

Headings	Component/ System	Failure Mode	Effects of Failure	S e v	C I a s s	Failure Cause	O c c u r	Prevention Controls	Detection Controls	D e t e c	RPN	(SxO)
n/a	shredder	Electrical failure. Tangled with waste.	waste not entering combustion chamber. Waste not properly shredding.	8	R/NB	power outage Material fatigue Corrosion Water ingress not properly shredding nappies	2	Back up generator, Appropriate material and design selection,	Environmental testing Increased motor parasitic	2	48	16
n/a	Guillotine Valve	electrical failure	waste not properly quarantine	8	R/NB	power outage Material fatigue Corrosion Water ingress	3	Back up generator, Ensure components are installed and operated in accordance with supplier	Environmental testing	2	32	24
n/a	Waste feed ram 1	electrical failure	waste not feeding bed steps	8	R/NB	power outage Material fatigue Corrosion Water ingress	2	Back up generator, Ensure components are installed and operated in accordance with supplier	Environmental testing	2	32	16
n/a	Waste feed ram 2	electrical failure	waste not feeding bed steps	8	R/NB	power outage Material fatigue Corrosion Water ingress	2	Back up generator, Ensure components are installed and operated in accordance with supplier	Environmental testing	2	81	16
n/a	Guillotine Valve	electrical failure	waste not properly quarantine, risk of fire in waste feed	9	S/L	power outage Material fatigue Corrosion Water ingress	3	Back up generator, Ensure components are installed and operated in accordance with supplier, Shutdown procedure initiated, Fire extinguisher initiated	Environmental motor testing, Environmental temperature testing	3	48	27
n/a	Ram 1	electrical failure, mechanical failure	waste not properly combusting	8	R/NB	unburnt hydrocarbons in ash, Waste build up.	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature, testing visual appearance	2	48	24
n/a	Ram 2	electrical failure, mechanical failure	waste not properly combusting	8	R/NB	unburnt hydrocarbons in ash, Waste build up.	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature, testing visual appearance	2	48	24
n/a	Ram 3	electrical failure, mechanical failure	waste not properly combusting	8	R/NB	unburnt hydrocarbons in ash, Waste build up.	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature, testing visual appearance	2	48	24
n/a	Ram 4	electrical failure, mechanical failure	waste not properly combusting	8	R/NB	unburnt hydrocarbons in ash, Waste build up.	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature, testing visual appearance	2	42	24
n/a	Ambient Primary air Fan 1	electrical failure	less combustion on waste material, unburnt hydrocarbons in ash,	7	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	42	21
n/a	Ambient Primary air Fan 2	electrical failure	less combustion on waste material unburnt hydrocarbons in ash,	7	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	42	21
n/a	Ambient Primary air Fan 3	electrical failure	less combustion on waste material unburnt hydrocarbons in ash,	7	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	42	21
n/a	Ambient Primary air Fan 4	electrical failure	less combustion on waste material unburnt hydrocarbons in ash,	7	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	54	21
n/a	EGR Primary air Fan 1	electrical failure	Less EGR in waste flash combustion	9	S/L	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature testing	2	54	27
n/a	EGR Primary air Fan 2	electrical failure	Less EGR in waste could cause flash combustion	9	S/L	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature testing	2	48	27

n/a	EGR Primary air Fan 3	electrical failure	Less EGR in waste could move combustion from gasification into combuston	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature testing	2	48	24
n/a	EGR Primary air Fan 4	electrical failure	Less EGR in waste could move combustion from gasification into combuston	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing, Environmental temperature testing	2	48	24
n/a	Exhaust EGR Flap Valve 1	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	48	24
n/a	Exhaust EGR Flap Valve 2	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	48	24
n/a	Exhaust EGR Flap Valve 3	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	72	24
n/a	Exhaust EGR Flap Valve 4	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust Ambient Flap Valve 5	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust Ambient Flap Valve 6	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust Ambient Flap Valve 7	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust Ambient Flap Valve 8	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Secondary Ambient Air 1	electrical failure	Emission limits increase	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Secondary Ambient Air 2	electrical failure	Emission limits increase	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Secondary EGR Air 1	electrical failure	Emission limits increase	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Secondary EGR Air 2	electrical failure	Emission limits increase	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust EGR Flap Valve 1	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust EGR Flap Valve 2	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water Ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24

n/a	Exhaust Ambient Flap Valve 1	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Exhaust Ambient Flap Valve 2	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Tertiray Ambient Air 1	electrical failure	Loss of function Overheating combustion chamber materials	8	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Tertiray Ambient Air 2	electrical failure	Loss of function Overheating combustion chamber materials	8	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Tertiray Ambient Flap Valve 1	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Tertiray Ambient Flap Valve 2	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Thermal camera	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Loss of visual	2	48	24
n/a	Ash Level lazor sensor	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental electrical testing	3	72	24
n/a	bed fire extinguisher	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Annual checks, Environmental motor testing	3	72	24
n/a	Main Chamber Burner 1	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Annual checks, Environmental motor testing	3	72	24
n/a	Main Chamber Burner 2	electrical failure	Loss of function Safety Issue	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Annual checks, Environmental motor testing	3	72	24
n/a	Secondary Chamber Burner 1	electrical failure	loss of function	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Annual checks, Environmental motor testing	3	72	24
n/a	3 way EGR Valve	electrical failure	Loss of function Safety Issue, Emission limits increase, Flash combustion	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental testing	2	48	24
n/a	Constant emissions monitoring	electrical failure	Loss of function	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental testing	2	48	24
n/a	Cooling Chamber ash valve	electrical failure	Loss of function ash build up in cooling chamber	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24
n/a	Cyclone ash valve	electrical failure	Loss of function ash build up in cyclone	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	3	72	24

