"Geri Dönüşüm Sistemleri"

MT MAKİNA LTD. ŞTİ.

MOBILE & CONTAINERIZED WASTE INCINERATION SYSTEM

YFM-20R

Plug-and-play independent waste disposal power built inside standard ISO containers for disaster zones, military bases, field hospitals, and temporary camps.



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Executive Preface

The vision that merges future zero-waste and on-site disposal goals with total mobility.

Waste management poses a massive operational burden in disaster zones, military bases, temporary field camps, and logistically remote settlements. Transporting wastes over long distances leads to high freight costs, environmental pollution risks, and epidemic transmission. Traditional landfill methods fail to provide a practical solution in these areas.

As MT Makina, we developed Lowbed, Container, and Trailer type mobile incineration systems that bring industrial power directly to the field. Our YFM series mobile incinerators aim to destroy waste at its source with zero harmful emissions. These systems are independent, plug-and-play installations integrated with their own generator, fuel tank, and scrubbers. This catalog details their thermal, mechanical, and logistical capabilities.



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

Mobile Disposal Principles

Thermal disposal cycle of waste on-site and at the source, independent of logistics.

Mobile disposal systems enable the on-site incineration of waste in emergency zones, military operations, or remote work sites without transportation. The skid-mounted or containerized structure brings the thermal disposal cycle directly to field conditions. Wastes are gasified and destroyed in the mobile unit's primary chamber, reducing volume by 95% and eliminating transport dependency.

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

ON-SITE DISPOSAL & LOGISTICS SAVINGS RATE

The mobile incineration system eliminates the need for waste transport, reducing logistics costs by **%100**. It eliminates on-site storage by destroying waste at the source and reducing its volume by 95%. It is a critical recovery tool in disaster zones.

In our mobile incinerators operating in the field, combustion gases are routed to an integrated secondary chamber working at 850°C - 1100°C. Gas residence time is minimum 2.0 seconds. Thanks to this high-temperature oxidation, our mobile units ensure smokeless and odorless operation even near residential areas.

YFM-20R General Description

Plug-and-play independent disposal power built inside ISO containers for disaster zones, temporary camps, and military bases.

Our mobile incinerators are plug-and-play disposal systems built inside standard ISO 20ft or 40ft containers, integrated with their own generator and fuel tank, designed for disaster zones, military camps, field hospitals, and temporary settlements. All equipment complies fully with transport standards.

Primary Applications

- **Disaster Zones:** Emergency on-site disposal of contaminated waste generated after earthquakes, floods, or hurricanes.
- **Military Operations:** Mobile waste cleaning in field operations where troops relocate.
- **Field Hospitals:** On-site incineration of medical waste in epidemic or emergency situations without contamination.
- **Ports & Border Gates:** Rapid disposal of quarantined customs and ship wastes.

Key Design Advantages

Our mobile incinerators are built inside CSC-certified containers compliant with ISO standards, built to withstand harsh terrain. They are fully suitable for maritime or land transport.

> 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

YFM-20R Capacity, engineering, energy consumption, and physical parameters of the model.

PARAMETER DESCRIPTION	TECHNICAL VALUE / SPECIFICATION
Nominal Incineration Capacity	20 kg / h
Primary Chamber Temperature	850°C - 950°C
Secondary Chamber Temperature	1100°C - 1200°C
Primary Burner Thermal Power	100.000 kcal/h
Secondary Burner Thermal Power	120.000 kcal/h
Feeding Door Dimensions	600 mm x 600 mm
Primary Chamber Volume	0.5 m³
Electrical Power Requirement	4.0 kW
External Dimensions (W x L x H)	1200 mm x 1800 mm x 1800 mm
Total Empty Weight	~ 3.500 kg
Waste Loading System	Manual or Hydraulic Ram Feeder
Ash Discharge System	Manual Ash Raking
Flue Gas Treatment System	Wet Scrubber Tower
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 Chamber

Special refractory structure resistant to trailer vibrations and gasification cycle.

The primary chamber is where waste is directly fed and the combustion cycle begins. Since mobile units are in constant transport, monolithic castable refractory reinforced with steel mesh is used to prevent bricks from loosening or cracking. The primary chamber operates in an oxygen-depleted (sub-stoichiometric) atmosphere. This restricted pyrolysis prevents sudden flare-ups, allowing wastes to gasify stably.

Mobile Frame & Air Control Infrastructure

Air injection to the primary chamber is provided via high-pressure fans and air distribution manifolds integrated into the trailer or container floor. The PLC control unit automatically adjusts primary air flow via a frequency inverter based on data from chamber temperature sensors.



- **Volume:** 4.8 m^3 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.



