"Geri Dönüşüm Sistemleri"

MT MAKİNA LTD. ŞTİ.

CONTINUOUS DUTY HIGH CAPACITY DISPOSAL SYSTEM

YF-2000P

Utility-scale 24/7 waste disposal plant operating in continuous regime with pre-shredder preparation and automatic hydraulic feeding for regional hubs and industrial complexes.



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Executive Preface – Integrated Waste Disposal Plants

A new era in pre-shredding, fully automatic, and high-capacity waste disposal technology.

Disposal of large volumes of solid, medical, and industrial wastes requires an integrated process design rather than just a high-temperature furnace. As MT Makina, in our YF-P series high-capacity disposal plants, we combine shredding, automatic feeding, thermal oxidation, and advanced emissions scrubbing under a single roof.

At the core of our plants, the Redmonster Series double-shaft shredding unit reduces waste volume in seconds, increasing combustion surface area and maximizing thermal efficiency. With fully closed automatic feeding and ash discharge conveyors, we reduce human contact to zero, while dry scrubber and bag filter systems ensure compliance with strict environmental norms. This catalog details the engineering and process highlights of the plant.



Kurumsal

A technology brand born in Turkey, producing industrial machinery at global standards.

Since its foundation, MT Makina has played a pioneering role in the industrial shredding, destruction, and recycling machinery sector. At our production base in Istanbul, we design global waste management solutions with our expert engineering team and R&D staff. All our production processes comply fully with ISO 9001 Quality Management, ISO 14001 Environmental Management, and CE quality standards. Our machines possess the durability to operate under the most demanding field conditions.

Design & R&D Philosophy

We use 3D parametric modeling, Finite Element Analysis (FEA), and Computational Fluid Dynamics (CFD) software in our designs. Inside-furnace temperature distributions and gas flow rates are simulated in virtual environments to achieve perfect combustion geometry.

Global Export & Service Network

We export our systems to more than 20 countries, primarily in Europe, the Middle East, Russia, and Africa. Our after-sales service teams, together with remote SCADA telemetry monitoring support, ensure continuous plant operation.

Sustainability Commitment & Zero Waste

We focus on environmental protection in all our R&D projects. Our waste incinerators comply fully with emission laws in force by environmental ministries. By converting recovered waste heat into steam or hot water energy, we directly reduce the carbon footprint of the facilities. This approach strengthens circular economy models and permanently minimizes waste disposal costs.

CE	ISO 9001	ISO 14001	TSE-HYB
STANDARDS	QUALITY MNGT	ENVIRONMENT	COMPLIANCE

Industrial Disposal Principles

Industrial disposal of large-tonnage waste in continuous regime with shredder integration.

In the high-capacity disposal process, solid wastes homogenized in size via pre-shredding are fed into the primary chamber in a continuous or semi-continuous regime using hydraulic ram-feeders. In the primary chamber, where the oxygen level is precisely regulated, wastes enter a stable pyrolysis (gasification) process without sudden flares, minimizing dust.

1 **LOADING**
Feeding wastes into the loading hopper

→

2 **GASIFICATION**
Thermal decomposition at 850°C

→

3 **COMPLETE COMBUSTION**
Destruction of gases at 1100°C

→

4 **FILTRATION**
Washing and neutralisation of harmful gases

INDUSTRIAL SCALE WASTE-TO-ENERGY RECOVERY

In high-capacity integrated plants, waste heat generated from combustion is recovered via special thermal oil or steam exchangers for power generation or process heating, accelerating the plant's investment payback (ROI) by **%40**.

In our high-capacity plants operating continuously, gases are combusted in the secondary chamber at minimum 1100°C with at least a 2.0-second residence time to comply with EU standards (Directive 2010/75/EU). This thermal oxidation is fully completed before gases enter heat recovery boilers.

YF-2000P General Description

Large-scale waste disposal plant operating in continuous regime with pre-shredder preparation for regional hubs and industrial complexes.

Our high-capacity disposal systems are engineered for regional waste hubs and industrial complexes to operate 24/7 in continuous regime. They feature either rotary kiln or multi-stage static chambers, integrated with high-torque shredders and hydraulic ram-feeders, built to handle continuous heavy-duty loads.

