# GUIDELINES FOR PROCESSING AND USING REFUSE DERIVED FUEL (RDF) IN CEMENT INDUSTRY

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## PREAMBLE

Pakistan has 29 cement plants with total installed capacity of 44 million tons. The shortage of natural gas and increasing cost of oil and coal has adversely affected cement production in the country. The cement entrepreneurs are exploring different venues to supplement their fuel requirement and bringing down their cost of production. One of the options for them is to use certain percentage of refuse as fuel, as being practiced in other countries. A number of cement units have approached federal and provincial Environmental Protection Agencies for issuance of consent under the environmental laws for processing and use of Refuse Derived Fuel (RDF). The RDF system should guarantee the minimum environmental contamination during manufacturing processes and, at the end of their working life and guarantee the elimination of waste through recycling method. All obligations and responsibilities imposed by the Pakistan Environmental Protection Act, 1997 and rules and regulations made thereunder continue to apply and a proponent may still be liable if harm arises from the use of RDF.

## OBJECTIVE OF GUIDELINES

2. The objective of these Guidelines is to provide guidance for processing and using RDF as supplementary fuel in the cement manufacturing and to prescribe procedures for monitoring of emissions.

## SCOPE OF GUIDELINES

3. These Guidelines are reference document for processing and using RDF as supplementary fuel in cement industry whether in the public or private sector. These Guidelines provide the minimum requirements that a cement industry should meet.

## DEFINITIONS

4. The following definitions shall be used in these guidelines unless there is anything repugnant in subject context or contrary to the Pakistan Environmental Protection Act, 1997, rules, regulations and standards made thereunder.-

(a) “authorized officer” means an officer authorized by the Federal or Provincial Government for the purposes of these Guidelines

(b) “certified laboratory” means any laboratory certified under the National Environmental Quality Standards (Certification of Environmental Laboratories) Regulations, 2000.

(c) “consignment ” means a batch of municipal solid waste or RDF procured under a purchase order;

(d) “"municipal solid waste" means non-hazardous discarded material generated in residential, commercial, institutional, and light industrial units but excludes automobile oil, tires, lead-acid batteries, hazardous or infectious wastes, demolition debris, etc.

(e) “pollution control device” means a device installed at cement kiln or any other equipment to filter or remove particulate matter and other emissions which may include electrostatic precipitator or a bag-house filter.

(f) “storage area” means a site where RDF is accumulated within a structure that is not completely enclosed; and which comply with guidelines and relevant local/national laws.

(g) “Refuse derived fuel (RDF)” means a fuel that is produced by shredding and by completely shredding/cutting them into pieces for use as supplemental fuel dehydrating municipal solid waste with a waste converter technology.

## QUALITY OF REFUSE DERIVED FUEL

5. Municipal Solid Waste (MSW) contains non-combustible items such as metals and glasses. It is desirable that such items are separated from the waste before processing for RDF. No MSW containing industrial hazardous waste be used or processed for RDF. MSW is always rich in bacteria and viruses, disinfection through fumigation makes it safe for handling and safety of employees. Failure to meet the requirements of these guidelines may result in the concerned EPA determining that the material being used remains a waste and is subject to regulation as such in accordance with the environmental laws.

## TRANSPORTATION AND STORAGE

6. The transportation and storage arrangements for MSW or RDF should be done in a manner that no odor is spread in the atmosphere. The cement unit will address this issue in the Environment Management Plan to be submitted to concerned EPA. A proper system for spraying deodorant should be put in place. MSW should be properly covered during transportation and there should be no spill out of MSW during haulage. The company processing or using RDF shall workout appropriate materials flow and stockpile management plan to avoid excessive accumulation of waste material or RDF. Due attention should be paid to control leachate produced from MSW during storage. MSW Storage on unpermeable concrete platform should be provided to avoid seeping of leachate into soil. While designing storage area, attention should also be paid to avoid spread of leachate particularly due to rain.

## PROCESSING OF MSW

7. The processing of MSW for conversion into RDF should be carried out under closed shed. During RDF processing, collection, transportation, size reduction, bailing, and storage, the spread of odor should be strictly controlled through de-odorants.

## DETERMINATION OF RDF QUANTITY:

8. RDF is a co-incineration fuel used in combination with main recommended fuel by the manufacturer of the cement plant. The maximum quantity of RDF to be used shall be determined after carrying out emission tests at individual unit through third party under supervision of concerned EPA. No cement unit will be allowed to use RDF quantity beyond the limit set out. However, cement units can be allowed to use a greater proportion RDF provided they improve performance of pollution control system and after re-checking emission levels by concerned EPA.

9. Each cement factory will get its feeding system and pollution control technologies/equipment inspected before the use of RDF as fuel. For this purpose, a team of concerned EPA, within 15 working days from the receipt of inspection request, will assess the facilities of the cement unit and will witness the test trial of use of RDF.

## KILN FEEDING SYSTEM

10. Uncontrolled and disproportionate feeding of RDF could lead to toxic emission of gases from kiln stack. There is need to properly install automatic RDF feeding/weighing system and maintain record. In case of higher concentrations than the emission limits mentioned in the Guidelines are observed due to tripping or malfunctioning of pollution control device of the kiln, the RDF feeding system should automatically stop immediately.