n/a	Directional Gas Flaps	electrical failure	Loss of function, reduced steam production	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing Environmental temperature testing	3	72	24
n/a	Air compressor	electrical failure	Loss of function	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing Emission limits reached	2	48	24
n/a	ID fan	electrical failure	Loss of function Safety issue, Emission limits increase, Flash combustion	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental testing	2	48	24
n/a	Burner	electrical failure	loss of function	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Annual checks, Environmental motor testing	2	48	24
n/a	Bottom ash conveyor	electrical failure	loss of function, ash build up in combustion chamber, overheating	9	S/L	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing Environmental temperature testing	2	54	27
n/a	APC ash conveyor	electrical failure	loss of function, ash build up in combustion chamber, overheating	9	S/L	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing Environmental temperature testing	2	54	27
n/a	Bottom ash tube chain conveyor	electrical failure	Loss of function waste loading to combustion chamber stopped	8	R/NB	Material fatigue Corrosion Water ingress Over heating	3	Ensure components are installed and operated in accordance with supplier recommendations	Environmental motor testing	2	48	24
1	Assembly	Appearance Degredation	Non- returnable appearance issue noticed by customers	3	CR	Material degradation due to environment	3	Appropriate material spec selection Appropriate environmental protection treatment	Environmental testing, Visual check during routine maintenance	3	27	9
1	Assembly	Structural Failure	Loss of function	3	R/NB	Material degradation due to environment	3	Appropriate material spec selection Appropriate environmental protection treatment	Environmental testing, Visual check during routine maintenance	3	27	9
1	Electrical assembly - Lighting and 240V sockets	Electrical failure	Loss of function Safety issue	8	R/NB	Material fatigue Corrosion Water ingress	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection Conformity to electrical installation standards (17th edition)	Conformance checking Maintenance item	3	72	24
1	Fixings, adhesives and sealants	Appearance Degredation	Non- returnable appearance issue noticed by customers	3	R/NB	Material degradation due to environment	3	Appropriate material spec selection Appropriate environmental protection treatment	Environmental testing, Visual check during routine maintenance	2	18	9
2	AC Generator	Mechanical failure	Loss of function, secondary damage to other system components	8	R/NB	Material fatigue failure	2	Ensure that generator is installed and operated in accordance with supplier recommendations Consider effects of vibration	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	2	32	16
2	AC Generator	Electrical failure	Loss of function, secondary damage to other system components	7	R/NB	Material fatigue failure	2	Ensure that generator is installed and operated in accordance with supplier recommendations	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	2	28	14
2	Switch and Relay box Assembly	Electrical failure	Loss of function	8	R/NB	Material fatigue Corrosion Water ingress	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection Conformity to electrical installation standards (17th edition)	Ensure system shut-down in fail safe mode.	3	72	24