Primary Applications

- **Integrated Industrial Plants:** 24/7 continuous solid waste disposal in petrochemical, textile, or automotive factories.
- **Regional Waste Centers:** Emission-controlled plants destroying wastes of multiple municipalities at a single point.
- **International Airports:** Incineration of catering and cabin waste from aircraft according to international quarantine rules.
- **Organized Industrial Zones:** Shared-scrubbing disposal of non-recyclable waste from regional factories.

Key Design Advantages

In our high-capacity plants, waste is passed through shredders to achieve homogeneous sizing, then automatically loaded into the furnace via hydraulic ram-feeders. Human contact is zero.

> Through high-integrity door gaskets and negative pressure control, odor and smoke leakage to the surrounding environment is 100% prevented during operation.



Detailed Technical Specifications

YF-2000P Capacity, engineering, energy consumption, and physical parameters of the model.

PARAMETER DESCRIPTION	TECHNICAL VALUE / SPECIFICATION
Nominal Incineration Capacity	2000 kg / h
Primary Chamber Temperature	850°C - 950°C
Secondary Chamber Temperature	1100°C - 1200°C
Primary Burner Thermal Power	1.200.000 kcal/h
Secondary Burner Thermal Power	1.500.000 kcal/h
Feeding Door Dimensions	2200 mm x 1600 mm
Primary Chamber Volume	25.0 m³
Electrical Power Requirement	75.0 kW
External Dimensions (W x L x H)	4200 mm x 12000 mm x 4800 mm
Total Empty Weight	~ 80.000 kg
Waste Loading System	Manual or Hydraulic Ram Feeder
Ash Discharge System	Automatic Wet Ash Conveyor
Flue Gas Treatment System	Dry Scrubber + Reagent + Bag Filter
Control Automation	Siemens S7-1200 PLC & HMI

CAPACITY & OPERATING CONDITIONS NOTE

Stated capacities vary based on waste moisture (10–50%) and calorific value. Dry wastes with high plastic content reach upper limits, while highly humid organic waste requires continuous primary burner support.

Primary Combustion Chamber & Feeding Unit

Controlled gasification and initial thermal treatment of shredded homogeneous waste.

In our high-capacity YF-P series plants, the primary chamber is the main unit operating under sub-stoichiometric (oxygen-deficient) conditions, where waste is automatically fed via hydraulic ram-feeders or conveyor lines. Thanks to the pre-shredding process, waste spreads homogeneously across the hearth bed and undergoes uniform heat transfer. This extends refractory life, prevents uncontrolled flare-ups or thermal shocks, and maintains temperature between 800°C and 1000°C.

Continuous Hearth Design & Load Resistance

The hearth bed of high-capacity systems is armored with reinforced refractory castables and alloy steel plates to withstand heavy waste loads and mechanical wear. The automatic hydraulic ram mechanism feeds the waste into the primary chamber without disrupting internal draft or thermal stability.



- **Volume:** 4.8 m³ large internal volume allowing high volume waste acceptance at one time.
- **Burner Integration:** Automatic primary burner with flame length adjusted to furnace geometry.
- **Temperature Control:** Continuous furnace temperature monitoring with dual K-Type Thermocouples.
- **Wall Thickness:** A multi-layered refractory wall structure with a total thickness of 300 mm.

Secondary Combustion Chamber & Turbulence

High-temperature destruction of volatile gases and harmful emissions.

Half-burned hydrocarbon gases, volatile organic compounds (VOCs), and carbon monoxide released as a result of waste gasification in the primary chamber are transferred to the secondary combustion chamber (Post-Combustion Chamber) via gravity and the draft fan. In this chamber, gases undergo thermal oxidation at temperatures of at least 1100°C - 1200°C in an oxygen-rich (super-stoichiometric) environment.

Turbulent Gas Mixing & EU Compliance Criteria

The chamber geometry and the angle of the secondary air injection nozzles are designed to create a strong vortex (turbulence) in the gases. This turbulence maximizes destruction efficiency by ensuring 100% contact of oxygen molecules with unburned gases. To comply with environmental regulations (EU Directive 2000/76/EC), a minimum gas residence time of 2.0 seconds at 1100°C is guaranteed. This process ensures the complete decomposition of dioxin and furan chains.

