

GUIDELINES FOR USING TIRE DERIVED FUEL (TDF) IN
PAKISTAN 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 have 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 old tires in shredded form as fuel, as being practiced in other countries. A number of cement units have approached federal & provincial Environmental Protection Agencies for issuance of consent under local, national & international obligations for import, processing and use of Tire Derived Fuel (TDF).

OBJECTIVE & SCOPE OF THE GUIDELINES:

Objective:

2. The objective of these Guidelines is to provide guidance for using TDF in the cement manufacturing kilns and prescribe procedures for monitoring of emissions.

Scope:

3. These Guidelines are reference document for using TDF in cement industry whether owned by public or private sectors. These Guidelines provide the minimum practice required to be followed in cement industry.

DEFINITIONS:

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, regulation 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 TDF procured under a purchase order;

- (d) “pollution control device” means a device installed at cement kiln to filter or remove particulate matter and other emissions which may include electrostatic precipitator or a bag-house filter.
- (e) “storage area” means a site where TDF is accumulated within a structure that is not completely enclosed; and which comply with guidelines and relevant local/national laws.
- (f) “tire derived fuel(TDF)” means a fuel that is derived from end of life scrap tires by completely shredding/cutting them into pieces for use as supplemental fuel.

PERMISSION TO IMPORT TDF:

The import in the country is governed by the Import Policy as announced by the Federal Government from time to time and the international conventions and protocols to which Pakistan is a party. No cement unit is allowed to import or use TDF without obtaining consent from concerned Environmental Agency and the Designated National Authority (DNA) of the related international convention/protocol. The following criteria and standards shall apply to award consent to the cement unit desirous to import or use TDF in the country:

1. QUALITY OF TIRE DERIVED FUEL:

A clean TDF is composed of about 88% of carbon and oxygen, which accounts for its rapid combustion and relatively high heating value. Cement unit will procure clean, properly sized (≤ 2 inch), high-energy-content tire derived fuel as far as possible. Each consignment of TDF will be accompanied by a certificate from DNA of the exporting country verifying that the consignment of TDF does not contain or is contaminated with hazardous substances or wastes as defined in section 2 of sub-section (xviii) and (xix) of the Pakistan Environmental Protection Act 1997 or included in Annexure IX of the Basel Convention. The Authorized Officer of EPA will check quality of TDF as and when deemed necessary.

2. TRANSPORTATION AND STORAGE:

The transportation and storage arrangements for TDF shall comply with the guidelines framed under section 14 of Pakistan Environmental Protection Act, 1997. In addition the cement industry should modify its fire fighting plan and procedure to include and respond to the potential fire risks and hazards associated with transportation storage, and usage of TDF. Special attention should be given to the fire protection measures on the feeding end of the cement kiln.

3. DETERMINATION OF TDF QUANTITY:

Normally, a cement unit utilizes 15-30% TDF of the total heat input. The exact maximum quantity 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 TDF quantity beyond the limit set out. However, cement units can be allowed to use a greater proportion TDF provided they improve performance of pollution control system and after re-checking emission levels by concerned EPA.

4. KILN FEEDING SYSTEM:

Uncontrolled and disproportionate feeding of TDF could lead to toxic emission of gases from kiln stack. There is need to properly install automatic TDF 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 TDF feeding system should automatically stop immediately.

5. KILN BURNING SYSTEM:

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 1650°C, and retention time of 3 to 6

seconds in above 1200°C, is well suited for the safe and efficient consumption of TDF.

6. COMBUSTION AND POLLUTION CONTROL DEVICES:

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 TDF in uncontrolled and controlled conditions are different. In the former case TDF burning especially at low temperatures, causes generation of highly toxic gases and compounds like; Poly-aromatic hydrocarbons, dioxin/furan, hydrogen chloride, benzene, polychlorinated biphenyls (PCBs). Metals such as arsenic, cadmium, nickel, zinc, mercury, chromium, and vanadium are also emitted. Exposure to emissions from tire burning in uncontrolled conditions could cause irritation to skin, skin, eyes, and mucous membranes, central nervous system, depression, respiratory disorders and cancer.

Firing of TDF under controlled condition at higher temperature is considered safe. According to US EPA, “with the exception of zinc emissions, potential emissions from TDF are not expected to be very much different than from other conventional fossil fuels, as long as combustion occurs in a well-designed, well-operated, and well-maintained combustion device. The operating gas temperatures in cement kilns is over 1650°C and is well suited for the safe and efficient combustion of TDF along with other conventional fuel due to extremely high toxic gases destruction efficiency”.

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 TDF as fuel would allow free emission of toxic gases. Much emphasis therefore should be given on performance of pollution control devices while using TDF as fuel. Besides electrostatic precipitators, scrubbers may be used where required to clean out hazardous gases e.g. Benzene PAH_s or PCB. All the anti-pollution devices should be kept in good operating condition.

7. EMISSION LIMITS:

Cement unit using TDF should comply with the following emission limits:

	Parameters	Permissible Limit mg/Nm ³ unless specified	Testing Frequency	Test Duration	Reporting Frequency to EPA
	Smoke	40% or 2 Ringlemann Scale or equivalent smoke number	Bi annually	30 min	Bi annually
1.	Particulate Matter(PM)	300	Online	30 min	Monthly
2.	Oxides of Nitrogen (NOx)	400	Online	30 min	Monthly
3.	Carbon Monoxide (CO)	800	Online	24 hrs	Monthly
4.	Sulphur dioxide(SO ₂)	1700	Bi annually	30 min	Bi annually
5.	Dioxin and Furan	0.10 ng TEQ/Nm ³	Bi annually	8 hrs	Bi annually
6.	Arsenic	20	Bi annually	2 hrs	Bi annually
7.	Cadmium &Thallium	20	Bi annually	2 hrs	Bi annually
8.	Nickel	20	Bi annually	2 hrs	Bi annually
9.	Zinc,	200	Monthly	2 hrs	Monthly
10.	Mercury	10	Bi annually	2 hrs	Bi annually
11.	Chromium	0.50	Bi annually	2 hrs	Bi annually
12.	Vanadium	0.50	Bi annually	2 hrs	Bi annually
13.	THC (Total Hydrocarbons)	100	Online	2 hrs	Monthly
14.	Chlorine	150	Bi annually	2 hrs	Bi annually
15.	PAHs	2 ug/Nm ³	Bi annually	2 hrs	Biannually

8. TESTING FACILITIES:

It is desirable that cement industry using TDF should have in-house capacity for measuring levels of conventional pollutants like, PM, CO, NOx, SO₂, THC using own reliable online emission analyzers. 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 / certified

laboratories should be acquired for monitoring the emission, including heavy metals as per the timescale defined above.

9. MONITORING AND REPORTING:

Every cement unit burning TDF will be registered under self monitoring and reporting tool (SMART) with concerned EPA. Cement industry will monitor the level of PM, CO, NO_x, SO₂ and THC 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 include the following information and report to the concerned EPA on monthly basis;

- a. Quantity of TDF imported
- b. quantity of TDF used
- c. Amount of coal/fuel substituted.

10. ENVIRONMENTAL MANAGEMENT PLAN (EMP):

Cement industry desiring utilization of TDF will prepare a detailed EMP and submit to the concerned EPA. The EMP shall be prepared considering these Guidelines as well as the obligations under the prevailing environmental laws.

11. INVOLVEMENT OF COMMUNITY:

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