Radioactive Contamination in Steel Products – Indian Experience

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Outlines of the Talk

1. Radioactive contamination
2. Incidents of radioactive contamination in steel products
3. Radiological impact of contamination
4. Economical Impact of contamination
5. Preventive measures adopted in India
6. Suggested action plan at the international level
7. Conclusion

Radioactive contamination

What is radioactive contamination in steel ?

- is it anything showing radiation level above natural background radiation level ?
- is it anything above the exempt (activity concentration and total activity) level of IAEA ?
- is it any other ?

Incidents of radioactive contamination

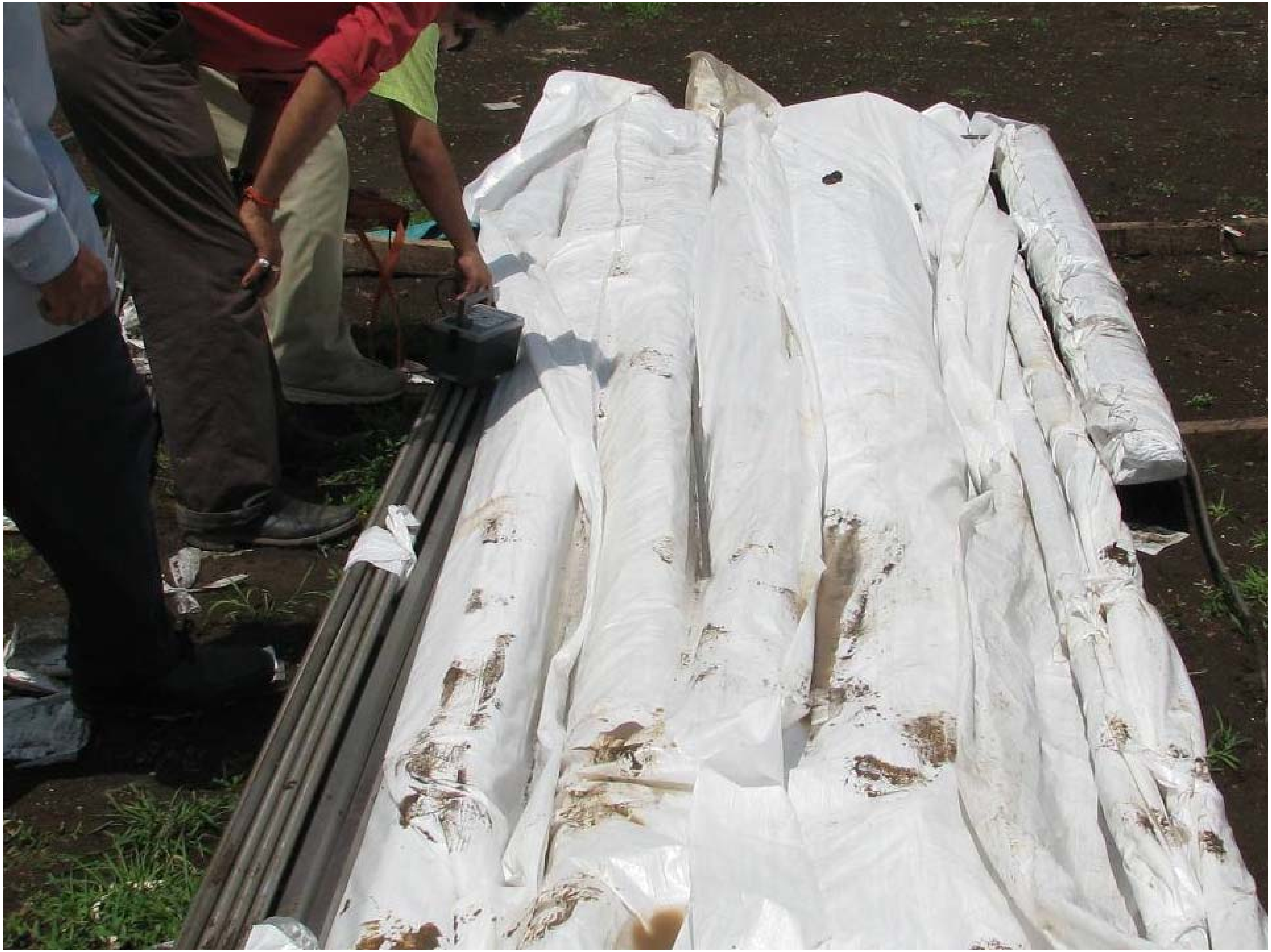
- First incident reported in 1991
- About 12 incidents, either reported to and during inspection by AERB
- Main radioisotope of contamination is Co-60 of industrial use, category 3 and below sources
- Observed radiation levels are 0.06 to 250 µSv/h, LSA I
- Metals identified contaminated are rods, flanges, valves, door pull handles, man hole covers, nails, coils, bright bars, billets etc.
- No report of any serious health hazard so far
- Use of imported metal scrap
- Most of the contaminated material identified since the last two/ three years lying pending for safe disposal