> Since the inner surface of the secondary chamber is exposed to highly acidic gas, its refractory lining is built with specialized silica-alumina bricks possessing high corrosion resistance.

SECONDARY CHAMBER REACTION PARAMETERS

- **Minimum Operating Temperature:** 1100°C (1200°C limit for medical and toxic wastes).
- **Gas Residence Time:** Min. 2.0 seconds (EU standard).
- **Secondary Air Flow Rate:** PLC controlled modulated injection.
- **Oxygen Level:** Min. 6% free oxygen guarantee at the flue gas outlet.
- **Thermal Insulation:** Ceramic fiber blanket and calcium silicate backing boards.
- **Automatic Burner Control:** Automatic ignition system when the temperature falls below 850°C.

Refractory, Ceramic Fiber Insulation & Steel Body Architecture

1450°C resistant internal refractory lining and reinforced external steel construction.

The lifespan and thermal stability of incinerators are directly related to the refractory quality used. In MT Makina furnaces, a multi-layered modern refractory architecture is applied to prevent the transfer of internal temperatures to the outer steel frame and to minimize energy loss. The outer body is reinforced with steel profiles resistant to corrosion and thermal expansion stresses.

Refractory Layer Structure

- **Fire Face (Inner Layer):** Special refractory concrete casting or fireclay brick with high alumina content (60–85% Al2O3), resistant to 1450°C operating temperature.
- **Intermediate Insulation Layer:** Ceramic fiber blanket and calcium silicate boards with low thermal conductivity, resistant to 1260°C.
- **Chassis Insulation:** Rockwool and insulation mortars ensuring the furnace outer shell temperature remains at maximum 60°C.

Outer Chassis and Corrosion Protection

The outer body of the furnace is manufactured from ASTM A36 or equivalent structural steel plates. Areas subject to intensive mechanical loads and thermal stresses (door frames and waste inlets) are armored with **Hardox** wear plates. Chassis surfaces are protected with double coats of epoxy primer and high-temperature resistant industrial furnace paint.

> The multi-layer insulation structure increases the thermal efficiency of the furnace while reducing fuel consumption by up to 35%.



Modulating Burner Technology & Gas Control Station

Automatic modulated combustion equipment with high safety and multiple fuel options.

Maintaining the furnace internal temperature at the desired set points (850°C for the primary chamber, 1100°C for the secondary chamber) is achieved through precise control of the burner system. In the MT Makina YF series, industrial burners of proven global standard (Baltur, Riello, or Ecoflam) are used, operating fully integrated with the PLC automation panel.

Safety and Flame Control

On the burners are photocell (UV detector) sensors that constantly monitor the presence of flame. In case the flame goes out for any reason, safety solenoid valves on the fuel line shut off fuel flow within 1.2 seconds, preventing gas accumulation and explosion risks entirely.

Fuel Options

Burner systems, depending on customer request and facility infrastructure, suitable for Natural Gas (CNG/LNG), Diesel oil, or LPG fuel types olarak seçilebilir. Ayrıca çift yakıtlı (Dual-Fuel) brülör entegrasyonu da opsiyonel olarak sunulmaktadır.



Redmonster Integrated Automatic Feeding Line

Continuous feeding with Redmonster double-shaft shredder and zero human contact.

The key to efficiency in high-capacity waste disposal is the seamless integration of shredding and combustion. At the plant inlet, the Redmonster Series double-shaft shredder reduces large and resistant waste sizes to the ideal combustion profile in seconds. Shredded waste is then fed directly into the furnace via automatic conveyor belts and closed chutes. This fully sealed loop eliminates operator contact with hazardous medical, chemical, or municipal wastes, ensuring maximum occupational safety.