Loading and Feeding Units

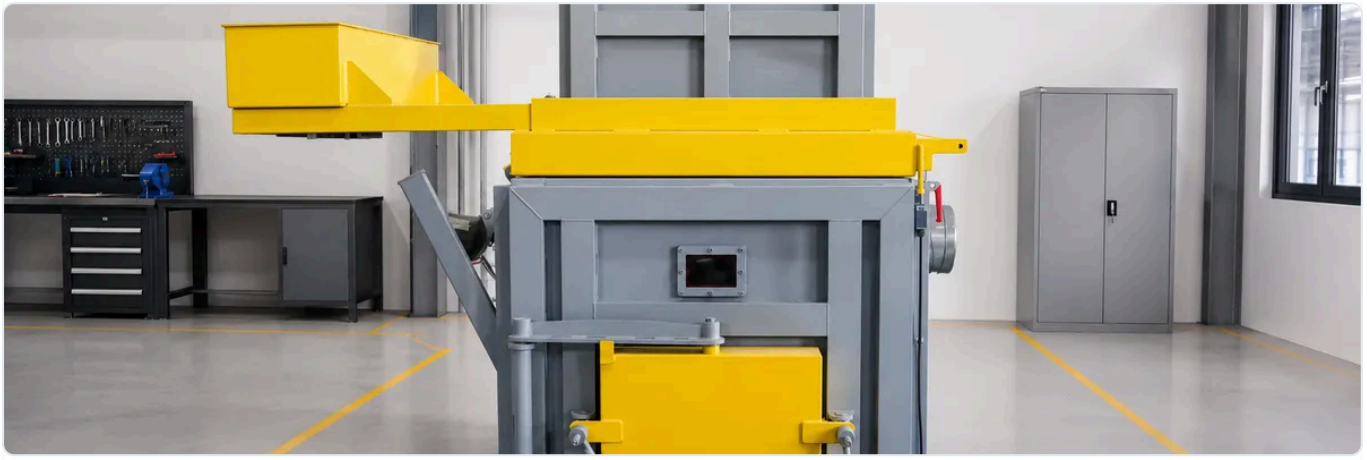
Odor-sealed manual or automatic hydraulic loading solutions tailored for mobile field operations.

In mobile incinerators, transferring waste safely into the furnace is critical to maintain negative pressure and prevent harmful gas leaks to the environment. In the YFM series, two different loading options are available depending on the field and waste type. Container models (K) favor top-hatch crane loading, while trailer models (R) use rear manual sliding pneumatic doors.

Mobile Loading Stations

These are sliding door designs driven by trailer-mounted pneumatic or hydraulic cylinders. When the operator presses the button, the door opens automatically and waste flows into the chamber via gravity.

GÜVENLİK KİLİDİ: Primer brülör çalışırken kapak açılmaz.



Ash Grate & Discharge Systems

Sealed ash collection trays and easy discharge mechanisms integrated into the mobile chassis.

After the incineration cycle is complete, mineral ash accumulated at the bottom must be discharged. YFM series mobile incinerators feature vibration-resistant cast grates and a sealed, sliding ash collection drawer at the bottom. This drawer system prevents dust release by 100%, protecting the environment and operator from ash contact.

Manual Ash Extraction Tray

This is a drawer made of heat-resistant steel, positioned below the high-alloy grate at the furnace bottom. Once the incinerator is shut down and cooled, it can be easily pulled out and emptied.

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.

Flue Gas Cleaning – Wet Scrubber

Compact gas washing tower with PP body and neutralization system integrated into the mobile chassis.

High-temperature gases exiting the secondary chamber must be cleaned before safe discharge to the atmosphere. YFM series mobile incinerators feature a compact, vertically designed **Wet Scrubber** unit tailored for frame limits. In this corrosion-resistant PP or stainless steel tower, flue gas is washed under a water curtain, neutralizing acidic pollutants.

Integrated Circulation Tank

Positioned under the mobile unit, this is a sealed water tank housing water circulation pumps and chemical dosing stations. Closed-loop water circulation minimizes the need for a continuous external water connection.



Dry Filtration & Cyclone Separators

Compact dry cyclone design capturing volatile dust particles at the mobile chimney output.

Since chimney height is restricted in mobile systems, gases are first passed through a dry-type **Multi-cyclone Dust Separator** to prevent fly ash and soot from spreading. Operating via centrifugal force, this system drops coarse soot particles into a bottom collection chamber. This pre-cleaning reduces emissions and prevents wet scrubber clogging.

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 YFM-20R 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.

YFM-20R 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.

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MT MAKİNA LTD. ŞTİ.

THERMAL DISPOSAL TECHNOLOGIES

HEADQUARTERS & ADDRESS

Cumhuriyet Mah. 1983 Sk. Kent Palas 2
Kat:7 D:85 Esenyurt / Istanbul / Turkey

E-POSTA

info@mtmakina.com.tr

CONTACT LINES

Tel: +90 850 259 01 66

Tel: +90 212 671 74 55

WhatsApp: +90 542 310 99 30

WEBSITES

www.incinerator.com.tr
www.mtmakina.com.tr