

Condition Assessment Manual

Francis Turbine Inspection Form and Check List



Revision 1.0, 12/08/2011

Francis Turbine - Inspection Form

General Information:

Date of Site Visit: _____ Unit No. _____

Plant name: _____

Source/s of data: _____

Manufacturer: _____ Age: _____

Rated Output (MW): _____ Max. Output (MW): _____ Rated Speed (rpm): _____

Rated net head (ft) _____ Max. net head (ft): _____ Max. Efficiency (%): _____

General Turbine Description: _____

Maintenance History / Major Repairs Description:

Runner:

Diameter, intake: _____ Diameter, discharge: _____

Main Shaft Size (At runner connection): _____ Shaft Orientation: _____

Centerline to bottom: _____

Centerline to top: _____

Material: _____

Addition specification data:

Wicket Gates:

Material: _____

Addition specification data:

Stay Vanes:

Material: _____

Addition specification data:

Spiral Case (see Turbine Common Sub-Section):

Material: _____

Addition specification data:

Draft Tube:

Material: _____ Net Area at outlet opening (per unit): _____

Horizontal length (centerline of turbine to downstream face): _____

Vertical distance (distributor centerline to draft tube floor): _____

Addition specification data:

Vacuum Breaker:

Material: _____

Addition specification data:

Francis Turbine Check List				
Topic	Yes	No	N/A	Comments/Details
Maintenance & Major Repair History				
Runner cavitation repair? <i>[welding labor hrs/yr]</i>				
Runner erosion repair? <i>[welding labor hrs/yr]</i>				
Runner crack repair? <i>[welding labor hrs/yr]</i>				
Runner re-coating with different material? <i>[Very hard metals, polymeric coatings, ceramics]</i>				
Any Runner modifications to reduce cavitation?				
Has the Runner wear ring been replacement?				
Has Runner been replaced with like original runner or new runner design?				
Is the Runner accessible for visual inspections? <i>[Identify if de-watering is an option for interior inspection.]</i>				
Have all plant records regarding runner maintenance, repairs, operating conditions and performance data been requested/gathered?				

Francis Turbine Check List - Continued				
Topic	Yes	No	N/A	Comments/Details
Maintenance & Major Repair History - Continued				
Has there been a refurbishment or replacement of the wicket gates?				
Has there been a replacement of wicket gate bushings? <i>[greased to greaseless]</i>				
Has there been a change of bushing type/design?				
Has there been change of wicket gate seal type or replacement of seals due to excessive leakage or rubbing.?				
Has there been change of inter-gate seal type?				
Has there been change of head cover seal type?				
Has there been change of bottom ring seal type? <i>[high density polyurethane]</i>				
Has there been a replacement of V packing on lower headcover bearings?				

Francis Turbine Check List - Continued				
Topic	Yes	No	N/A	Comments/Details
Maintenance & Major Repair History - Continued				
Has there been an improvement to wicker gate failure mechanism to increase reliability?				
Has there been a rehabilitation of operating ring, links, levers and servomotor connecting rods?				
Has there been an implementation of an automatic greasing system?				
Have there been any modifications/repairs to vacuum breaker?				

Francis Turbine Check List - Continued				
Topic	Yes	No	N/A	Comments/Details
Equipment Condition Assessment				
Is there evidence of runner surface corrosion?				
Is there evidence of erosion on the runner surface?				
Is there evidence of cavitation on the runner surface?				
Is there cracking in runner bucket root area?				
Can measurement to engineering drawings be made for the runner seal or blade tip clearance (gap)?				
Can the structural integrity of stay vane fillets be assessed?				

Francis Turbine Check List - Continued				
Topic	Yes	No	N/A	Comments/Details
Equipment Condition Assessment - Continued				
Can end clearances be assessed?				
Is there history of failure mechanism- shear pin failures?				
Is there evidence of surface wear on wicket gate links, levers and connecting rods?				
Can WG servomotor leakage rate be assessed?				
Can Servomotor pressure be assessed?				
Can internal surface condition of spiral case (coating) be assessed?				
Can surface condition of baffle plates be assessed?				
Is annual welding cost known (\$/yr, labor hrs/yr)?				

Francis Turbine Check List - Continued				
Topic	Yes	No	N/A	Comments/Details
Equipment Condition Assessment - Continued				
Is there evidence of inter-gate leakage?				
Can surface finish of wicket gates be inspected for pitting?				
What is level of cracking on the wicket gates?				
Can wicket gates bushings/bearings condition be assessed?				
Can wicket gates radial clearance of bearings be assessed?				
Can wicket gates seal condition be assessed?				
Can nose to tail seal clearances be assessed?				