Stable Thermal Balance & Automatic Ram-Feeder

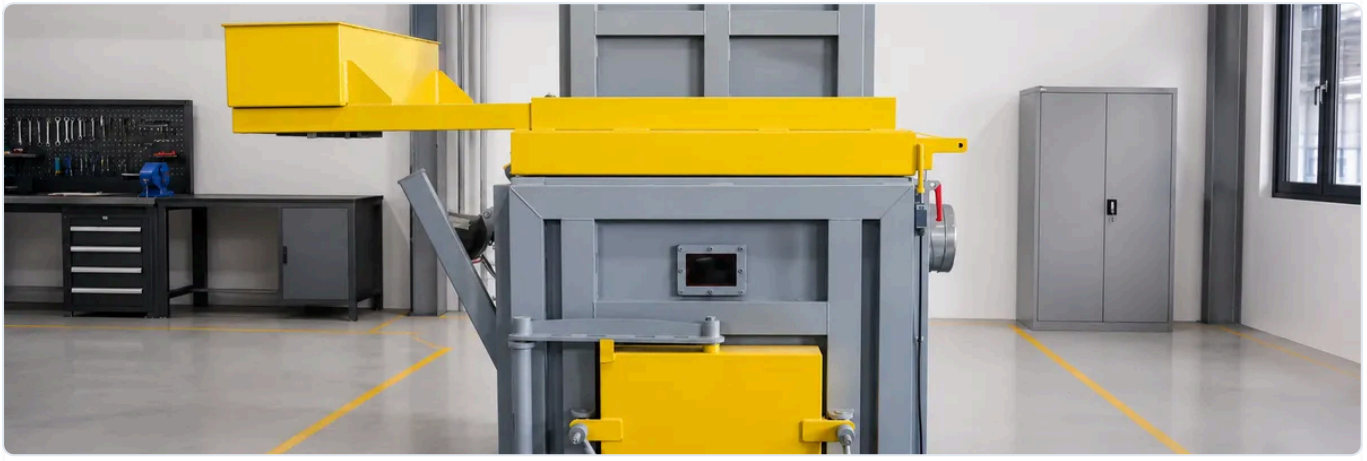
Manual feeding door openings cause cold air ingress and thermal fluctuations inside the furnace. In our high-capacity plants, the automatic conveyor belt and hydraulic ram-feeder mechanism preserve the negative pressure and high temperature stability thanks to their closed-loop design, saving auxiliary fuel.

GÜVENLİK KİLİDİ: Primer brülör çalışırken kapak açılmaz.

2. Automatic Conveyor Belt Feeding

Shredded waste from the Redmonster is continuously routed via sealed belts to the hydraulic ram feeder for automated injection.

REDMONSTER INTEGRATION: Fully integrated, closed loop and safe disposal.



Automatic Wet Ash Discharge System

Fully enclosed, dust-free automatic ash conveyor operating without furnace shutdown.

The greatest challenge in high-capacity combustion operations is managing the large volume of accumulated ash. Waiting for the furnace to cool down or shutting it down for manual cleaning causes significant capacity losses. In our YF-P series plants, ash falls directly from the hearth floor into a wet sealed chamber. Quenched ash is then continuously discharged by the automatic wet ash conveyor while the furnace remains fully operational, preventing dust from spreading.

Mechanical Lifespan & Redmonster Synergy

Waste reduced to the ideal size by the Redmonster shredder forms a much more stable and homogeneous ash structure at the hearth floor. This reduces friction and wear on the mechanical components of the automatic discharge conveyor, minimizing clogging risks and maintenance downtime.

ASH MANAGEMENT & DISCHARGE STANDARDS

- **Grate Material:** Chrome-nickel alloy cast grate with 1200°C thermal strength.
- **Manual Raking Interface:** Heavy-duty, double-gasketed ash removal door.
- **Sealing:** Silicone gasketed covers preventing air leakage in the furnace under negative pressure.
- **Ash Reduction Rate:** 95% volumetric and 90% mass disposal efficiency.
- **Ash Characterization:** Inert (harmless) mineral ash structure thanks to complete combustion.
- **Environmental Protection:** Integration of a dust collection hood preventing dust dispersion to the environment during dry discharge.

Dry Scrubber & Bag Filter System

Destruction of acidic compounds and fine particulates in high-flow flue gases.

High-flow flue gases generated during high-capacity solid and medical waste incineration must be filtered to strict standards before stack release. Our YF-P series plants employ a **Dry Scrubber + Reagent Injection + Bag Filter** combination instead of a standard wet scrubber. Slaked lime or sodium bicarbonate injected into the reaction column neutralizes acidic HCl, SOx, and NOx gases. Generated salts and fly ash are then captured in high-efficiency PTFE membrane bag filters.

