TEREX

INTERNATIONAL ACADEMY OF ENVIRONMENTAL SANITATION AND PUBLIC HEALTH
IAESPH

TEXCON

Opportunities in C&D Waste and Legacy Waste Management

Dr N B Mazumdar
Chairman, International Academy of Environmental Sanitation and Public Health
New Delhi

Bangalore, 5th October 2023

Structure of this presentation

In today's short presentation, the following issues would be discussed:

- Business opportunities in C&D waste management
- The first commercial C&D waste processing plant in India
- Business opportunities in a new area – legacy waste management
- Regulatory aspects
- Technical aspects of C&D waste management
- Technical aspects of legacy waste management

INTERNATIONAL ACADEMY
OF ENVIRONMENTAL SANITATION
AND PUBLIC HEALTH

IAESPH

Business opportunities in C&D waste management

C&D waste management

- Appropriate management of construction and demolition waste is vital for overall Municipal Solid Waste Management (MSWM) as it will contaminate the other components, particularly the biodegradable portion. This will save significant areas of land used for dumping.
- This is still not practiced in majority of the municipalities although the C&D Waste Management Rules, 2016 has been notified and the IS 383 code has been modified to accommodate utilisation of processed C&D waste.
- At the same time, medium to large plants have been actually set up from 2009 having capacities of 150-2000 TPD.
- While planning for setting up C&D waste management plant, the waste should be analysed, quantity measured for about a year and the market for recycled products surveyed. Then the system for storage, collection and processing plant should be planned / designed.

C&D waste generation in 10 cities (2015) GIZ and DA

Sl. No.	City	Daily generation (MTPD)*	Annual generation (MTPA)
1	Delhi	4600	1.38
2	Mumbai	2500	0.75
3	Chennai	2500	0.75
4	Kolkata	1600	0.48
5	Bengaluru	875	0.26
6	Ahmedabad	700	0.21
7	Patna	250	0.08
8	Jaipur	200	0.06
9	Coimbatore	92	0.03
10	Bhopal	50	0.02

*MTPD – million tons per day
Utilisation of Recycled Produce of Construction and Demolition Waste, BMTPC 2018 – 100 million tons per year

Business opportunities in C&D waste management

- **Modification of IS 383: 2016 has significantly expanded the scope of this business**
- Manufactured fine aggregate (Manufactured sand):
  - Iron slag aggregate
  - Steel slag aggregate
  - Copper slag aggregate
  - Recycled concrete aggregate
  - Bottom ash from Thermal Power Plant
- Manufactured from other than natural source:
  - Iron slag aggregate
  - Steel slag aggregate
  - Recycled concrete aggregate
  - Recycled aggregates
- **Note: Iron slag aggregates already used by CSIR-CRRI in border roads and appreciated by the Hon'ble PM**

IS 383: 2016 – Extent of utilization for different aggregates and fines

Type of aggregate	Maximum utilization permitted %		
	Plain concrete	Reinforced concrete	Lean concrete (less than M15 grade)
Coarse aggregate			
Iron slag aggregate	50	25	100
Steel slag aggregate	25	Nil	100
Recycled concrete aggregate (RCA)	25	20 (up to M 25 grade)	100
Recycled aggregate (RA)	Nil	Nil	100
Bottom ash from thermal power plants	Nil	Nil	25
Fine aggregate			
Iron slag aggregate	50	25	100
Steel slag aggregate	25	Nil	100
Copper slag aggregate	40	35	50
Recycled concrete aggregate	25	20 (up to M 25 grade)	100

The first commercial plant in India for processing C&D waste

- The first plant was set up at Burari area in Delhi in a 7 acre plot allotted by the Municipal Corporation of Delhi in 2009.
- The concessionaire IL&FS Environmental Infrastructure & Services Ltd (IEISL) developed the facility completely indigenously through rigorous R&D work between 2009-2014.
- This included development of technology – first ‘dry’ process followed by ‘wet’ process followed by product development and marketing efforts.
- Initially 500 TPD plant was installed along with development of storage, collection and transport mechanism. Later capacity was increased to 2000 TPD.
- The effort led the Government to formulate an elaborate set of C&D Waste Management Rules in 2016, separate from the Solid Waste Management Rules.
- Marketing was helped by BIS by amendment of IS 383: 2016, which also included industrial waste slag from Iron, Steel and Copper plants and bottom ash from thermal power plants.
- Subsequently another processing plant of 500 TPD was installed at Shastri Park, Delhi.

