Bloomenergy

Bloom Energy Server

Natural Gas Specification

This gas specification must be used for proper Energy Server contracting and operation

Specifications

Hydrocarbon Composition	Limit (mol %)
Methane (CH_4)	Min 85
Ethylene (C_2H_4)	Max 0.5
Ethane (C_2H_6)	Max 12
Propylene (C_3H_6)	Max 0.125
Propane (C_3H_8)	Max 3.4
iButane + nButane (C_4H_{10})	Max 2.0
Sum of C_{5+}	Max 0.2

Notes:

1. Note that not all the hydrocarbons can be at the upper limit simultaneously.
2. Composition transients within the above specification ranges shall change at less than 1% per hour.
3. Composition data collected per ASTM D1945 or ASTM D1946 methods.
4. The customer is expected to provide the hydrocarbon composition during contracting.

Contaminant	Limit
Siloxanes	< 0.12 mg/m^3
Arsenic (AsH_3 &/or As)	< 0.05 ppmV
Halogens (CH_3Cl, HCl, etc.)	< 2.8 $\mu g/m^3$
Mercury	< 2.0 ppmV
Cadmium	< 2.0 ppmV
Zinc	< 2.0 ppmV
Ammonia	< 40 ppmV
Phosphorous/PH_3	< 2.0 ppmV
Sodium	< 2.0 ppmV

Sulfur Species	Average (ppbV)	Maximum (ppbV)[4]
H_2S (Hydrogen Sulfide)	1,000	2,000
COS (Carbonyl Sulfide)	200	500
CS_2 (Carbon Disulfide)	50	150
Mercaptans[1]	2,000	4,000
Thiophenes[2]	2,000	4,000
Others[3]	50	100
Total Sulfurs (sum of all)	5,000	10,000

1. TBM is the primary Mercaptan
2. THT is the primary Thiophene
3. Other sulfides and disulfides
4. Levels above this amount must be approved by Bloom

- Contaminants and Sulfur species limits shall be measured by Draeger tubes, bag sampling, or online gas analyzers at site.
- The gas composition requirements of this specification were verified by historical data of site gas sampling per: ASTM D8230 Siloxanes, EPA TO-15 Halogens, EPA29 Arsenic, Mercury, Cadmium, Zinc, NIOSH 6015 Ammonia and ASTM D5504 Sulfur

Trace component	Limit
N_2	< 3.0 mol%
O_2	< 0.2 mol%
CO_2	< 3.0 mol%
H_2	< 1.0 mol%
CO	< 100 ppm
H_2O	< 154 ppmV i.e. <7 lbs/mmscf

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