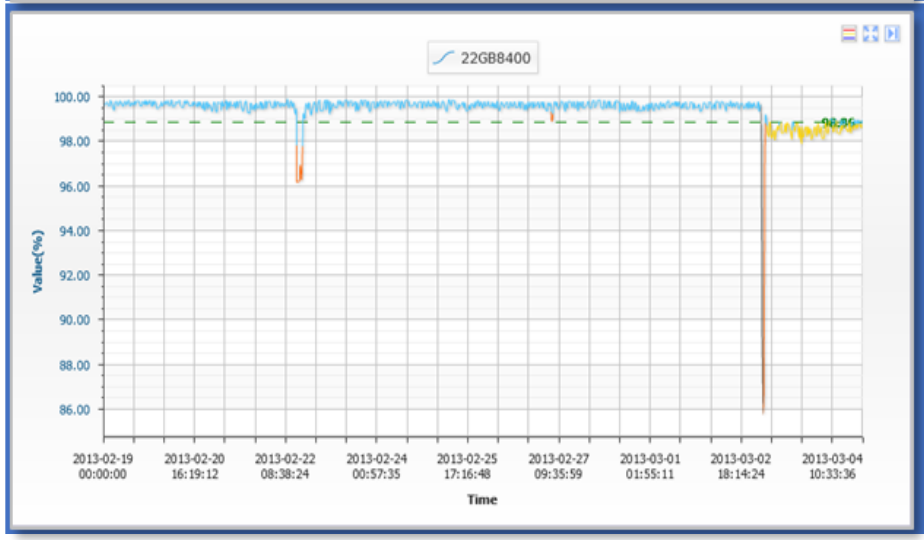

CRTsoft
User:Administrator Last Login:2015-10-16 16:04:29
Homepage
eWarnings
My eWarnings
AHM
Power Plant
Trend
Reports
Rules
Knowledge
Forum
Document
Links
Logs
Document
New Folder
Cut
Copy
Paste
Rename
Delete
Upload
Document

记录


CRTsoft
iEM.Enterprise
User:Administrator Last Login:2015-10-16 16:04:29
Homepage Hide/Show Download Skin Help Setting Quit
eWarnings
My eWarnings
AHM
Power Plant
Trend
Reports
Rules
Knowledge
Forum
Document
Links
Logs
Users View
OK
Group
User
Select
Selected
Action
iEMDefault
iEMAdmin
iEMDemo
admin
demo
>>
Logs
User
Description
Group
Last Login
IP
Logins
Processing/Processed
No.
Asset
Processing eWarnings
Processed eWarnings

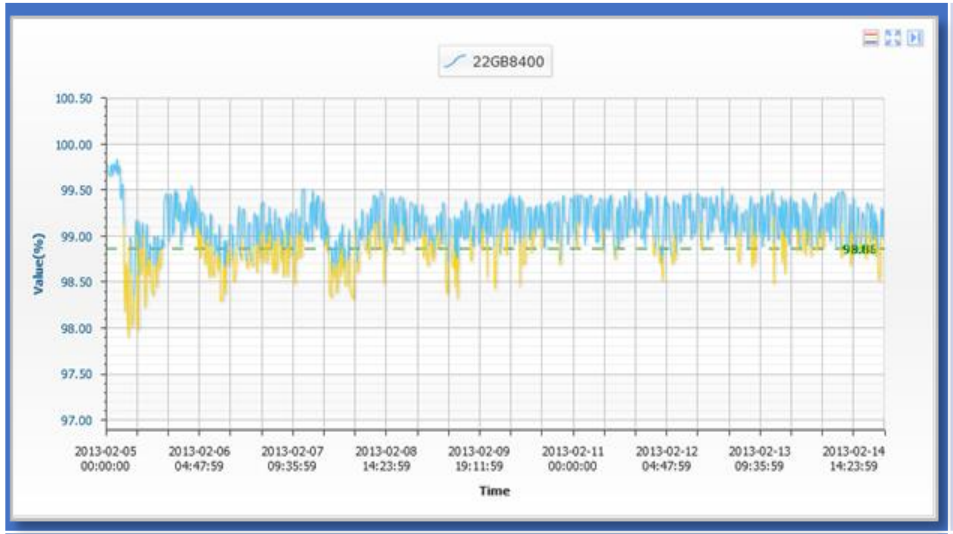
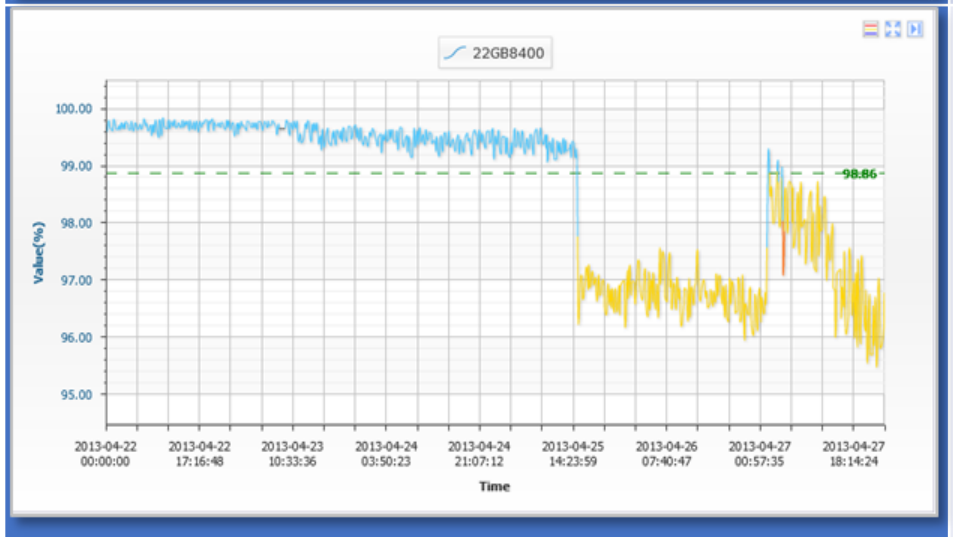
练习：HPI识图

CRTsoft

图形	分析	处理
	1. 正常 2. 异动预警 3. 测点故障 4. 通讯故障 5. 状态劣化	A. 停机处理 B. 现场巡点检 C. 通讯检查 D. 关联点分析 E. 不做处理
	1. 正常 2. 异动预警 3. 测点故障 4. 通讯故障 5. 状态劣化	A. 停机处理 B. 现场巡点检 C. 通讯检查 D. 关联点分析 E. 不做处理

练习：HPI识图

CRTsoft

图形	分析	处理
	1. 正常 2. 异动预警 3. 测点故障 4. 通讯故障 5. 状态劣化	A. 停机处理 B. 现场巡点检 C. 通讯检查 D. 关联点分析 E. 不做处理
	1. 正常 2. 异动预警 3. 测点故障 4. 通讯故障 5. 状态劣化	A. 停机处理 B. 现场巡点检 C. 通讯检查 D. 关联点分析 E. 不做处理

参考答案

CRTsoft

1) 1，E
2) 3，DCB
3) 5，D
4) 2，DB

iEM练习五：iEM.Explorer使用

CRTsoft

- 查看模型的健康度曲线，识别模型状态
- 查询、处理预警信息（关联测点状态分析）
- 编写设备状态分析报告
- 网页报表配置（选做）

CRTsoft

下一节：

报表和邮件配置