

Description of component, subsystem, or function	Symptom (what?)	Effect (so what)	Failure mode (why?)	Probability of failure	Severity of effect	Risk priority	Remedial action
Auger	support failure	visibly see auger not turning or pyrolysis tube moving	bearing issue	1	2	2	stop system
Auger	support failure	visibly see auger not turning or pyrolysis tube moving	bolts shear	1	4	4	stop system
Electrical system	electrical short	fire hazard, inability to produce biochar, live wires	motor/control system failure	1	4	4	diagnose failure point, replace damaged/defective parts
Auger	biomass not moving	fire hazard, inability to produce biochar	motor/gear issue	2	3	6	check motor, potentially shut down system
Electrical system	system stops	Inability to produce biochar	system unplugged	3	2	6	plug system in
Boiler	Temperature Drops, no visible flame	Inability to produce biochar	solenoid valve functioning improperly	2	4	8	shut down, check valve

Collection bin	auger stops	Inability to produce biochar	material build up	4	2	8 shut down system, pull apart pyrolysis chamber
Collection bin	auger stops	Inability to produce biochar	material blockage	4	2	8 shut down system, pull apart pyrolysis chamber
Electrical system	system stops	Inability to produce biochar	breaker failure	4	2	8 reset breaker
Electrical system	system stops	Inability to produce biochar	invalid logic settings project	2	4	8 validate settings
Electrical system	electrical short	fire hazard, inability to produce biochar, live wires	loose wire	2	4	8 insulate wires
Boiler	Temperature Drops, no visible flame	Inability to produce biochar	propane tank empty	3	3	9 fill tank

Gases	burning material, ash visible in output	fire hazard, inability to produce biochar	nitrogen tank empty or flow stopped	3	3	9	stop system, fill tank
Gases	burning material, ash visible in output	fire hazard, inability to produce biochar	Oxygen leaking into system	3	3	9	stop system, investigate leak
Electrical system	system stops	Inability to produce biochar	E-Stop button pressed	5	2	10	reset button
Boiler	Temperature Drops, no visible flame	Inability to produce biochar	air flow issue	3	4	12	shut down propane, investigate air flow
Auger	biomass not moving	fire hazard, inability to produce biochar	material binding auger	5	3	15	shut down system, pull apart pyrolysis chamber

		Very Probable	Probable	Occasional	Remote	Improbable
		5	4	3	2	1
<b>Catastrophic</b>	<b>4</b>	20	16	12	8	4
<b>Critical</b>	<b>3</b>	15	12	9	6	3
<b>Marginal</b>	<b>2</b>	10	8	6	4	2
<b>Negligible</b>	<b>1</b>	5	4	3	2	1

### **Severity of Effect**

<b>Catastrophic</b>	The failure causes substantial damage to the product itself or related items (including people), requiring repair.
<b>Critical</b>	The failure causes significant damage to the product itself or related items, requiring repair.
<b>Marginal</b>	The failure causes some damage to the product itself or related items, potentially requiring repair.
<b>Negligible</b>	The failure causes no significant damage.

### **Probability of Failure**

<b>Very Probable</b>	Every time
<b>Probable</b>	Most times
<b>Occasional</b>	Observed multiple times during the project.
<b>Remote</b>	Might be possible during the project.
<b>Improbable</b>	Maybe observed once during the project or predicted to happen after hand off.

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		5	4	3	2	1
Catastrophic	4	20	16	12	8	4
Critical	3	15	12	9	6	3
Marginal	2	10	8	6	4	2
Negligible	1	5	4	3	2	1

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