Toxic Gas Destruction & Active Carbon

In addition to acidic neutralization, the system injects active carbon into the flue gas duct. The active carbon adsorbs dioxins, furans, and heavy metals like mercury on its surface, directing them to the bag filter. This process guarantees that plant emission levels remain well below the strictest international limits.



Dry Cyclone Separator & Particulate Capture

Separation of high-volume fly ash using mechanical centrifugal force before the bag filter.

In high-capacity furnaces, the high velocity of the flue gas carries a substantial amount of coarse fly ash and soot out of the chamber. Direct entry of these particles into the bag filter would cause rapid bag wear and clogging. In our YF-P series plants, gases pass through high-efficiency dry **Cyclone Separators** before entering the bag filter. The vortex generated inside the cyclone forces coarse dust against the walls, dropping them into the sealed hopper below.

Multicyclone Operating Principle

Gases enter the cyclone chamber tangentially at high velocity. The geometry creates a strong vortex. Due to centrifugal force, solid soot and dust particles heavier than the gas strike the walls, lose kinetic energy, and drop into the dust hopper at the bottom.



- **Temperature Resistance:** Steel body design capable of operating up to 400°C.
- **Zero Energy Consumption:** Operates purely on mechanical principles without electricity.
- **Easy Cleaning:** Easy Cleaning: A sealed, easily detachable dust collector bucket at the bottom.

PLC Control Panel and SCADA Integration

Safe management of the entire facility from a single screen, data logging, and remote telemetry support.

The YF-2000P incineration plant features fully automatic operation. Combustion air flow rates, burner modulation, kiln pressure, dosing rates, and safety interlocks are managed by Siemens or Schneider PLC. The operator controls the system via a color HMI touch screen.

Smart Sensor Integration

Pressure transmitters, thermocouples, pH probes, and flowmeters installed on the plant transmit real-time data to the PLC panel. The system processes these data to optimize combustion stability and minimize fuel consumption.

SCADA and Remote Service

Thanks to the built-in internet modem, MT Makina engineers can monitor operation data remotely, update parameters, and analyze faults, solving service needs without requiring on-site intervention.

HMI SCREEN PARAMETERS

- **Chamber 1 Temp:** 850°C - 950°C (Grafiksel Takip)
- **Chamber 2 Temp:** 1100°C (Emisyon Emniyet Kilidi)
- **Draft Pressure:** -15 Pa (Hafif Vakum Kontrolü)
- **pH level:** 7.2 (Otomatik Dozajlama Aktif)
- **System Status:** RUNNING - LIVE TELEMETRY

> The system logs all emission and operating temperature data for 1 year (compatible with USB export).



Environmental Emission Standards & Compliance

Comparison of facility emission values with European Union norms and legal limits.

YF-2000P is equipped with gas cleaning technologies capable of complying with the strictest environmental laws. The combination of 1100°C temperature and a minimum of 2 seconds residence time in the secondary combustion chamber with gas scrubbing systems reduces pollutants in the stack gas to far below legal limits.

POLLUTANT AGENT	EU LIMIT (2010/75/EU)	MEASURED VALUES
Total Particulate Matter (PM)	10 mg/m³	< 6.5 mg/m³
Carbon Monoxide (CO)	50 mg/m³	< 15.0 mg/m³
Sulfur Dioxide (SO_2)	50 mg/m³	< 8.0 mg/m³
Nitrogen Oxides (NOx)	200 mg/m³	< 120.0 mg/m³
Hydrochloric Acid (HCl)	10 mg/m³	< 2.5 mg/m³
Dioxins and Furans	0.1 ng-TEQ/m³	< 0.04 ng-TEQ/m³

CONTINUOUS EMISSION MONITORING (CEMS)

Through stack-mounted continuous emission monitors (CEMS), parameters like CO, O_2, dust, SO_2, and temperature are logged in real-time. The system supports direct remote data telemetry to national environmental databases.

Installation Site, Concrete Foundation & Assembly Guide

Tesisin kurulacağı beton zemin kaide gereksinimleri ve altyapı bağlantıları.