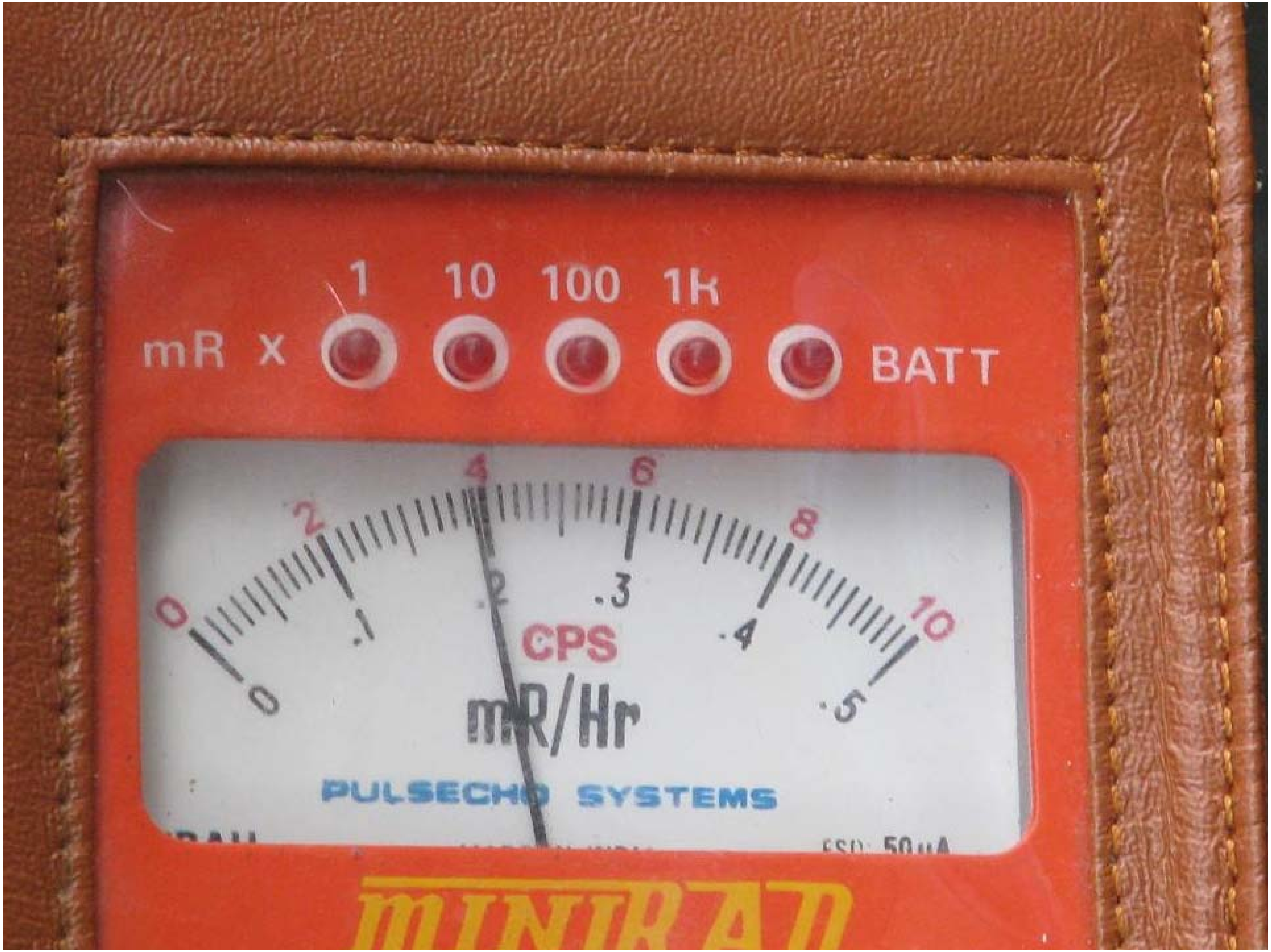
Radiological impact of contamination

- Attempted to estimate the dose that might be received by a worker in a typical Indian foundry, which is very conservative.
- Based on the actual measurement of radiation level for a contaminated steel bundle(30 nos. of SS bars, 6 m length, dia 20 mm and total mass of 465 kg).
- Measured radiation levels are at

the centre of the surface of the bundle	- 484. 66 µSv/h
a distance of 30 cm	- 288.47 µSv/h
a distance of 60 cm	- 187.05 µSv /h
a distance of 1.5 m	- 74.16 µSv /h
a distance of 2.5 m	- 35.20 µSv /h
a distance of 3 m	- 24.23 µSv /h

Beyond 3 m distance, inverse square law can be applied.