3	Control System Connector Boxes	Electrical failure	Loss of function	7	R/NB	Material fatigue Corrosion	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection	Ensure system shut-down in fail safe mode.	3	63	21
3	Control System Wiring	Electrical failure	Loss of function	7	R/NB	Material fatigue Corrosion Water ingress	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection Confirmity to electrical installation standards (17th edition)	Ensure system shut-down in fail safe mode.	3	63	21
3	Electrical Sensors	Electrical failure	Loss of function	7	R/NB	Component internal failure	2	Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Ensure system shut-down in fail safe mode.	2	28	14
3	Electronic Control Units	Electrical failure	Loss of function	7	R/NB	Material fatigue Corrosion	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection	Ensure system shut-down in fail safe mode.	3	63	21
3	PC Control Assembly	Computer failure	Loss of function	8	R/NB	System crash, Material fatigue, Water ingress, External forces	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection Confirmity to electrical installation standards (17th edition)	Ensure system shut-down in fail safe mode.	1	24	24
3	PC Control Assembly	Electrical failure	Loss of function	8	R/NB	Material fatigue, Corrosion, Water ingress, External forces	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection Confirmity to electrical installation standards (17th edition)	Ensure system shut-down in fail safe mode.	3	72	24
3	Power electronics Assembly	Electrical failure	Loss of function	8	R/NB	Material fatigue, Corrosion, Water ingress, External forces	3	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection Confirmity to electrical installation standards (17th edition)	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Ensure system shut-down in fail safe mode.	3	72	24
4	Piping on board Assembly	Structural failure due to internal system pressure build up	Loss of function, fluids leakage. Secondary damage to other components.	8	R/NB	Material fatigue, Corrosion, External forces	7	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection.	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Ensure system shut-down in fail safe mode.	2	112	56
4	Piping on board Assembly	Structural failure (leak)	Reduction of function, secondary damage to other system components	7	R/NB	Material fatigue failure due to external forces	2	Fitted location in safe position, protected from all anticipated impacts Protection from external forces and impacts with high strength structural framework and enclosure Appropriate material spec selection	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Water Loss	2	28	14
4	Off board steam & water pipe work assembly	Structural failure due to internal system pressure build up	Loss of function, fluids leakage. Secondary damage to other components.	7	R/NB	Material fatigue, Corrosion, External forces	2	Appropriate materials selection Ensure components are installed and operated in accordance with supplier recommendations Appropriate environmental protection.	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Ensure system shut-down in fail safe mode.	2	28	14
4	Off board steam & water pipe work assembly	Structural failure (leak)	Reduction of function, secondary damage to other system components	7	R/NB	Material fatigue failure due to external forces	2	Fitted location in safe position, protected from all anticipated impacts Protection from external forces and impacts with high strength structural framework and enclosure Appropriate material spec selection	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Water Loss	2	28	14
5	Heat Exchanger assembly	Blockage of exhaust gas flow	Loss of function, overheating risk	8	R/NB	Internal blockage due to build up of foreign matter (e.g. Carbon)	2	Confirm effects of build up of foreign matter in use Monitor for loss of heat exchanger efficiency	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	5	80	16

5	Heat Exchanger assembly	Blockage of water flow	Loss of function, overheating risk	8	R/NB	Internal blockage due to build up of foreign matter (e.g. scale, corrosion)	2	Appropriate material spec selection Confirm effects of build up of foreign matter in use Monitor for loss of heat exchanger efficiency	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	5	80	16
5	Heat Exchanger assembly	Blockage of water flow	Loss of function, overheating risk	8	R/NB	Internal blockage due to structural failure	2	Appropriate material spec selection Monitor for loss of heat exchanger efficiency	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	4	64	16
5	Heat Exchanger assembly	Blockage of steam flow	Loss of function, overheating risk, pressure build-up risk	8	R/NB	Internal blockage due to build up of foreign matter (e.g. scale, corrosion)	2	Appropriate material spec selection Confirm effects of build up of foreign matter in use Monitor for loss of heat exchanger efficiency Confirm pressure relief system effectiveness	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	5	80	16
5	Heat Exchanger assembly	Blockage of steam flow	Loss of function, overheating risk, pressure build-up risk	8	R/NB	Internal blockage due to structural failure	2	Appropriate material spec selection Monitor for loss of heat exchanger efficiency Confirm pressure relief system effectiveness	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems	4	64	16
5	Heat Exchanger assembly	Pressure leak (steam)	Reduction of function, secondary damage to other system components	7	R/NB	Mechanical component failure causing loss of sealing	4	Appropriate material spec selection Design of mechanical fixings to consider effects of fatigue, corrosion and vibration Confirm effects of build up of foreign matter in use Malfunction (over temp/ over pressure) proving Pressure test to PED standard	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Pressure Loss Water Loss Noise Increase	5	140	28
5	Heat Exchanger assembly	Pressure leak (water)	Reduction of function, secondary damage to other system components	7	R/NB	Mechanical component failure causing loss of sealing	4	Appropriate material spec selection Design of mechanical fixings to consider effects of fatigue, corrosion and vibration Malfunction (over temp/ over pressure) proving Pressure test to PED standard	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Pressure Loss Water Loss Noise Increase	5	140	28
5	Heat Exchanger assembly	Pressure leak (exhaust gas)	Reduction of function, secondary damage to other system components	7	R/NB	Mechanical component failure causing loss of sealing	4	Appropriate material spec selection Design of mechanical fixings to consider effects of fatigue, corrosion and vibration Confirm effects of build up of foreign matter in use	Ensure control system can recognise symptoms and apply appropriate fail-safe and warning systems Noise Increase	3	84	28
5	Insulation Materials	Structural Degredation	Reduction of function Returnable appearance issue noticed by most customers	7	R/NB	Material structural failure due to environment/ temperature	3	Appropriate material spec selection Appropriate environmental protection treatment	Visual inspection during routine maintenance.	2	42	21
5	Heat Exchanger assembly	Structural failure	Loss of function, fluids and gas leakage	8	R/NB	Material failure due to external impact	1	Fitted location in safe position, protected from all anticipated impacts Protection from external forces and impacts with high strength structural framework and enclosure Appropriate material spec selection Malfunction (over temp/ over pressure) proving Pressure test to PED standard	Pressure Loss Water Loss Noise Increase	7	56	8
5	Heat Exchanger assembly	Structural failure	Loss of function, fluids and gas leakage	8	R/NB	Material failure due to corrosion	2	Appropriate material spec selection Confirm effects of build up of corrosive materials in use	Pressure Loss Water Loss Noise Increase	5	80	16