

HeartMate II System Controller Failure Presenting as Driveline Failure with Pump Stop

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BACKGROUND

- Mechanical failure of the HeartMate II (HM2; Abbott) can be from failure of the system controller, driveline or motor, or inflow/outflow graft damage
- Pump logfiles downloaded from the system monitor and analyzed by the manufacturer can help differentiate the cause of mechanical failure

CASE PRESENTATION

- 72 year old woman supported with HMII for 11 months without complications
- On the day of admission, patient noticed a red heart alarm and felt “bubbles in my chest”
- System monitor revealed several PUMP STOP alarms that coincided with the red heart alarm and her symptoms (Figure 1)
- No driveline damage was seen on x-ray or inspection, and patient denied trauma to system controller or driveline
- Logfile analysis by the manufacturer showed “phase-to-phase short within the patient’s driveline” prompting the manufacturer to recommend driveline repair, followed by pump exchange if the problem persisted
- An internal Detailed Logfile Analysis showed persistently elevated resistance in one driveline phase (Figure 2)

DATA

Clinical	Settings	Alarms	Save Data	History	
DAY-TIME	PUMP FLOW	PUMP SPEED	PUMP POWER	PULSE INDEX	ALARM
07/06/17 15:05:47	0.3	1680	12.8	2.7	PUMP OFF
					LOW FLOW
07/06/17 15:05:46	0.3	5370	10.2	2.6	LOW FLOW
07/06/17 15:05:43	0.0	1700	12.8	5.2	PUMP OFF
					LOW FLOW
07/06/17 15:05:42	0.0	1690	10.2	5.3	LOW FLOW
07/06/17 15:05:40	0.0	0	12.0	5.9	PUMP OFF
					LOW FLOW
					Power Cable Disconnected
07/06/17 15:05:39	0.3	1740	13.0	6.1	PUMP OFF
					LOW FLOW

Save to

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Records 13 - 18 of 240

Figure 1: Multiple pump stops that correlated with red heart alarms and symptoms

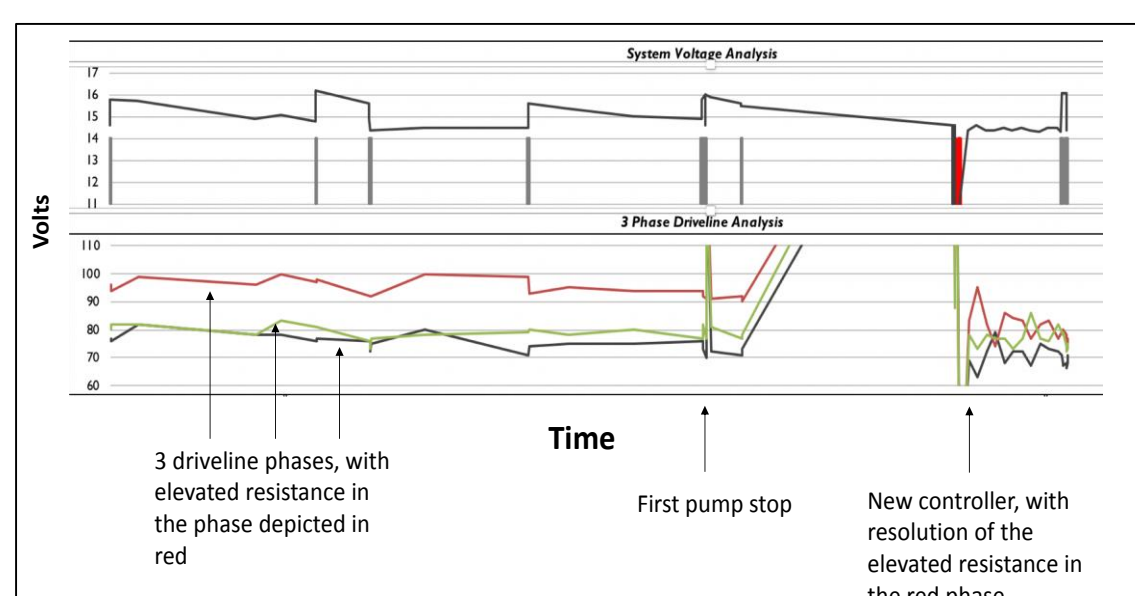


Figure 2: Detailed Logfile Analysis showing persistently elevated resistance in phase 2 of the driveline that resolved after system controller exchange

