

4. PRODUCTION, IMPORT, USE, AND DISPOSAL

4.1 PRODUCTION

In the United States, styrene is produced principally by the catalytic dehydrogenation of ethylbenzene. Hence, ethylbenzene is a common contaminant. It is also produced by oxidation of ethylbenzene to its peroxide which is then reacted with propylene to produce propylene oxide and alpha-methylphenyl carbinol. The carbinol is then further dehydrated to produce styrene (Dickson et al. 1983; HSDB 1989; IARC 1979).

Styrene has been manufactured in the United States since 1938. Its production has increased 1.8% in the decade between 1978 and 1988 with a 4.8% increase in production during the 5-year period between 1983 and 1988. Production of styrene for 1987 was over 8 billion pounds, and 1989 production is predicted to be almost 9 billion pounds (Dickson et al. 1983; Heylin 1989; SRI 1988a, 1989; USITC 1987, 1988).

Information regarding the locations of the numerous styrene production facilities and the amounts of styrene which may be present on-site is presented in Table 4-1.

4.2 IMPORT/EXPORT

Imports of styrene have generally been less than 1% of United States domestic production volumes with imports reported to be 26.4 million pounds for 1976, 28.6 million pounds for 1981, and 21 million pounds for 1982. Data regarding current styrene imports were not located. Styrene exports were over 1 billion pounds in 1981 and over 1 billion pounds in 1982, which represents a steady increase in styrene exports since the early years of styrene production (Dickson et al. 1983; IARC 1979).

4.3 USE

Styrene is used predominantly in the production of polystyrene plastics and resins (62%). Some of these resins are used for construction purposes such as in insulation or in the fabrication of fiberglass boats. Styrene is also used as an intermediate in the synthesis of materials used for ion exchange resins and to produce copolymers such as styrene-acrylonitrile (SAN), acrylonitrile-butadiene-styrene (ABS), and styrene-butadiene rubber (SBR).

Consumer products made from styrene-containing compounds include packaging, electrical, and thermal insulation materials, pipes, automotive components, drinking tumblers, other food-use utensils, and carpet backing. The Food and Drug Administration (FDA) permits styrene to be used as a direct additive for synthetic flavoring and an indirect additive in polyester resins, ion-exchange membranes, and in rubber articles (5% by weight maximum) intended for use with foods (HSDB 1989; IARC 1979; NIOSH 1983).

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TABLE 4-1. Facilities That Manufacture or Process Styrene^a

State ^b	No. of facilities	Range of maximum amounts on site in thousands of pounds ^c	Activities and uses ^d
AL	10	1-9,999	1, 4, 7, 8, 9, 11, 13
AR	14	0.1-9,999	2, 3, 7, 8, 9
AZ	8 (1) ^e	1-99	3, 7, 8, 9
CA	81 (6) ^e	0.1-49,999	2, 3, 7, 8, 9, 10, 11, 13
CO	5	1-9,999	3, 6, 7, 8, 9
CT	5	0.1-49,999	3, 7, 10, 12
DE	3	10-999	7, 8, 9
FL	44	1-9,999	1, 2, 3, 7, 8, 9, 11, 12, 13
GA	24	0.1-9,999	3, 4, 7, 8, 9
IA	16	0.1-9,999	2, 3, 4, 7, 8, 9, 12, 13
ID	2	10-99	9
IL	49 (4) ^e	0.1-99,999	2, 3, 5, 7, 8, 9, 10, 11, 12
IN	50 (4) ^e	0-49,999	2, 3, 4, 5, 7, 8, 9, 11, 12, 13
KS	13	0.1-999	2, 7, 8, 9, 12, 13
KY	21 (1) ^e	1-49,999	1, 5, 6, 7, 8, 9
LA	16 (1) ^e	0.1-99,999	1, 2, 4, 5, 6, 7, 8, 9, 10, 11
MA	13 (2) ^e	1-9,999	7, 8, 9, 10
MD	14 (1) ^e	1-99	3, 4, 5, 7, 8, 9
ME	5	1-99	7, 8, 9
MI	32 (1) ^e	0.1-49,999	2, 5, 7, 8, 9, 10, 11, 12, 13
MN	10 (1) ^e	10-999	1, 3, 6, 7, 8, 9, 12
MO	17 (1) ^e	0.1-999	2, 3, 7, 8, 9, 11, 13
MS	10 (1) ^e	1-9,999	2, 3, 7, 8, 9, 11
MT	2	1-9,999	3, 6, 7, 8, 11
NC	39	0.1-49,999	2, 3, 5, 7, 8, 9, 10, 11, 12, 13
ND	1 (1) ^e	No Data	7
NE	5	0-99	3, 8, 9, 12
NH	5	10-999	3, 5, 7, 8, 9
NJ	32 (3) ^e	1-49,999	2, 3, 6, 7, 8, 9, 10, 13
NM	1	1-9	8
NV	3	10-99	9, 12

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TABLE 4-1 (Continued)

State ^b	No. of facilities	Range of maximum amounts on site in thousands of pounds ^c	Activities and uses ^d
NY	13 (2) ^e	1-999	1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
OH	70 (6) ^e	0-49,999	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 13
OK	6 (1) ^e	10-49,999	3, 6, 7, 8, 9, 11
OR	11	1-999	7, 8, 9
PA	47 (2) ^e	0-49,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
PR	3	1-99	3, 7, 8, 9
RI	5	10-999	2, 4, 7, 8, 9, 13
SC	25 (5) ^e	1-999	2, 3, 7, 8, 9, 11, 12, 13
SD	2	1-99	7, 9
TN	36 (3) ^e	0-9,999	2, 3, 5, 6, 7, 8, 9, 12, 13
TX	78 (4) ^e	0-499,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
UT	2	1-9	4, 8, 9
VA	17 (2) ^e	1-49,999	2, 3, 7, 8, 9, 10, 12
WA	26 (1) ^e	0.1-9,999	1, 3, 6, 7, 8, 9, 11, 12
WI	23	0.1-499,999	2, 7, 8, 9, 13
WV	9 (3) ^e	10-9,999	3, 7, 8, 9, 10, 12
WY	1	1-9	7

^aTRI 1989

^bPost office state abbreviations

^cData in TRI are maximum amounts on site at each facility.

^dActivities/Uses:

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|-------------------------------|----------------------------------|
| 1. produce | 8. as a formulation component |
| 2. import | 9. as an article component |
| 3. for on-site use/processing | 10. for repackaging only |
| 4. for sale/distribution | 11. as a chemical processing aid |
| 5. as a byproduct | 12. as a manufacturing aid |
| 6. as an impurity | 13. ancillary or other use |
| 7. as a reactant | |

^eNumber of facilities reporting "no data" regarding maximum amount of the substance on site.

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4.4 DISPOSAL

Typical means of styrene disposal include absorption on vermiculite or similar material, followed by disposal in an EPA-permitted landfill. Incineration is also a useful disposal method, but this must be carefully controlled since pure styrene is highly flammable. No data were located regarding the quantities of styrene disposed by these means (HSDB 1989).