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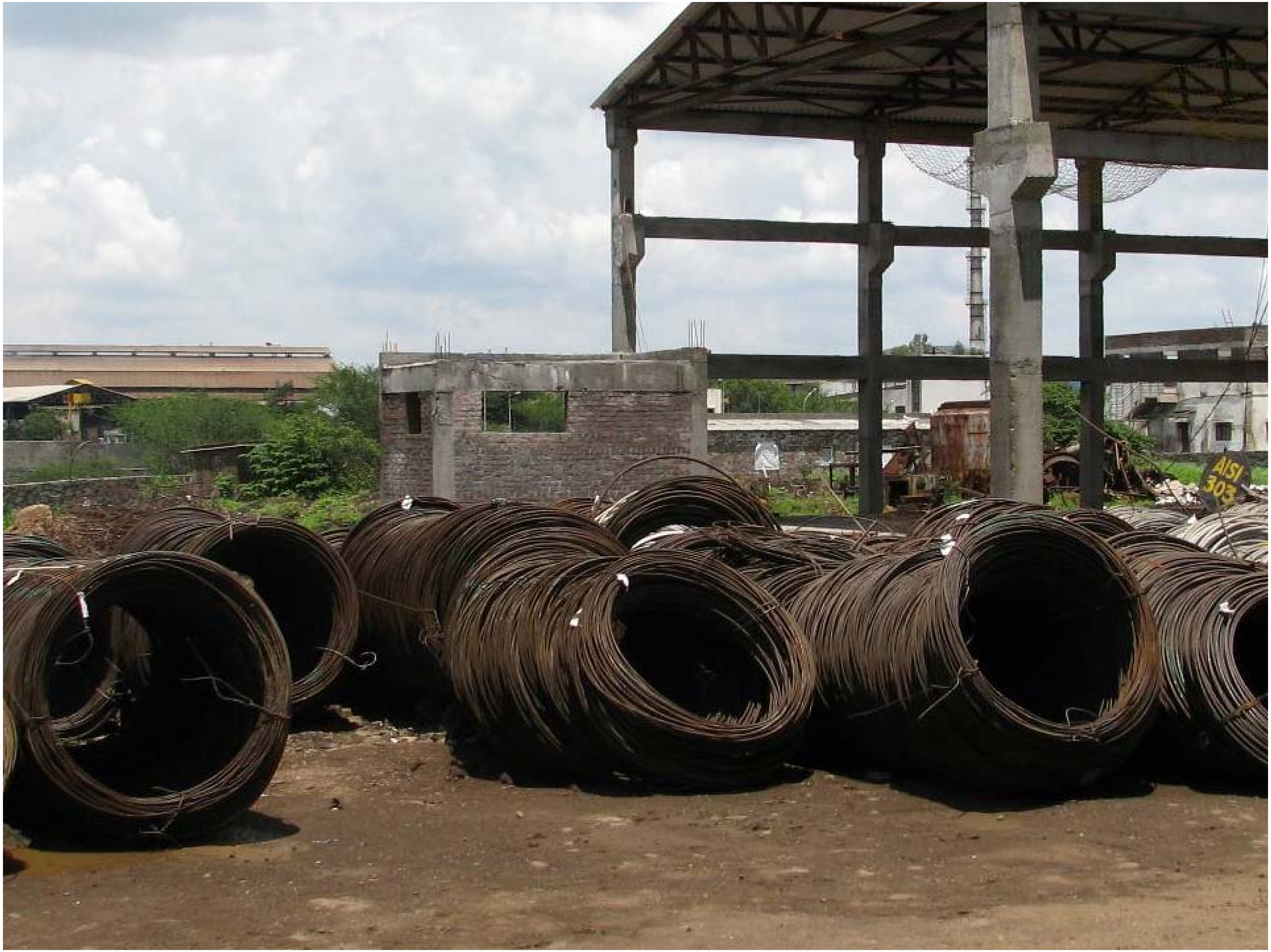