C&D waste processing plant – dry process at Burari, Delhi

C&D waste processing plant (wet process) at Burari in Delhi

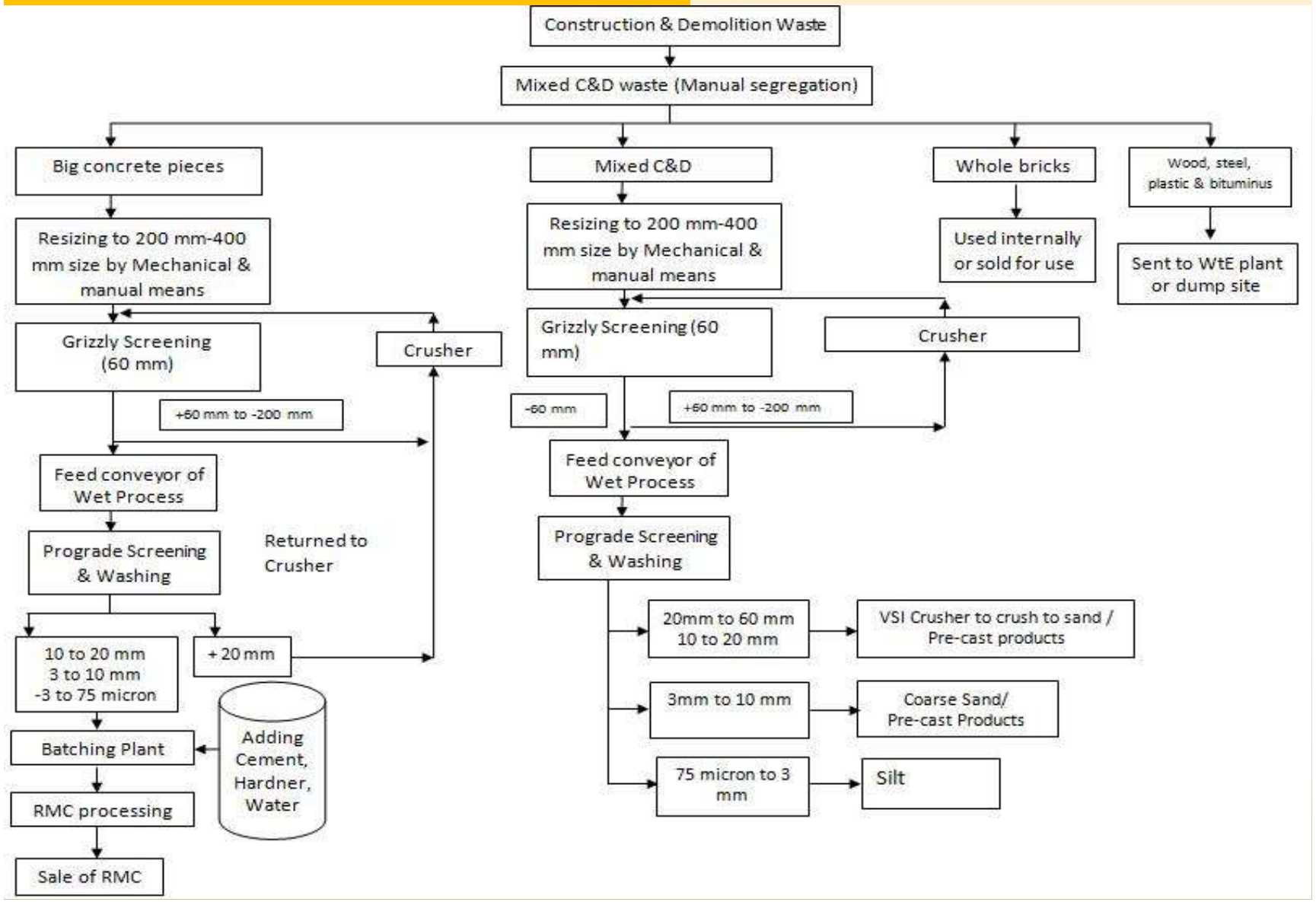
Wet processing plant

Coarse aggregate

Sand

Value added products from processed C&D waste

Processing of C&D Waste



C&D Management Processing Facilities in India

Sl. No.	City	Location	Processing capacity MTPD
1	Delhi	Burari Shastri Park Mundka	2000 500 150
2	Noida	Sector 80	150
3	Gurugram	Basai	300
4	Ghaziabad	Ghaziabad	150
5	Thane	Daighar	300
6	Indore	Devguradia	100
7	Hyderabad	Jeetimedla	300
8	Bengaluru	Chikkajala Kannur	1000 750
9	Ahmedabad	Gyaspur Pirana	1000
10	Tirupati	Tukivakam village	150
11	Vijayawada	Vijayawada	200
12	Chandigarh	Industrial Area phase I	150
13	Surat	Surat	300

Business opportunities in a new area – legacy waste management

- Every urban agglomeration in India has one or more dumpsites for disposal of municipal solid waste.
- Large metropoles have huge dumpsites which have become famous over the decades, e.g., Ghazipur dumpsite containing more than 14 million tons of dumped material, closely followed by the dumpsites at Bhalswa and Okhla in Delhi and Deonar in Mumbai, Kodungayur in Chennai and Dhapa in Kolkata.
- Both C&D waste as well as legacy waste occupy significant land area without any productive use

Basically, there are two options:

- To cover the dumpsite scientifically after planning all the aspects including post care.
- To recover the land blocked by the dumped waste material (also known as '**bio-mining**').
- The 2nd option gives rise to a new area developed by CSIR-CRRI

Scope in legacy waste management

- CSIR-CRRI has done very innovative work with processed legacy waste from old municipal solid waste dumpsites in Delhi
- Their R&D work and innovative laboratory studies concluded that 65-70% of the landfill waste (Legacy waste) can be suitably used in road embankment construction.
- They carried out the required geotechnical tests (grain size analysis, Standard Proctor Compaction Test, Direct Shear Tests, Consolidation Tests Permeability Tests etc.)
- The segregated legacy waste was tested for presence of heavy metals like Zinc, Cadmium, Lead, Mercury, Cobalt, Chromium etc. which were found to be within limits prescribed by the Solid Waste Management Rules, 2016

