Detection of the Rotational Direction of a Shaft in SKF @ptitude Observer

Introduction

In some applications, it is important to control data collection with respect to the direction of rotation of the shaft. This information is crucial in applications like rolling mills, shovels and draglines, since defects are more visible in a vibration spectra when the machine is under load. This kind of measurement can be complemented with gating (see application note **CM 3175**, *Gating Set up in SKF @ptitude Observer*) to be able to collect vibration data when the machine is, for example, operating at a certain load and rotational speed.

A shovel loading a haul truck.



Fig. 1. Example of machines where the rotational direction is important during the vibration measurement.



A dragline in operation.

Procedure

1 Install two tachometers for measuring the rotational speed plus one trigger point (i.e., target) on the shaft. The two tachometers shall be relative close to each other. See the laboratory set up in **fig. 2**.



Fig. 2. Mounting of the tachometers and the trigger point.

- 2 First create two digital channels and then two rotational speed points.
- Digital channels: Go to On-line/IMx units and add two digital channels (→ figs. 3 and 4).
- Digital measurement points: Go to On-line/IMx units and create two digital measurement points (-> figs. 5 and 6).

Digital channel	17 feet Name	×	Digital channel	Tana Tana	x
General			General		
MasCon:	6. Obserer test		MasCon:	6. Obserer test	
Number:	1 -	DIG 1	Number:	2 -	
Name:	Rot speed 1		Name:	Rot speed 2	
Enabled:			Enabled:		
Pulses/rev.:	1	0	Pulses/rev.:	1	0
Trans. angle:	0 [degrees]	90 270	Trans. angle:	0 [degrees]	l 90 270
Sensor feed:	N/A 👻	180	Sensor feed:	N/A 👻	180
System log		<u>Qk</u> <u>C</u> ancel	System log	(<u>Q</u> k <u>C</u> ancel

Fig. 3. Set up of digital channel 1.

Fig. 4. Set up of digital channel 2.

ame and comment	Petersed 1	- El Carbled
Name:	Hot speed - 1	• v Enabled
Description.		Speed 1
Point type:	Speed	Speed 1
nit and channel configuration		
MasCon/IMx unit:	06. Obserer test	•
MX Channel:	001. Rot speed 1 💌 Backup	o channel: <a>k
Trigg channel:	<none> • Backup</none>	o trigg:
nultarieous measurements		
Measurement group:	<none></none>	•
Speed meas.:	<none></none>	•
Process meas :	<pre>cNone></pre>	
Digital meas ::	<none></none>	•

Fig. 5. Set up of digital channel 1.

ame and	comment				
	Name:	Rot speed - 2	•	V Enabled	
1	Description:			0 10	
				Speed 2	
	Point type:	Speed		-	
Int and c	hannel configuration				
-	MasCon/IMx unit:	06. Obserer test -			
IMX	Channel:	002. Rot speed 2 🔫	Backup channel	«None» •	
	Trigg channel:	<none> 💌</none>	Backup trigg:	<none> •</none>	
inutane	ous measurements				
	Measurement group:	<none></none>	-		
0	Speed meas .:	<nione></nione>	•		
	Process meas.:	<none></none>	•		
	Digital meas.:	<none></none>	-		

Fig. 6. Set up of digital channel 2.

3 Create and configure the "Time difference" measurement point to calculate the time difference between the two trig pulses from the tachometers (→ figs. 7 and 8).



Fig. 7. Create a "Time difference" measurement point.

eneral Trend Alarm		
Name and comment Name: Description:	Direction if rotation	
Point type:	Time difference	
Unit and channel configuration		
MasCon/IMx unit:	06. Obserer test 👻	
Channel:	001. Rot speed 1	
Channel:	002. Rot speed 2	
Simultaneous measurements		
Speed meas.:	<none></none>	
Process meas .:	<none></none>	
Digital meas.:	<none></none>	

Fig. 8. Configuration of the "Time difference" measurement point.

- 4 A measurement point has to be created to be able to trend the time difference (→ figs. 9, 10 and 11), due to that a sensor on the machine has to be selected to be able to create this point. This can be any sensor on the machine (→ fig. 9).
- In the "Simultaneous measurements" section in the General tab, one of the "Rotational speed points" needs to be selected as a Speed meas. It doesn't matter which one you select (→ fig. 10).
- The "Direction of rotation" point in **fig. 10** also has to be selected as a **Process meas.** in the "Simultaneous measurements" section settings.
- Also see the necessary settings for the "Active range" in the **Trend** tab (→ fig. 11).



Fig. 9. Create vibration measurement point.

opt	ectra Trend Alarm Advanc	ed Diagnoses
Name and (comment	
7.	Name:	Direction if rotation trend point
V	Description:	
	Point type:	Vibration
Unit and ch	annel configuration	
	MasCon/IMx unit:	06. Obserer test
Mx	No. channels:	
	Channel X:	01. Acc
	Orientation:	1. Horizontal
	Rotation direction:	Clockwise 🗸
Simultaneo	us measurements	
	Measurement group:	<none></none>
	Speed meas.:	Rot speed - 1 💌 🔲 Trigg.
	Process meas.:	Direction if rotation
	Digital meas.:	<none></none>

Fig. 10. Select a vibration point on your machine, and also select one of the rotational speed measurement points plus the process measurement point called "Direction if rotation" in this case.

Meas. point (Wind Inc.\Test room\E	Direction of rotation\Svarven\Direction if rotation trend point\)	X
General Spectra Trend Alam A Trend alternative No. of lines: Rolling buffer: No. decimals:	dvanced Diagnoses 400 ▼ Unit: Acc. [g] ▼ Instant ▼ Detection: Peak ▼ 3 ▼ Exp. averaging: 0% Rapid ▼	In this case, the direction of rotation is counter clockwise, but if we configure as +2 to 0, the direction of rotation would be in the clockwise direction.
Active range Type: Process Type: Speed Measurement range Eabled Min:	✓ Condition: ✓ ✓ Condition: ✓ Condition:	d deta: 0 [e] d deta: 0 [cpm]
Data storage Storage interval:	1 Minutes (0-Off)	In this case, data is collected in the speed range of 800 to 1 100 RPM.
System log		Qk Cancel

Fig. 11. An example of the "Active range" settings on the vibration measurement point.

5 There is a positive and a negative time difference for this type of measurement (→ fig. 12). For the set up in this example, a positive time difference corresponds to a clockwise direction of the shaft, and the negative time difference corresponds to a counter clockwise direction of the shaft.

NOTE. This observation of the rotational direction needs to be done by the person who sets up the system. When you start up the system, you need to make a note which direction corresponds to the + or - sign in the trend (\rightarrow fig. 12).



Fig. 12. The trend diagram for the time difference measurement point.

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