



PredictMate ® and SCADA Systems

Davison Systems, LLC

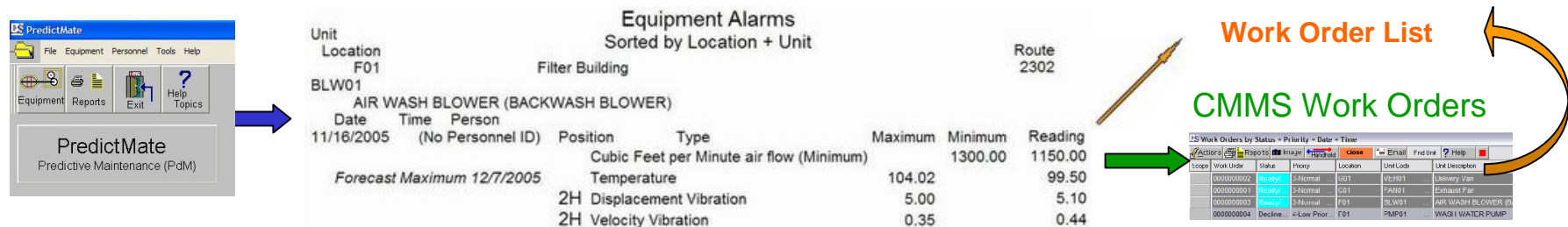
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Issue only valid work orders from a CMMS

Work orders created by PredictMate are an accumulation of all alarms for each equipment. This is **one** work order with related alarms, **not many** work orders for every alarm.

Work orders that were already added for equipment from PredictMate are not duplicated.



Alarms in PredictMate can differ from SCADA, allowing an operator to set alarm limits separate from the SCADA system.

Options for creating CMMS Work Orders from PredictMate ®

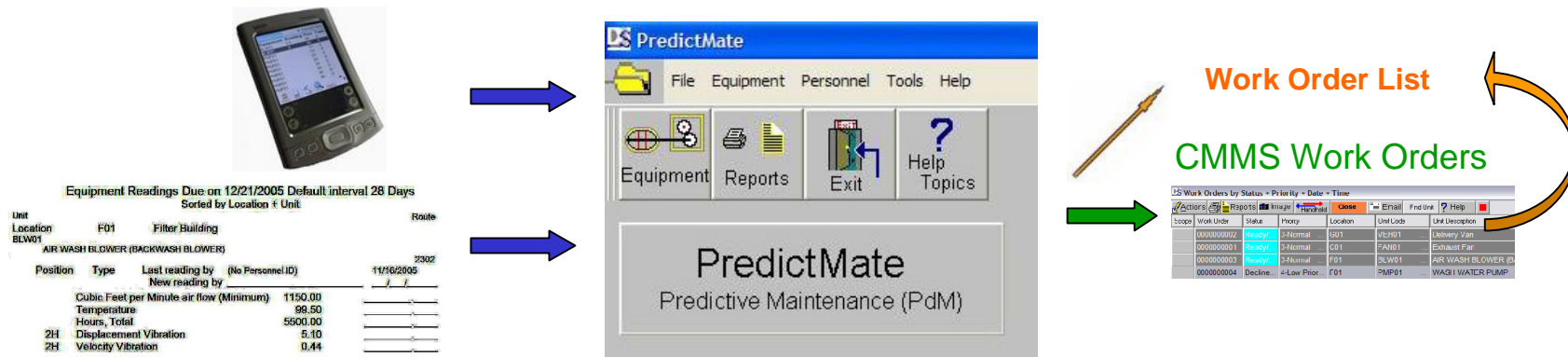
- Create corrective work orders and condition-directed preventive maintenance (PM) in the Davison CMMS.
- Export work order lists to files for upload to another CMMS.
- Use Davison CMMS as a standalone or local network system to avoid nuisance work orders in an enterprise CMMS. Then export a work order list for the enterprise CMMS.

You have two opportunities to accept or decline alarms for a work order list:

- 1) In PredictMate you can confirm the alarm conditions for transfer to a work order. If you do not want to review and select alarms for work orders, PredictMate can transfer alarms to work orders in the CMMS with a single run command from a scheduler.
- 2) In the CMMS you can decline or delay work orders that are unnecessary or low priority.