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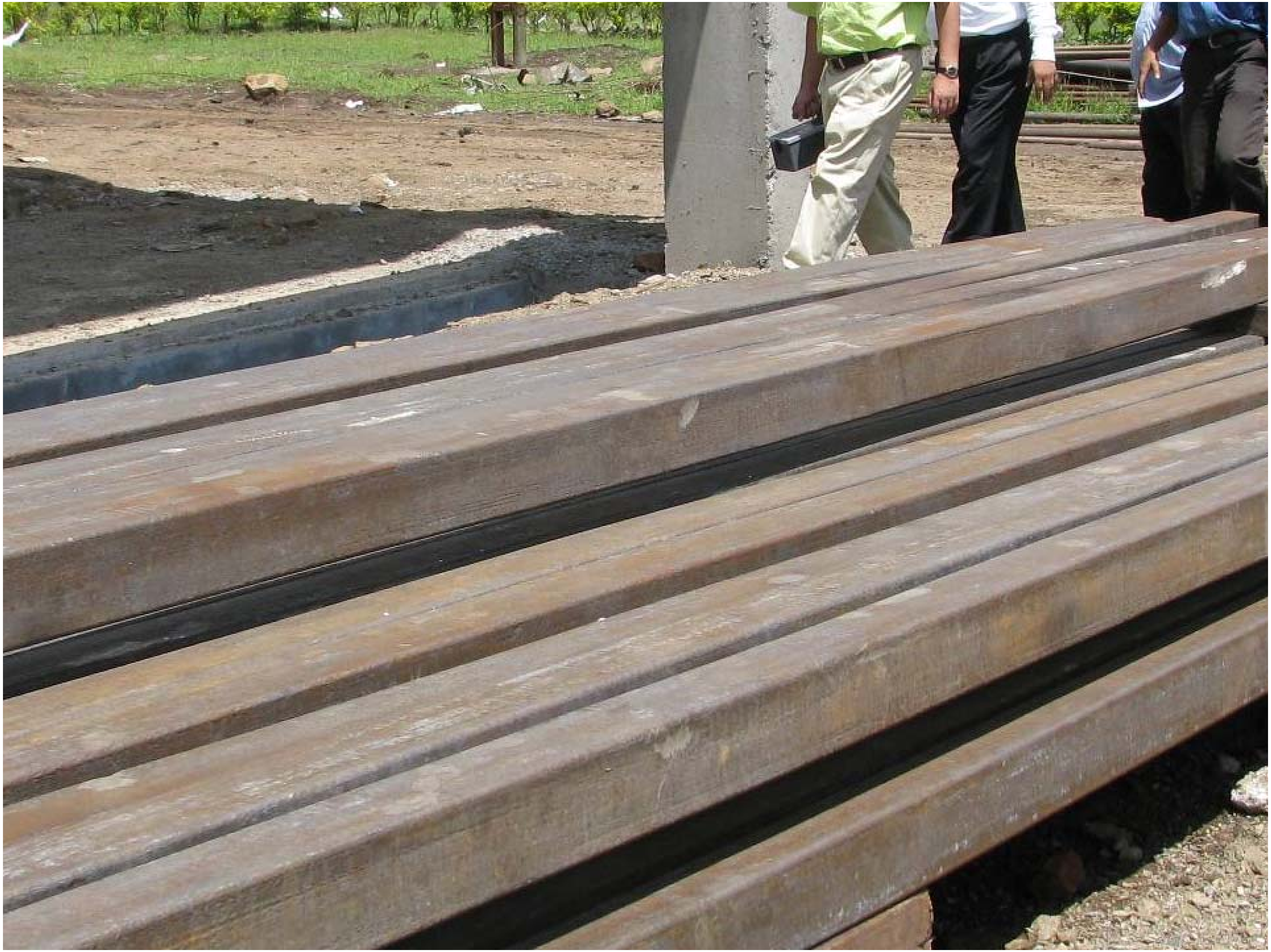

Radiological impact contd.

