

ATTACHMENT A TO SRCAA ORDER 22-01

EF Table I: Unified Emission Factors for Open Molding of Composites

Revised and Approved: 10/13/2009

Emission Rate in Pounds of Styrene Emitted per Ton of Resin or Gel Coat Processed

Styrene content in resin/gel coat, % ⁽¹⁾	<33 ⁽²⁾	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	>50 ⁽²⁾
Manual	0.126 x % styrene x 2000	83	89	94	100	106	112	117	123	129	134	140	146	152	157	163	169	174	180	((0.286 x % styrene) - 0.0529) x 2000
Manual w/ Vapor Suppressed Resin VSR ⁽³⁾	Manual emission factor [listed above] x (1 - (0.50 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Atomized	0.169 x % styrene x 2000	111	126	140	154	168	183	197	211	225	240	264	268	283	297	311	325	340	354	((0.714 x % styrene) - 0.18) x 2000
Mechanical atomized with VSR ⁽³⁾	Mechanical Atomized emission factor [listed above] x (1 - (0.45 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Atomized Controlled Spray ⁽⁴⁾	0.130 x % styrene x 2000	86	97	108	119	130	141	152	163	174	185	196	207	218	229	240	251	262	273	0.77 x ((0.714 x % styrene) - 0.18) x 2000
Mechanical Atomized Controlled Spray with VSR	Mechanical Atomized Controlled Spray emission factor [listed above] x (1 - (0.45 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Non-Atomized	0.107 x % styrene x 2000	71	74	77	80	83	86	89	93	96	99	102	105	108	111	115	118	121	124	((0.157 x % styrene) - 0.0165) x 2000
Mechanical Non-Atomized with VSR ⁽³⁾	Mechanical Non-Atomized emission factor [listed above] x (1 - (0.45 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Non-Atomized application of resins that contain Methyl Styrene monomer ⁽⁶⁾	Mechanical Non-Atomized Styrene monomer emission Factor (listed above) x .55																			
Mechanical Non-Atomized Filled DCPD resins ⁽⁷⁾	0.144 x % styrene x 2000	95	98	101	104	108	111	114	117	120	124	127	130	133	136	140	143	146	149	((0.1603 x % styrene) - 0.0055) x 2000
Filament application	0.184 x % styrene x 2000	122	127	133	138	144	149	155	160	166	171	177	182	188	193	199	204	210	215	((0.2746 x % styrene) - 0.0298) x 2000
Filament application with VSR ⁽³⁾	0.120 x % styrene x 2000	79	83	86	90	93	97	100	104	108	111	115	118	122	125	129	133	136	140	0.65 x ((0.2746 x % styrene) - 0.0298) x 2000
Gel coat Application	0.445 x % styrene x 2000	294	315	336	358	377	398	418	439	460	481	501	522	543	564	584	605	628	646	((1.03646 x % styrene) - 0.195) x 2000
Gel coat Controlled Spray Application ⁽⁴⁾	0.325 x % styrene x 2000	215	230	245	260	275	290	305	321	336	351	366	381	396	411	427	442	457	472	0.73 x ((1.03646 x % styrene) - 0.195) x 2000
Gel coat Non-Atomized Application ⁽⁸⁾	SEE Note 9 below	196	205	214	223	232	241	250	259	268	278	287	296	305	314	323	332	341	350	((0.4506 x % styrene) - 0.0505) x 2000
Lesser Atomized Gel coat Application ⁽¹²⁾	for < 30 : 0.323 x % styrene x 2000	229	241	252	264	276	287	299	311	322	334	346	357	369	381	392	404	416	428	((0.5842 x % styrene) - 0.07825) x 2000
Covered-Cure after Roll-Out	Non-VSR process emission factor [listed above] x (0.80 for Manual <or> 0.85 for Mechanical)																			
Covered-Cure without Roll-Out	Non-VSR process emission factor [listed above] x (0.50 for Manual <or> 0.55 for Mechanical)																			

Emission Rate in Pounds of Methyl Methacrylate Emitted per Ton of Gel Coat Processed

MMA content in gel coat, % ⁽⁴⁾	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	≥20
Gel coat application ⁽⁷⁾	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	0.75 x % MMA x 2000

Notes

- Including styrene monomer content as supplied, plus any extra styrene monomer added by the molder, but before addition of other additives such as powders, fillers, glass, etc.
- Formulas for materials with styrene content <33% are based on the emission rate at 33% (constant emission factor expressed as percent of available styrene), and for styrene content >50% on the emission rate based on the extrapolated factor equations, these are not based on test data but are believed to be conservative estimates. The value for "% styrene" in the formulas should be input as a fraction. For example, use the input value 0.30% styrene content by weight.
- The VSR reduction factor is determined by testing each resin/suppressant formulation according to the procedures detailed in the CFA Vapor-suppressant Effectiveness Test.
- SEE the CFA Controlled Spray Handbook for a detailed description of the controlled spray procedures.
- The effect of vapor-suppressants on emissions from filament winding operations is based on the Dow Filament Winding Emissions Study.
- Including MMA monomer content as supplied, plus any extra MMA monomer added by the molder, but before addition of other additives such as powders, fillers, glasses, etc.
- Based on the gel coat data from NMMA Emission Study.
- SEE the July 17, 2001 EECs report Emission Factors for Non-Atomized Application on Gel Coats used in the Open Molding of Composites for a detailed description of the non-atomized gel coat testing.
- Use the equation ((0.4506 x % styrene) - 0.0505) x 2000 for gel coats with styrene contents between 19% and 32% by wt; use the equation 0.185 x % styrene x 2000 for gel coats with less than 19% styrene content by wt.
- Refer to Section 3.0. Instructions and Examples for the Emission Factor table, 3.2 Calculation of the methylstyrene factor.
- Use this factor for the non-atomized application of DCPD or DCPD-blend resin, when filled to 30% or more by weight.

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Table from 30% TO 32% styrene content:	30	31	32
	194	206	217