Alarm Conditions not from SCADA

You can enter predictive information that you might not retrieve by SCADA points. This might be values for hour meters, cycles, oil analysis, or anything that is more easily collected by printouts or on handheld device (PDA) to PredictMate.



PredictMate can substitute when SCADA field devices are out of service.

Preventive Maintenance

Predictive readings can print with PM Tasks in Davison CMMS.

Condition-Directed (CD) tasks are PM Tasks that schedule according to a PredictMate alarm. For example, changing oil based on contamination.

Frequency of Readings

After an equipment reading is entered, the next reading is scheduled according to the "Frequency" (Days) for that equipment. PredictMate can adjust the scheduled frequency (Days) between readings. The interval is increased if the equipment unit readings are stable (within 10 percent). The interval is shortened if equipment readings exceed the reading limit or trend toward a limit.

Interval between readings (Days)

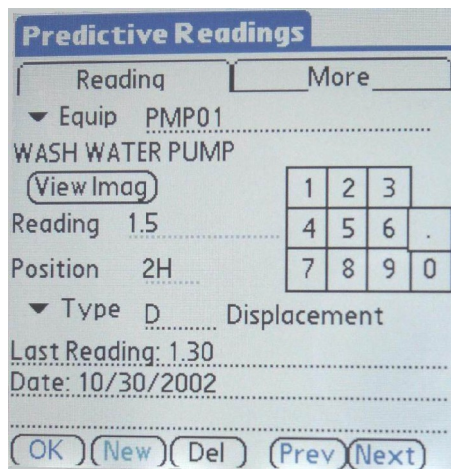
Let program change interval between readings

Scheduled readings are sorted by location, route, priority, or equipment group.

Equipment Readings Due on 12/21/2005 Default interval 28 Days
Sorted by Location + Unit

Unit				Route
Location	F01	Filter Building		
BLW01				
	AIR WASH BLOWER (BACKWASH BLOWER)			
				2302
Position	Type	Last reading by (No Personnel ID)		11/16/2005
		New reading by _____		__/__/____
	Cubic Feet per Minute air flow (Minimum)	1150.00	_____.	_____
	Temperature	99.50	_____.	_____
	Hours, Total	5500.00	_____.	_____
2H	Displacement Vibration	5.10	_____.	_____
2H	Velocity Vibration	0.44	_____.	_____

With the handheld, equipment can be identified by barcode or picture. Tap the number pad on screen to put numbers in the Reading field.