Stages of process	Estimated dose received
Unloading of scrap	Negligible
Melting	0.145 mSv
Refining through Argon Oxygen De-carbonization (AOD)	0.194 mSv
Continuous casting	234.7 µSv
Cooling	58.3 µSv
Painting	2.4 mSv
Length measurement	0.97 mSv
End cutting	42.6 µSv
Surface grinding	510 µSv
Storage	1.21 mSv
Loading on the truck for shipment	187.1 µSv
Estimated collective dose(about 22 workers)	0.0142 Person-Sievert


Material

Economical impact of contamination.

Calculation based

- on the inputs received from an Indian exporter
- material steel grade 304 exported to an European destination and returned to India after detection of contamination at the port of destination
- Price index prevailed in steel market in Aug , 2008.

	Rs./ kg.
Cost of raw material (A)	150.00
Processing cost of mfg. of bright bars (B)	15.00
Total input cost (A + B) = (C)	165.00
Transportation charge to final destination including clearing & forwarding charges (D)	**5.00**
Admin. & selling expenses (E)	2.00
Total cost (F) = (C) + (D) + (E)	172.00
Selling Price (G) = (F) + margin	176.00
Gross Profit (H)	4.00
Return transport charge if the material in the container is found to be contaminated (I)	**105.00**
Material loss = (G)	176.00
In case, the empty container having contained contaminated material is to be (J) retained [2] by the exporter (Rs. 200,000/- per 20 ft. Container)	200000.00
Total loss assuming that the carrier is agreed to take back the (K) = ((I+G)- H) empty container	277.00($ [3] 5.8)
Total loss assuming that the exporter has to retain the empty container (J + K)	200277.00($ 4172)
Average full load capacity of a container	22.00 M.T
Total loss in case a full load container is found to be contaminated (L)	Rs. 6094000($ 126958)
Total loss in case a full load container is found to be contaminated (J+K+L) with the condition that the exporter has to retain the empty container	Rs. 6294000($ 131125)


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Economical impact contd.

- [2] Some carriers have policy of not taking back the containers having contained contaminated material.
- [3] Assuming the current rate of foreign exchange US $ 1 = Rs 48
- Exorbitantly high transport charge for return of contaminated material to the country of origin
- Suitable shipping carriers are not easily available
- May delay the shipment, and sometimes deter the exporter to bring back contaminated material to avoid bankruptcy.

Preventive measures adopted in India

- Held consultative meeting with Engineering Export Promotion Council (EEPC), government supported conglomeration of the manufacturers and exporters of engineering product to create awareness and find ways of avoiding contamination of steel products.

- Several informative articles published in the news bulletin of EEPC on prevention of radioactive contamination of steel products.

- Five awareness programmes on radiation safety conducted for the manufacturers, exporters and concerned government officials

Preventive measures adopted in India contd.

- The manufacturer/exporters were advised to procure sensitive radiation monitoring instruments to monitor the incoming raw material and outgoing finished products
- Officials of AERB conducted more than 70 random inspections of the foundries and warehouses involved with the manufacturing of steel products from scrap steel metal.
- The concerned ministry of the Government of India has been requested to take up installation of portal monitors at the entry and exit points of all the international ports in the country. An indigenously developed portal monitor including neutron detector has been installed at Jawaharlal Nehru Port, Nava Sheva, the largest port in the country.

Preventive measures adopted in India contd.

- ❖ A notification has been issued through Indian Gazette that every importer of metal scrap should obtain a certificate issued by the regulatory body or an agency accredited by the regulatory body in the country of export certifying that the metal scrap is free from radioactivity.
- ❖ Strong regulatory control over the use of radiation sources.
- ❖ Any loss, theft and abandonment of source thoroughly investigated; preventive measures taken up; and reported to IAEA through ITDB.
- ❖ Any contamination incident brought to the notice of AERB, concerned manufacturers/exporters advised for ensuring safety and security of the contaminated material pending its final safe disposal at an authorized site.