Scope in legacy waste management

- A code has been developed by the Indian Roads Congress (IRC:SP: 132 - 2022)
- **This material has the potential to be used as road embankment material for different categories of roads** (from rural roads to national highways). The segregated MSW material shall be <75mm as specified by MoRTH (Ministry of Road Transport and Highways) as requirement for conventional soil (***IRC:SP: 132 – 2022 "Guidelines on use of Industrial Wastes for Road Embankment and Subgrade Construction", Indian Roads Congress***)

Policy and Regulatory Issues

- Different types of waste are generated – particularly in urban areas, but their management is inter-related
- Hence the Government of India had notified 6 rules in 2016:
    1. Solid Waste Management Rules, 2016
    2. **Construction and Demolition Waste Management Rules, 2016**
    3. Bio-Medical Waste Management Rules, 2016
    4. Plastic Waste Management Rules, 2016
    5. E-Waste Waste Management Rules, 2016
    6. Hazardous and other Waste (Management and Transboundary Movement) Rules, 2016
    7. Batteries (Management and Handling) Rules 2001, Amended in 2010 was also notified

Relevant Guidelines and Reports from the Government of India and other organizations

To assist implementation of the rules, the Government of India has published elaborate Guidelines from to time, some important ones relating to C&D waste management are:

- Municipal Solid Waste Management Manual (3 parts), Ministry of Urban Development, 2016 (contains section on C&D waste management)
- Resource Efficiency in the Indian Construction Sector: Market Evaluation of the Use of Secondary Raw Materials from Construction and Demolition Waste, GIZ and DA, New Delhi (2015).
- Construction and Demolition Waste. New Delhi, GIZ.
- Recycling, use and management of C&D wastes, ICI Bulletin 01 (Report of Technical Committee), Indian Concrete Institute, October 2015.
- Guidelines for use of construction and demolition waste in road sector, IRC: 121-2017, Indian Road Congress, 2017.
- Utilisation of produce of Construction and Demolition Waste: a Ready Reckoner, BMTPC (Building Materials & Technology Promotion Council), 2018, Min. of Housing and Urban Affairs, GoI.