## KILN BURNING SYSTEM

11. Two operating conditions viz. operating temperature and retention time are of utmost importance for avoiding production of dioxin and furan. Operating temperature in cement kiln, which is over 1550$^{o}$C, and retention time of 3 to 6 seconds in above 1200$^{o}$C, is well suited for the safe and efficient consumption of RDF.

## COMBUSTION AND POLLUTION CONTROL DEVICES

12. The level of emissions from any furnace / kiln is highly dependent on the way in which it is operated and process is controlled. In general emissions are likely to increase when operated in unstable conditions. Emissions being released from the burning of RDF in uncontrolled and controlled conditions are different. In the former case RDF burning especially at low temperatures, causes generation of highly toxic gases and compounds like dioxin/furan.

13. In Pakistan, almost all cement units are equipped with some kind of anti-pollution devices to control emission of gases and particulate matter. The majority of the cement units are fitted with electrostatic precipitators (EPs). Some units frequently come across tripping or breakdown of EPs causing excessive emission of kiln flue gases and particles. Under this condition, use of RDF as fuel would allow free emission of toxic gases. Much emphasis therefore should be given on performance of pollution control devices while using RDF as fuel. Besides electrostatic precipitators, scrubbers should be used where required to clean out hazardous gases. All the anti-pollution devices should be kept in good operating condition.

## EMISSION LIMITS

14. Cement unit using RDF should comply with the National Environmental Quality Standards (NEQS) and the following emission limits:

| | **Parameters** | **Permissible Limit** mg/$Nm^3$ unless specified | | **Testing Frequency/ Method** | **Test Duration** | **Reporting Frequency to EPA** |
|---|---|---|---|---|---|---|
| | Smoke | 40% or 2 Ringlemann Scale or equivalent smoke number | | Bi annually by smoke meter or Ringlemann scale. | 30 min | Bi annually |
| 1. | Particulate Matter(PM) | 300 | | Online | 30 min | Monthly |
| 2. | Oxides of Nitrogen (NOx): | Oil Fired | 600 | Online | 30 min | Monthly |
| | | Gas Fired | 400 | | | |
| | | Coal Fired | 1200 | | | |
| 3. | Carbon Monoxide (CO) | 800 | | Online | 24 hrs | Monthly |
| 4. | Sulphur dioxide($SO_2$) | 1700 | | Bi annually by spectrophotometric method | 30 min | Bi annually |
| 5. | Dioxin and Furan | 0.10 ng TEQ/$Nm^3$ | | Annually by HRGC/HRMS | 8 hrs | Annually |

| | | | | | |
|---|---|---|---|---|---|
| 6. | Arsenic | 20 | Bi annually by Atomic Absorption. | 2 hrs | Bi annually |
| 7. | Cadmium &Thallium | 20 | Bi annually by Atomic Absorption. | 2 hrs | Bi annually |
| 8. | Nickel | 20 | Bi annually by Atomic Absorption. | 2 hrs | Bi annually |
| 9. | Zinc, | 200 | Monthly by Atomic Absorption. | 2 hrs | Monthly |
| 10. | Mercury | 10 | Bi annually by Atomic Absorption. | 2 hrs | Bi annually |
| 11. | Chromium | 0.50 | Bi annually by Atomic Absorption. | 2 hrs | Bi annually |
| 12. | Vanadium | 0.50 | Annually by Atomic Absorption. | 2 hrs | Annually |

**TESTING FACILITIES**

15. It is desirable that cement industry using RDF should have in-house capacity for measuring levels of conventional pollutants like, PM, CO, NOx, using reliable emission analyzers (US EPA compliant). The staff should be trained to independently check emission of heavy metals as prescribed in the above standards. In absence of the facility, the services of EPAs or approved / laboratories certified under Certification of Environmental Laboratories Regulations 2000 dated 10-02-2000, should be acquired for monitoring the emission, including heavy metals as per the timescale defined above.

**MONITORING AND REPORTING:**

16. Every cement unit burning RDF will be registered under with concerned EPA. Cement industry will monitor the level of PM, CO, NOx using own reliable online emission analyzers and maintain record and also report the same to the concerned EPA in accordance with the frequency mention in the table under heading “emission limits”. Cement industry will also report to the concerned EPA on monthly basis the quantity of RDF used.

## ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN (EMP):

17. Cement industry desiring processing and utilization of RDF will prepare and submit Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE), as the case may be alongwith detailed EMP to concerned EPA before starting actual work. The EMP shall be prepared considering these Guidelines as well as the obligations under the prevailing environmental laws. The company involved in processing and usage of RDF may also obtain ISO 14000.

## TRAINING OF STAFF

18. The staff involved in manufacturing processing or usage of RDF should be well trained. The company should actively promote the internal training of staff and should be fully acquainted with the environmental management practices prescribed under ISO 14000.

## INVOLVEMENT OF COMMUNITY

19. The management may invite public representatives and duly brief them about their plan for processing and using RDF. The community should be educated on the pollution control measures while processing and using RDF.