

## #22 Valero Renewable Fuels Ethanol Fort Dodge Plant Energy and Water Usage

Ethanol Plant without CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY		Comments
Ethanol Plant - Near Fort Dodge Iowa						
	Valero Renewable Fuels Fort Dodge		330	330		Without CO <sub>2</sub> capture water requirement
	Combined Towns All Water Usage		672.0	672.0		City residential use assumes 70 gal./person/day
1	Coalville	50	1.3	1.3		Water usage too small to require a permit
2	Kalo	50	1.3	1.3		Water usage too small to require a permit
3	Knierim	53	1.4	1.4		
4	Clare	136	3.5	3.5		
5	Moorland	168	4.3	4.3		
6	Barnum	175	4.5	4.5		
7	Callender	368	9.4	9.4		
8	Otho	429	11.0	11.0		
9	Fort Dodge	24,871	635.5	635.5		
	Percentage of ethanol plant usage of total water usage	26,300	32.9%	32.9%		
<b>Conclusion: Without CO<sub>2</sub> Capture</b>						
	<b>This ethanol plant consumes 33% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).</b>					

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No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Fort Dodge Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Coalville	50	1.3	1.3		Water usage too small to require a permit
2	Kalo	50	1.3	1.3		Water usage too small to require a permit
3	Knierim	53	1.4	1.4		Permit less than 5
4	Clare	136	3.5	3.5		Permit less than 5
5	Moorland	168	4.3	4.3		Permit less than 5
6	Barnum	175	4.5	4.5		Permit less than 5
	No Permit	100	2.6	2.6	0%	
	Permits less than 5 MGY	532	13.6	13.6	1%	
7	Callender	368	9.4	9.4	1%	
8	Otho	429	11.0	11.0	1%	
9	Fort Dodge	24871	635.5	635.5	57%	
10	Ethanol plant water for Ethanol Production		330	330	30%	Without CO <sub>2</sub> Capture water requirement
11	Ethanol Plant water for CO <sub>2</sub> Capture		115.5	115.5	10%	Additional CO <sub>2</sub> Capture water requirement
	Total Plant and Towns	26300	1117.5	1117.5	100.00%	
	Percentage of ethanol plant usage of total water usage		39.9%	39.9%		
<b>Conclusion: With CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 40% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
<b>*Ethanol Production Capacity of Plant - MGY</b>		<b>110</b>				
<b>Factor: Water required to cool and compress the CO<sub>2</sub> for capture - MGY Water/ MGY Ethanol</b>		<b>1.05</b>				
<b>Calculate additional water required for CO<sub>2</sub> Capture - MGY</b>		115.5				
<b>Calculate ratio of gallons of water/ gallons of Ethanol</b>		3.0				
<b>Total water requirement of towns and Ethanol plant - MGY</b>		1133.6				
<b>Total water requirement of towns - MGY</b>		688.1				
<b>Total water requirement for ethanol plant - MGY</b>		445.5				
<b>Ratio of ethanol plant water use vs. surrounding area</b>		0.65				
<b>Percentage of ethanol plant usage of total water usage</b>		39.3%				
<b>Total population within the 10 mile radius</b>		<b>26,300</b>				

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<b>Water Use</b>					
Typical water use per person per day - Gallons/ person/ day	70				
Equivalent # of people ethanol plant water use w/o CO2 capture	12,916				
Equivalent # of people ethanol plant water use w/ CO2 capture	17,436				
<b>Electricity Use</b>					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	66,000,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	41,470,000				
Total electricity to produce ethanol and capture CO2 - kWh	107,470,000				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	10,258.7				
Number of people / residence	2.4				
Equivalent number of people	24,621				
<b>Natural Gas Use</b>					
Natural gas use per gallon of ethanol for production - BTU's/ gal.	26,000				
Natural gas use for ethanol plant - BTU's	2.860E+12				
Natural gas use per gal. of ethanol for CO2 capture - BTU's/ gal.	0				
Typical Natural Gas use/ residence - BTU's/ year	96,000,000				
Equivalent number of residences	29,792				
Number of people / residence	2.4				
Equivalent number of people	71,500				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

# #22 Valero Renewable Fuels Ethanol Plant (110 MGY) near Fort Dodge

Ethanol plant 2023 water usage vs. surrounding residential water usage of towns within a ten mile radius MGY (Millions of Gallons per Year).