Relevant Guidelines and Reports from the Government of India and other organizations

- Utilisation of Municipal Solid Waste in Road Embankment, CSRI-CRRI (Central Road Research Institute), sponsored by NHAI, 2016.
- Guidelines on use of Industrial Wastes for Road Embankment and Subgrade Construction,

  IRC:SP: 132 – 2022, Indian Roads Congress.

Government support examples

Delhi Advisory on use of recycled material

- Delhi PWD issued an advisory to all Delhi Government Departments in 2015, mandating 2- 10% use of recycled C&D waste products in building construction and road works.
- Was reissued by the Delhi PWD in 2018- updated advisory mandates the use of C&D waste products and also advises that more small capacity C&D waste recycling plants, i.e., 500 TPD, should be installed at different locations in the city, including at least one for each major stakeholder of the government.
- The advisory notes that North Delhi Municipal Corporation has made available seven dumping locations for C&D waste generated from individual houses.

Alignment with Govt programs

- **Swachh Bharat Mission:** Flagship programme of Government of India for improving waste management and resource recovery; C&D waste management falls squarely within its objectives. Cities must demonstrate improvements in cleanliness and waste management in comprehensive annual surveys, which should serve as an incentive to municipal bodies.
- **AMRUT**: Mission for urban infrastructure improvement with emphasis on pedestrian zones in 500 ULBs. Recycled products made from C&D waste (e.g., paver blocks) can be used beneficially for pedestrian zones.
- **Smart Cities Mission:** Mission envisions transformative projects in cities with an emphasis on innovation. C&D waste processing as well as utilisation of recycled products can be included in such projects.
- **Housing for All (Pradhan Mantri Awas Yojana):** Ambitious mission to address severe housing shortages by constructing 1.2 crores affordable housing units by 2022. Incorporation of “sustainable green materials” is encouraged by the mission, and recycled products from C&D waste can find utilisation.

Technical aspects of C& D waste management

- The success of any C&D waste management plan depends on the following factors:
  - Appropriate storage of C&D waste (small, medium and large scale)
  - Collection and transport to the designated processing facility
  - Processing
  - **Processing at the site of generation is also a good option for large generation in which case track / wheel mounted equipment can be used. Such arrangements can be moved as the work area shifts location.**
- Broadly the following steps are undertaken for dry process:
  - Size reduction (different types of crushers are available such as, cone crusher, vertical shaft impact crusher etc.)
  - Screening as required (grizzly to screens of different sizes as required)
- For ‘wet’ process:
  - Washing and scrubbing
  - Removal of water using thickener and filter press
  - Recycling of water so that 10-15% make up water is able to satisfactorily run the process

Technical aspects of C& D waste management

- Appropriate planning is crucial for success
- As of now suitable equipment of different types and sizes are available in the market as shown in the illustrations in the following slides (only TEREX equipment has been shown here)
- As mentioned in slide no. 5, last bullet, a thorough study of the ground situation (qualitative plus quantitative) round the year (variation due to season and festivals) should be carried out. Market (item, expected quality, pricing) should be surveyed.
- One important aspect in this business is the mild to wild variation in quantity of waste generated.
- The facility should be planned accordingly.
- In areas where industrial slags are generated (indicated in amended IS 383), the business can be planned for both (C&D waste and industrial slag).
- In this case the technical aspects need to be planned carefully along with inventory and storage of different products.
- Some equipment required for processing of C&D waste are shown in the following sliodes.