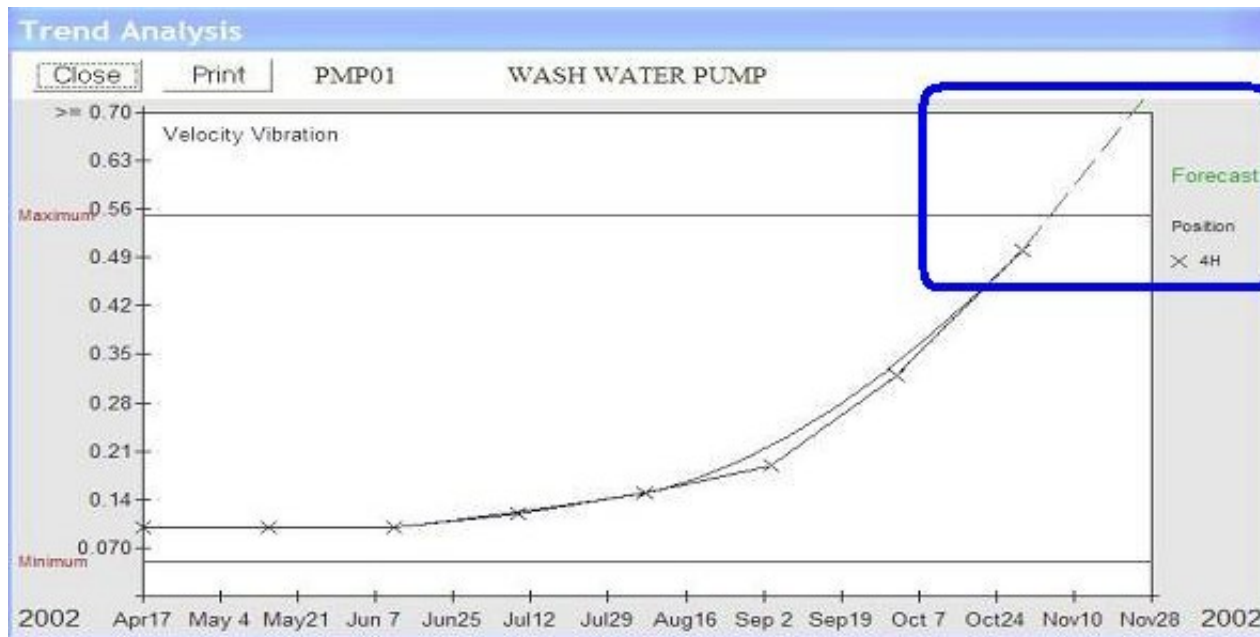


Forecasting Alarm Conditions

PredictMate® forecasts the date that alarms will occur, shown in both the Alarm Report and trend graphs.

Unit	Location	Filter Building	Route
BLW01	F01		2302
AIR WASH BLOWER (BACKWASH BLOWER)			
Date	Time	Person	
11/16/2005		(No Personnel ID)	
		Position	Type
			Maximum
			Minimum
			Reading
		Cubic Feet per Minute air flow (Minimum)	1300.00
		Temperature	104.02
		2H Displacement Vibration	5.00
		2H Velocity Vibration	0.35
			1150.00
			99.50
			5.10
			0.44

Forecast Maximum 12/7/2005



Setting PredictMate® Alarm Limits

PredictMate will report alarm limits by **one** of the following four methods for each equipment unit, depending on how much information you enter.

1. Let PredictMate set limits from past data. At least six (6) readings for a type and position are required before a limit is calculated.

2. By the type of reading where no other limit exists for the equipment.

Scope	Components	Type	Maximum	Minimum
	0 0.00	D ...	1.5000	0.0000
	0 0.00	V ...	0.6000	0.0000
	01 03 04 0 0.00	D ...	5.0000	0.0000
	01 03 04 0 0.00	V ...	0.3500	0.0000

3. By a group of equipment, related by components where no specific limit exists.

4. Setting the specific limit for each equipment reading.

Scope	Out	Location	Route	Unit Code	Unit Description
	<input type="checkbox"/>	00098000		00099000	Equipment 00099000
	<input type="checkbox"/>	00100000		00100000	Equipment 00100000
	<input type="checkbox"/>	F01	2302	BLW01	AIR WASH BLOWER
	<input type="checkbox"/>	F01			
	<input type="checkbox"/>	G01			
	<input type="checkbox"/>	M01			

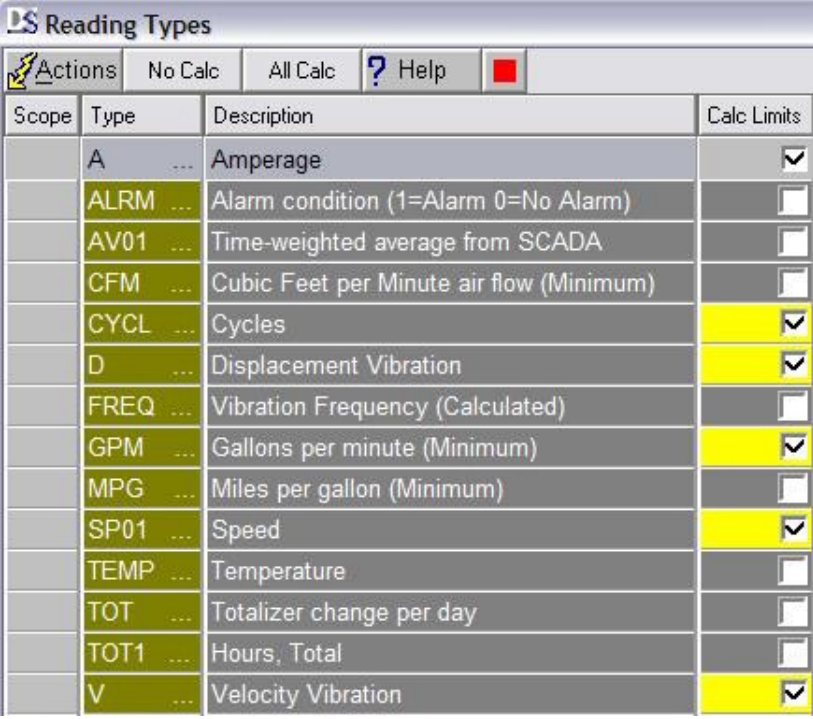
Reading Type	Position	Entered Limit	None	Change	Maximum	Minimum
CFM Cubic ...		1300.00	<input type="checkbox"/>	<input type="checkbox"/>	0.00	1300.00
TEMP Temp...		105.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>	104.02	0.00

