Recent status of irradiation facilities in the world

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1. Introduction

Ionizing radiation can modify physical, chemical and biological properties of the irradiated materials. At present, the principal industrial applications of radiation are sterilization of health care products including pharmaceuticals, irradiation of food and agriculture products, and materials modification [1,3,4,5]. The purpose of this paper is to review recent status of irradiation facilities in order to understand radiation technology and to provide industrial end users with information in order to familiarize them with technology.

2. Radiation sources

The number of irradiators, working on the service basis or installed on-line is growing. IAEA has prepared a directory for industrial gamma irradiators and plans to prepare a similar database for electron accelerators [2].

2.1. Gamma irradiators

The number of irradiation units increased remarkably. The world directory of industrial gamma irradiators was prepared by IAEA [2].

The total dataset of the directory currently contains 83 organisations which operate 123 irradiation units in the 45 Member States. Table 1 lists the Member States and their regional classification which is partly based on the IAEA classification system. The number in parenthesis following the name of Member State indicates the number of irradiation units operating there.

Table 1. Regional distribution of irradiation units in 2002

Region (No.)*	Participating Member States (No.)	Regional total
Africa (3)	Egypt(1), Ghana(1), South Africa(3)	5
East Asia and the Pacific (12)	Australia(2), Bangladesh(2), China(21), India(3), Indonesia(1), Japan(2), Korea (Republic of)(1), Malaysia(4), Philippines(1), Taiwan(2), Thailand(4), Vietnam(1)	44
Europe (18)	Austria(1), Belgium(2), Bulgaria(1), Croatia(1), Germany(3), Greece(1), Hungary(3), Ireland(1), Italy(2), Portugal(1), Romania(1), Serbia & Montenegro(1), Sweden(1), Switzerland(1), Netherlands(3), Turkey(2), Ukraine(1), United Kingdom(5)	31
Latin America (5)	Argentina(1), Brazil(4), Chile(1), Mexico(2), Peru(1)	9
North America (2)	Canada(1), United States of America(28)	29
West Asia (5)	Iran, Islamic Republic of (1), Israel(1), Jordan(1), Saudi Arabia(1), Syria(1)	5

* ( ) is the number of Member States of IAEA

2.2. Facility operation

The details of technical data related to the source and the operation of the facility are shown in Table 2.

TABLE2. OPERATION OF THE FACILITY

Unit	Types
Source storage	Dry (10%) wet (90%)
Source rack	rectangular (86%) cylindrical (10%) other (4%)
Source hoisting	electrical (29%) pneumatic (54%) hydraulic (15%) info unavailable (1%)
Product movement	on pallets (11%) in totes (35%) in carriers (50%) info unavailable (3%)
Operating mode	continuous (72%) in batch (28%) other (1%)

2.3 Source activity

Table 3 shows the distribution of the design capacity and current source activity for all irradiation units in the dataset. Some of the organizations preferred not to re veal this information, which is identified here as 'unavailable'.

Table 3. Regional distribution of the design capacity and currently installed activity of radiation source amongst 165 commercial gamma facilities in 2002

Activity of cobalt-60 (kCi)		All regions	Africa	East Asia and Pacific	Europe	Latin America	North America	West Asia
Design capacity	un-available*	28	3	9	12	0	1	3
	15-500	47	1	41	2	2	1	0
	500-1000	37	0	23	9	3	0	2
	>1000	53	1	13	8	4	27	0
Current	un-available*	70	0	44	11	1	14	0
	15-500	53	4	28	12	4	1	4
	500-1000	14	1	5	3	3	1	1
	>1000	28	0	9	5	1	13	0

2.4 Industry growth

The growth of industrial radiation processing in terms the number of irradiation units that were commissioned over the indicated time period [6,7,8]. Each indicated time period is 10 years. Since 1990, 58

new irradiation units have been commissioned. Their regional distribution is shown in the literatures [9,10].

3. Conclusion

It is evident that the radiation processing industry is growing worldwide. Also, this technology is used for a variety of products and the types of radiation processing applications are also increasing. The current database on industrial irradiation facilities would be a useful tool for industry and researchers. It also provides the IAEA and Member States with valuable materials for establishing contacts and for the preparation of new R&D programmes.

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