TEREX FM 200DF with Water Recycling Systems

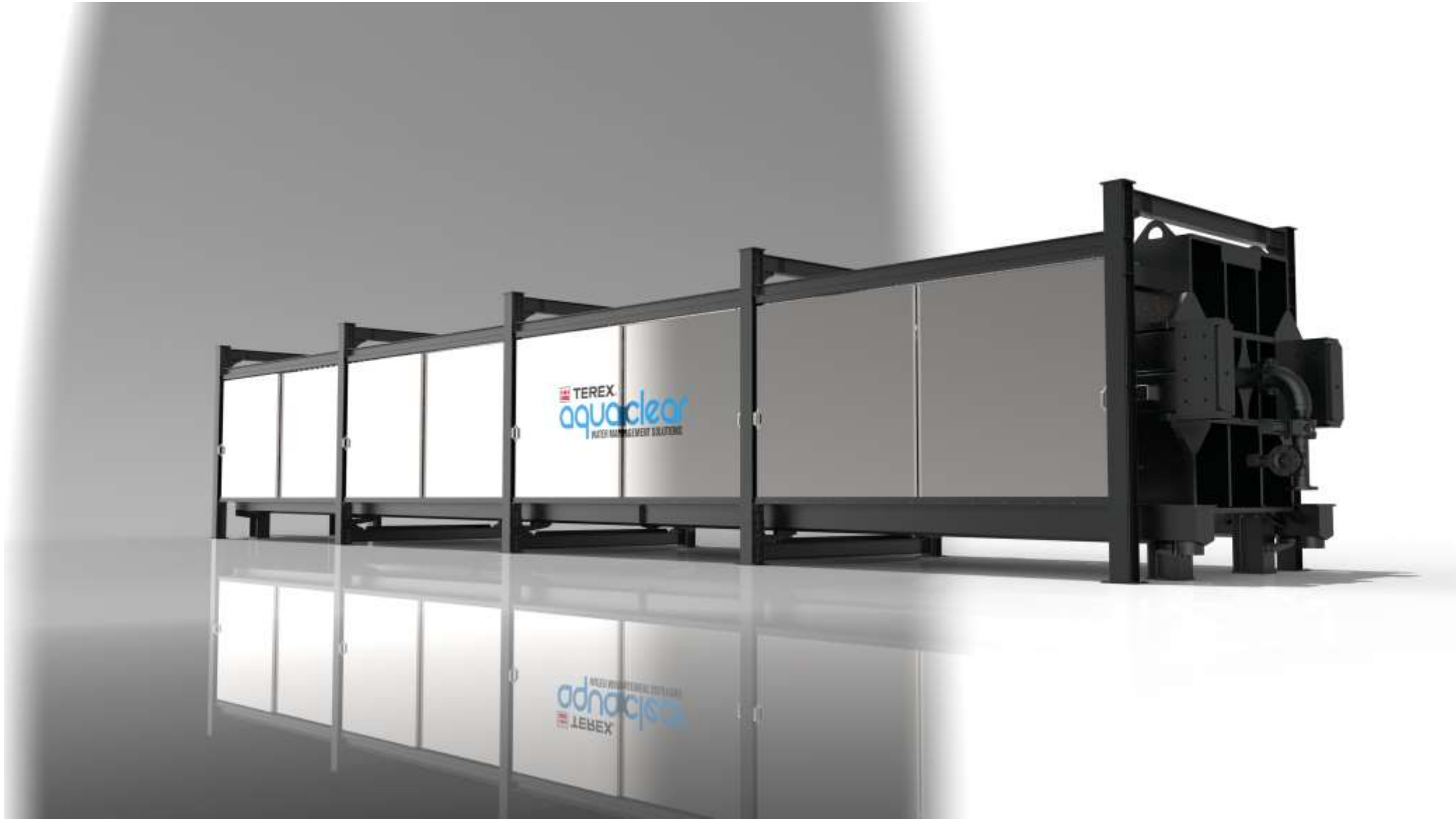
TEREX combined system for sand making and washing

TEREX Aggwash – multigrade aggregates and sand

Track / wheel mounted system

Deep cone thickener (left) and high rate thickener (right)

Filter press for recovering water



INTERNATIONAL ACADEMY
OF ENVIRONMENTAL SANITATION
AND PUBLIC HEALTH
IAESPH

Thank You !

Dr N B Mazumdar

Email: nbmazumdar@gmail.com

And nb.mazumdar@iaesph.org