CASE CONTINUED

- The pump stopped a total of 94 times overnight
- System controller exchange was performed with resolution of pump stoppage problems, and resolution of the persistently elevated resistance in one driveline phase
- The old system controller was hooked up to a mock loop, again causing frequent pump stoppages

DISCUSSION

- Phase-to-phase short is caused by loss of insulation between driveline phases (Figure 3)

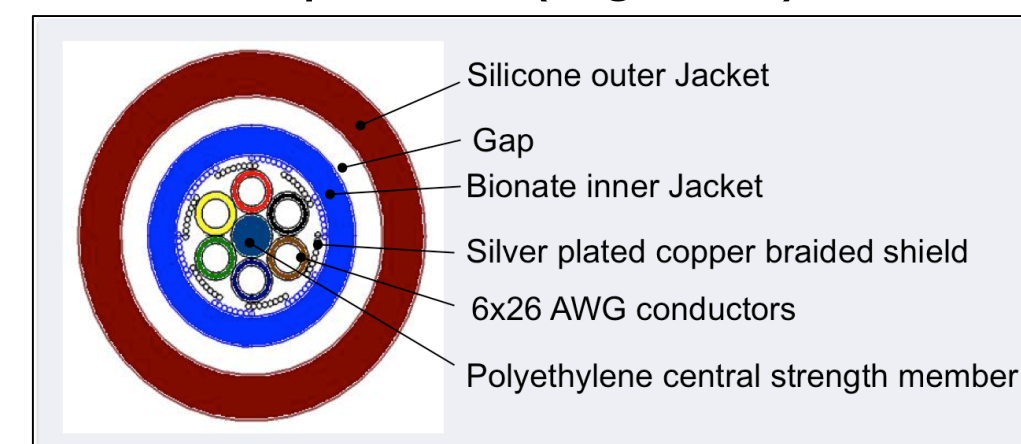


Figure 3. Schematic of HM2 driveline

- However, the finding of persistently elevated resistance in one driveline phase (Figure 2) was inconsistent with phase-to-phase short
- Rather, the motor was failing to deliver current through one phase of the driveline, resulting in the finding of elevated resistance (Figure 4)

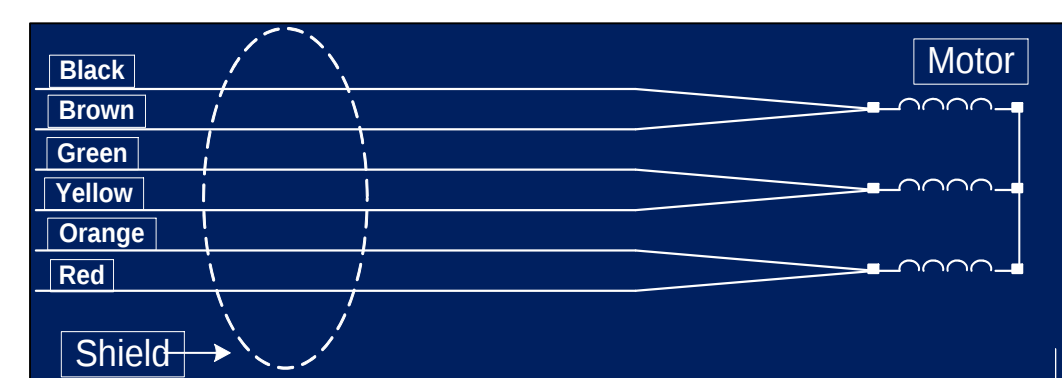


Figure 4. Schematic of HM2 motor current and driveline phases

- Detailed logfile analysis compiles data captured by the pump at pre-set intervals and whenever an event occurs

CONCLUSION

- Differentiating between failure of the driveline vs. system controller is challenging, but clinically important.
- Detailed Logfile Analysis beyond that provided by the manufacturer can be helpful in identifying the cause of pump malfunction.