Since the waste incinerator is a heavy-duty system with thermal expansion characteristics, the installation floor and infrastructure must meet specific standards. Concrete foundation plans and utility connection drawings are delivered by MT Makina engineers to the client before shipment.

Foundation & Concrete Specification

The installation ground must be a reinforced concrete raft foundation of minimum **C25/30** class. Concrete thickness must be minimum 250 mm and designed with double-layer steel mesh reinforcement. The furnace foundation being perfectly level is critical for tension-free installation of piping and mechanical connections.

Installation Period

The on-site installation period, including modular parts assembly, piping, and electrical wiring, is on average **5–7 business days**. Upon completion, cold tests and hot commissioning (waste burning test) are performed under the guidance of an MT Makina supervisor.

INFRASTRUCTURE REQUIREMENTS

- **Electrical Power:** 380 V / 50 Hz, 32 A three-phase power line.
- **Fuel Line:** Diesel tank or min. 300 mbar gas connection line depending on burner type.
- **Water Connection:** Mains water at continuous 2–4 bar pressure for the scrubber (Softened water is recommended).
- **Compressed Air:** Min. 6 bar dry air for pneumatic loading door and filter cleaning.

COMMISSIONING AND ACCEPTANCE PROCESS PROTOCOL

1. Mechanical & Electrical Controls (Cold Tests):
After system installation, all motor rotation directions, fan flow rates, PLC signalings, burner ignition sequence, and air tightness gaskets are tested. Basic safety training is delivered to operators at this stage.

2. Incineration Test & Emission Measurement (Hot Tests):
The system is gradually heated to reach the operating temperature (1100°C). Capacity is verified by performing real waste loading. During commissioning, emission values are checked and reported with flue gas analyzers.

Periodic Maintenance & Operation Schedule

Routines and inspections required to maximize system lifespan and thermal efficiency.

Not neglecting periodic maintenance in industrial incineration plants is essential for the health of mechanical components and refractory structures operating under high temperatures. A detailed maintenance schedule is delivered to operators with the system.

MAINTENANCE PERIOD	INSPECTIONS AND OPERATIONAL STEPS
Daily Inspections	Clearing the ash drawer, burner photocell cleaning, inspection of air nozzles, checking scrubbing pH levels.
Weekly Inspections	Fuel filter cleaning, fan belt tension checks, pneumatic door piston seals, soot accumulation checks in exhaust ducts.
Monthly Inspections	Refractory wall wear check, thermocouple sensor calibrations, cleaning the scrubber pump impeller.
Yearly Maintenance	Local replacement of worn refractory, electrical panel terminal checks, ID fan bearing replacements, chimney sweeping.

ORIGINAL SPARE PARTS GUARANTEE

All critical refractory castables, thermocouple sensors, burner nozzles, and filter bags are stocked at MT Makina. Thanks to our rapid parts dispatch, downtime is kept to a minimum.

Occupational Health, Safety (OHS) & Protective Equipment

Operator safety and high-temperature protection systems in plant operation.

Waste incineration systems contain high temperatures, high-voltage electricity, fuel lines, and moving hydraulic or pneumatic components. Therefore, strict adherence to OHS rules during plant operation is mandatory to prevent accidents and injuries. All electrical safety lock mechanisms are active for system safety.

Mechanical & Electrical Interlocks

Waste loading doors are locked with limit switches and solenoid bolts to prevent manual opening when the internal temperature is not below limits or when the draft fan is off. The system warns with audible and visual alarms in case of critical failures on the HMI panel.

Emergency Scenarios

In case of power failure or overheating, burner fuel solenoid valves close instantly via spring-return safety valves. In addition, **Emergency Stop Buttons** are located at easily accessible points throughout the facility.

REQUIRED PROTECTIVE EQUIPMENT

- **High-Heat Gloves:** Use of sleeved aluminized gloves is mandatory during waste feeding and ash cleaning.
- **Heat-Protective Visor:** Visor with gold-coated shield protecting the face from high radiation heat.
- **Dust Mask:** Use of FFP3 class dust/ash mask is mandatory during ash removal.
- **Safety Shoes:** Steel-toed, puncture-resistant, antistatic protective boots.

“Geri Dönüşüm Sistemleri”

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