NQAQSR NORTH AMERICA

PRE-SHIPMENT INSPECTION CERTIFICATE

Please see paragraph 2.32 (1) of Handbook of Procedure (Vol.1)

CERTIFICATE No. NQ/AMC/168

1.	Details of Importer a) Name b) Address c) Telephone No. d) E-mail	Anugraha Valve Castings Ltd S.F. No 391/2, S.G.Purdur Coimbatore, India 641 407
2.	Details of Import :-	

Description of Metallic	Scrap Quantity
316R Stainless Steel Melting Scrap Container # HLXU 348040-9 Seal # UL-588078	18,185.8 KGS

3.	Details of test carried out :	NQAQSR-North America have performed visual inspection, sampling and testing of random samples using a hand held monitor for radioactive contaminated/ explosive material in any form used or otherwise

DECLARATION / UNDERTAKING

1. The consignment does not contain any type of arms, ammunition, mines, shells, cartridges, radio active contaminated or any other explosive material in any form either used or otherwise.
2. The imported item is actually metallic scrap/ seconds/ defective as per the internationally accepted parameters for such a classification.
3. I/We hereby declare that the particulars and statements made in this certificate are true and correct and nothing has been concealed or held therefrom.

Date 01 / 19 / 2009

NQAQSR North America 5945 West Parker Rd. Suite 2836 Plano TX 75093

Official Seal

Signature ....

Designation CEO

Name of the agency as : NQAQSR - North America per appendix 5
Address : 5945 West Parker Road Suite 2836 Plano, TX 75093
Mailing Address : 9721 Cypresswood Drive, Suite 1113, Houston, TX 77070, USA
Phones : 781- 964-4672, 281-640-1831 Fax : 281-957-5278, 214-280-0949
E-mail : info@nqaqsr.us Web : www.nqaqsr.us

Note : This pre-shipment inspection certification is issued under paragraph 2.32 (i) of Handbook of Procedures (Vol. I) for unshredded, compressed and loose forms of metallic waste and scrap.

Suggested action plan at the international level

- Mandatory radiation monitoring of the incoming raw material and outgoing finished products in the steel factories using scrap metal as input material should be introduced through suitable national legislation.
- A harmonized level of standards for acceptance of contamination in steel products should be developed.
- Countries exporting scrap metal should also monitor the consignment before dispatch.
- Concerned national regulatory authorities should strengthen the mechanism adopted for certifying radioactivity free of the steel materials meant for export and import.

Suggested action plan at the international level

- ❖ Concerned national regulatory authorities should facilitate the segregation of the contaminated steel product at the port of detection; and allow only the contaminated material be returned to the country of origin while retaining the non-contaminated material for use in the importing country.
- ❖ Concerned national regulatory authority should advise about the packaging of the contaminated material as per the IAEA regulations for the safe transport of radioactive material before returning the contaminated material to the country of origin and issue the necessary regulatory clearances to enable the return of the radioactively contaminated material.

Suggested action plan at the international level

- ❖ Concerned national regulatory authority of the country of origin of contaminated material should issue necessary regulatory clearances to enable bringing back (import) of the radioactively contaminated material.

- ❖ Concerned port authorities en-route the shipment of the contaminated material should issue prompt clearances for transit stops.

- ❖ Denials of shipments of radioactively contaminated material by the shipping carriers should be taken up with the International Maritime Organization; and shipping carriers should be made aware of the fact that an empty freight container having contained radioactively contaminated steel material is not hazardous and can be continued to use as earlier.

Suggested action plan at the international level

- An International Co-ordinating Committee be constituted for better exchange of information among all stake holders.

Conclusion

- Radioactive contamination is undesirable
- Main cause is the presence of radioactive material in the metal scrap that is used by the scrap recycling industry.
- Radiological hazard, generally, from such contamination is very low .
- But, can have significant economic impact in the industry.
- Necessary that all stakeholders take appropriate measures to prevent such incidents .
- An action plan to tackle the problem at the international level needs to be considered.
- Desirable that a harmonized level of standards for acceptance of contamination in steel products should be developed for the benefit of each country.

Challenges

- Method for Safe disposal of bulky and voluminous radioactive contaminated material.

- Identifying of contaminated material already circulated in the domestic market.

Thank You

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&

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