POWERTRAIN SHOP

Shop	Equipment	Failure Mode	Thermal Imaging	Current	Vibration	Ultrasound	Equipment Controller
Powertrain	Spindle Machines	Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction	Use motor current sensor to detect current raise due to friction	Use Sensor on motor to detect vibration (axle, radius) due to bearing damage		
		Ballscrew Damage	Use thermal imager to detect temperature raise due to friction		Use Sensor on motor to detect vibration (axle, radius) due to damage		
		Hydraulic Leak or Block					Use logic to monitor cylinder stroke timing to identify leak
		Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction			Use Sensor on motor to detect noise due to bearing damage	
		Cylinder Leak					Use logic to monitor cylinder stroke timing to identify leak
	Grinders	Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction	Use motor current sensor to detect current raise due to friction	Use Sensor on motor to detect vibration (axle, radius) due to bearing damage		
		Ballscrew			Use Sensor on Ballscrew to detect vibration (axle, radius) due to Ballscrew damage		
		Hydraulics					Use logic to monitor cylinder stroke timing to identify leak
		Pump Motor failure	Use thermal imager to detect temperature raise due to friction		Use Sensor on motor to detect vibration (axle, radius) due to bearing damage	Use Sensor on motor to detect noise due to bearing damage	
		Spindle Bearing failure			Use Sensor on spindle to detect vibration (axle, radius) due to bearing damage		
		Cylinders					Use logic to monitor cylinder stroke timing to identify leak

POWERTRAIN SHOP (CONT.)

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Shop	Equipment	Failure Mode	Thermal Imaging	Current	Vibration	Ultrasound	Equipment Controller
Powertrain	Gantry	Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction	Use motor current sensor to detect current raise due to friction			
		Pneumatics					Use logic to monitor cylinder stroke timing to identify leak
	Conveyance	Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction			Use Sensor on motor to detect noise due to bearing damage	
		Cylinders					Use logic to monitor cylinder stroke timing to identify leak
	Washers	Pump			Use Sensor on pump to detect vibration (axle, radius) due to pump damage	Use Sensor on pump to detect noise due to pump damage	
		Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction		Use Sensor on motor to detect vibration (axle, radius) due to bearing damage	Use Sensor on motor to detect noise due to bearing damage	
		Cylinders					Use logic to monitor cylinder stroke timing to identify leak
	Robots	Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction		Use Sensor on motor to detect vibration (axle, radius) due to bearing damage		Kawasaki Software PdM

POWERTRAIN SHOP (CONT.)

Shop	Equipment	Failure Mode	Thermal Imaging	Current	Vibration	Ultrasound	Equipment Controller
Powertrain	Furnace	Motor Gearbox or Bearing Damage		Use motor current sensor to detect current raise due to friction	Use Sensor on motor to detect vibration (axle, radius) due to bearing damage		
		Pumps			Use Sensor on pump to detect vibration (axle, radius) due to bearing damage		
		Fan / Bearings			Use Sensor on fan to detect vibration (axle, radius) due to bearing damage		
		Cylinders					Use logic to monitor cylinder stroke timing to identify leak
	Chillers/Cooling Units	Compressors			Use Sensor on compressor to detect vibration (axle, radius) due to bearing damage		
		Motor Gearbox or Bearing Damage	Use thermal imager to detect temperature raise due to friction		Use Sensor on motor to detect vibration (axle, radius) due to bearing damage	Use Sensor on motor to detect noise due to bearing damage	
	Hobs	Spindle Bearings			Use Sensor on bearing to detect vibration (axle, radius) due to bearing damage		
		Ballscrew			Use Sensor on Ballscrew to detect vibration (axle, radius) due to bearing damage		
		Cylinders					Use logic to monitor cylinder stroke timing to identify leak

POWERTRAIN SHOP (CONT.)

Shop	Equipment	Failure Mode	Thermal Imaging	Current	Vibration	Ultrasound	Equipment Controller
Powertrain	Assembly Testers	Motor, Gearbox, or Bearing Damage	Use thermal imager to detect temperature raise due to friction	Use motor current sensor to detect current raise due to friction			
		Bearings			Use Sensor on bearing to detect vibration (axle, radius) due to bearing damage		
		Pumps			Use Sensor on pump to detect vibration (axle, radius) due to pump damage		
		Cylinders					Use logic to monitor cylinder stroke timing to identify leak
	Lubrication	Motor, Gearbox, or Bearing Damage			Use Sensor on motor to detect vibration (axle, radius) due to bearing damage		
		Filtration Pumps/Motor			Use Sensor on motor to detect vibration (axle, radius) due to bearing damage		
	Control Panels		Use thermal imager to detect temperature raise due to friction				

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