Reading Type

Example reading types are vibration displacement and velocity, amperage, run-time hours, speed, temperature, and cycles – anything that can indicate an alarm condition.

The following types are reserved for special purpose:

- "D" and "V" for Displacement and velocity vibration
- "FREQ" for graphing the vibration frequency (frequency = velocity / 3.1416 / displacement * 60000)
- "TOT" for totalized readings can be followed by a number like "TOT1", "TOT2"
- "ALRM" for alarm conditions received from SCADA.



The screenshot shows a software window titled "Reading Types" with a menu bar containing "Actions", "No Calc", "All Calc", "? Help", and a red square icon. Below the menu bar is a table with four columns: "Scope", "Type", "Description", and "Calc Limits". The table lists various reading types, some of which are highlighted in yellow. The "Calc Limits" column contains checkboxes, some of which are checked.

Scope	Type	Description	Calc Limits
	A ...	Amperage	<input checked="" type="checkbox"/>
	ALRM ...	Alarm condition (1=Alarm 0=No Alarm)	<input type="checkbox"/>
	AV01 ...	Time-weighted average from SCADA	<input type="checkbox"/>
	CFM ...	Cubic Feet per Minute air flow (Minimum)	<input type="checkbox"/>
	CYCL ...	Cycles	<input checked="" type="checkbox"/>
	D ...	Displacement Vibration	<input checked="" type="checkbox"/>
	FREQ ...	Vibration Frequency (Calculated)	<input type="checkbox"/>
	GPM ...	Gallons per minute (Minimum)	<input checked="" type="checkbox"/>
	MPG ...	Miles per gallon (Minimum)	<input type="checkbox"/>
	SP01 ...	Speed	<input checked="" type="checkbox"/>
	TEMP ...	Temperature	<input type="checkbox"/>
	TOT ...	Totalizer change per day	<input type="checkbox"/>
	TOT1 ...	Hours, Total	<input type="checkbox"/>
	V ...	Velocity Vibration	<input checked="" type="checkbox"/>

Reading Position

Position is **where** the reading is taken on the equipment. More than one type of reading might be entered with one Position, like displacement and velocity vibration both in the same Position. **Position can be empty** for readings like temperature, count, or hours.

On a driven machine follow the torque from beginning to end, starting with the outboard end of the driver (motor) or for each phase of amperage use "A", "B", "C". In the CMMS a machine can be divided into components like motor, pump, control. In PredictMate a unit can be divided into many more positions depending on how many readings are needed.

The screenshot displays two windows from the PredictMate software. The top window, titled "Equipment by Location + Unit", shows a list of equipment with columns for Scope, Out, Location, Route, Unit Code, and Unit Description. The bottom window, titled "Equipment Readings by Date of Readings", shows a table of readings with columns for Scope, Personnel ID, Date, Time, Position, Type, and Reading. A red circle highlights the "Position" column in the readings table, which is currently empty for all entries.

