

## Dairy VOC and NH3 Emission Factors

<b>Breakdown of Dairy VOC Emission Factor by type of Cow &amp; Housing</b>				
<b>Type of Cow</b>	<b>VOC EF (Corral Housing)</b>	<b>NH3 EF (Corral Housing)</b>	<b>VOC EF (Freestall Housing)</b>	<b>NH3 EF (Freestall Housing)</b>
Milking Cow	19.3*	74.0	21***	74.0
Dry Cow	11.9**	45.4	12.9**	45.4
Heifer (15-24 mo)	8.3**	31.8	9**	31.8
Heifer (7-14 mo)	7.2**	27.8	7.9**	27.8
Heifer (4-6 mo)	6.6**	25.1	7.1**	25.1
Calf (under 3 mo)	6.2**	23.6	6.7**	23.6

\*This emission factor is from "APCO's Determination of VOC Emission Factors for Dairies" report.

\*\*This emission factor was developed by taking the ratio of manure generated by the different types of cows to the milk cow and multiplying it with the emission factor obtained in the "APCO's Determination of VOC Emission Factors for Dairies" report.

\*\*\*This emission factor was developed in a District document entitled "Breakdown of Dairy VOC Emission Factor into Permit Units", however, the basis of the emission factor was taken from the "APCO's Determination of VOC Emission Factors for Dairies" report.

### Breakdown by Permit Unit

<b>Open Corral Flush dairy****</b>		
<b>Dairy Emissions</b>	<b>Emissions (lb/hd-yr)</b>	<b>NH<sub>3</sub> Emissions (lb/hd-yr)</b>
Cow Housing (enteric)	7.6	0
Cow Housing (manure)	4.8	32.3
Cow Housing (Total)	12.4	32.3
Milk Center (Enteric)	0.7	0
Milk Center (Manure)	0.2	1.3
Milking Center (Total)	0.9	1.3
Liquid Manure Handling	2.3	15.5
Solid Manure Handling	N/A	N/A
Land Application	3.7	24.9
<b>Total</b>	<b>19.3</b>	<b>74</b>

Freestall Flush dairy****		
Dairy Emissions	Emissions (lb/hd-yr)	NH <sub>3</sub> Emissions (lb/hd-yr)
Cow Housing (enteric)	7.6	0
Cow Housing (manure)	4.8	28
Cow Housing (Total)	12.4	28
Milk Center (Enteric)	0.7	0
Milk Center (Manure)	0.2	1.2
Milking Center (Total)	0.9	1.2
Liquid Manure Handling	2.7	15.7
Solid Manure Handling	N/A	N/A
Land Application	5	29.1
<b>Total</b>	<b>21</b>	<b>74</b>

**Breakdown per type of cow of Permit Unit**

Cow Housing Permit Unit - Enteric and Manure****				
Type of Cow	Open Corral Housing		Freestall Housing	
	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)
Milk Cow	12.4	32.3	12.4	28
Dry Cow	8.2	20.6	8.2	17.9
Heifer (15 to 24 months)	5.7	14.4	5.7	12.6
Heifer (7 to 14 months)	5	12.6	4.9	11
Heifer (3 to 6 months)	4.5	11.4	4.5	9.9
Calf (under 3 months)	4.3	10.7	4.3	9.3

<b>Cow Housing Enteric Breakdown****</b>		
Type of Cow	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)
Milk Cow	7.6	0.0
Dry Cow	4.8	0.0
Heifer (15 to 24 months)	3.4	0.0
Heifer (7 to 14 months)	2.9	0.0
Heifer (3 to 6 months)	2.6	0.0
Calf (under 3 months)	2.5	0.0

<b>Cow Housing Non-Enteric (Manure) Breakdown****</b>			
Type of Cow	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr) (Freestall)	(lb-NH <sub>3</sub> /cow-yr) (Open Corral)
Milk Cow	4.8	28.0	32.3
Dry Cow	3.4	17.9	20.6
Heifer (15 to 24 months)	2.4	12.6	14.4
Heifer (7 to 14 months)	2.1	11.0	12.6
Heifer (3 to 6 months)	1.9	9.9	11.4
Calf (under 3 months)	1.8	9.3	10.7

<b>Lagoon/Storage Pond Emission Factors for Dairy Cows****</b>				
Type of Cow	Open Corral Housing		Freestall Housing	
	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)
Milk Cow	2.3	15.5	2.7	15.7
Dry Cow	1.4	9.5	1.7	9.6
Heifer (15 to 24 months)	1	6.7	1.2	6.7
Heifer (7 to 14 months)	0.9	5.8	1	5.9
Heifer (3 to 6 months)	0.8	5.3	0.9	5.3
Calf (under 3 months)	0.7	4.9	0.9	5

**Land Application Emission Factors for Dairy Cows\*\*\*\***

Type of Cow	Open Corral Housing		Freestall Housing	
	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)	(lb-VOC/cow-yr)	(lb-NH <sub>3</sub> /cow-yr)
Milk Cow	3.7	24.9	5	29.1
Dry Cow	2.3	15.3	3.1	17.9
Heifer (15 to 24 months)	1.6	10.7	2.1	12.5
Heifer (7 to 14 months)	1.4	9.3	1.9	10.9
Heifer (3 to 6 months)	1.3	8.5	1.7	9.9
Calf (under 3 months)	1.2	7.9	1.6	9.3

\*\*\*\*The emission factors for milk cows are based on an internal draft document entitled “*Breakdown of Dairy VOC Emission Factor into Permit Units*”. The emission factors for the other cows were developed by taking the ratio of manure generated by the different types of cows to the milk cow and multiplying it by the milk cow emission factor.