Scope	Out	Location	Route	Unit Code	Unit Description
	<input type="checkbox"/>	F01	2302	BLW01	AIR WASH BLOWER (BACKWASH BLOWER
	<input type="checkbox"/>	F01	2303	PMP01	WASH WATER PUMP 1
	<input type="checkbox"/>	G01	1020	VEH01	Delivery Van
	<input type="checkbox"/>	M01	1010	FAN01	Exhaust Fan

Scope	Personnel ID	Date	Time	Position	Type	Reading
		11/16/2005			SP1 Time-weighted Average from SCADA	565.00
		11/16/2005			CFM Cubic Feet per Minute air flow (Minim...	1150.00
		11/16/2005			SP01 Speed	1050.00
		11/16/2005			TEMP Temperature	99.50
		11/16/2005			TOT1 Hours, Total	5500.00
		11/16/2005		1H	V Velocity Vibration	0.30
		11/16/2005		2H	D Displacement Vibration	5.10
		11/16/2005		2H	V Velocity Vibration	0.44

Host-Reporting Server

Davison "ODBC Replication" is a host-reporting server. In the host-reporting server Site Number separates each remote site. Reports can run for a single remote site or can access all sites for information, like a list of common inventory parts or cost comparison among groups of equipment. You can create reports from the host-reporting server with tools in the database system of your choice among MS Access, SQL Sever, SyBase, MySQL, or Oracle.

<Site Number> <Unit> <Component>

00001 PMP01 MOTOR

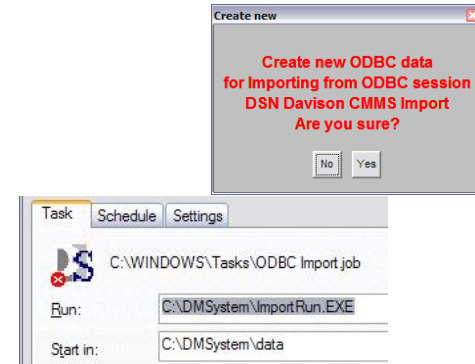
In Davison CMMS the Unit + Component combination must be unique. However, in the host-reporting server the unique combination is Site + Unit + Component. In the host-reporting server Unit + Component, Stock codes, Equipment Group, and other codes can be identical among several sites.

Getting work orders from SCADA through PredictMate ®

An outline of scheduled jobs or review by the user

Configuration

- In PredictMate select File, ODBC Import, Create in DSN, Predictive Only.
 - Then SCADA can add rows to the staging tables. Configure SCADA to add rows to the staging tables continuously, usually at the top of every hour.
 - ODBC Import usually runs from a scheduler every hour, soon after the staging tables are filled by SCADA.
- Run C:\DMSsystem\ImportRun.exe from the scheduler.



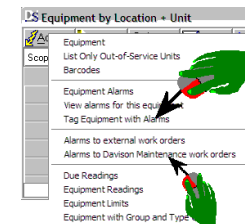
Routine Review or Scheduled Jobs

Review alarms for valid work orders or schedule run commands to create a work order list.

- After review and tagging equipment in PredictMate, select "Reports", "Alarms to external work orders" or "Alarms to Davison Maintenance work orders". See "How to Create Work Orders from Alarms".

Equivalent run commands from a scheduler:

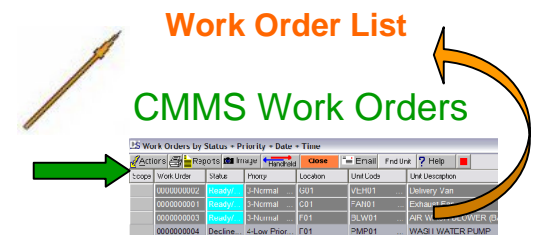
- External work order list (CSV or Tab-delimited): "c:\dmsystem\DSPdM.exe ALRMTOEX"
- Add Davison CMMS work orders: "c:\dmsystem\DSPdM.exe ALRMTOWO"
- Upload the external work order list (CSV or Tab-delimited file) to another, enterprise, CMMS.
- Or manage the work orders in Davison CMMS.
- As an option, export a work order list from Davison CMMS for the enterprise CMMS.



Menu options to export to CSV or Tab-delimited from Davison CMMS Work Orders:

- Select Actions, Export, Export to text file (CSV/TXT).
- Special command provided by Davison Software for work order lists in CSV or Tab-delimited files.

Special options include formatting for direct upload to MS-Excel or for upload to SQL databases for another system.



Conclusion

SCADA retrieves point values and possible alarm conditions.

PredictMate ® confirms and forecasts alarm conditions for work orders.

The CMMS manages work orders until the alarm condition is resolved.