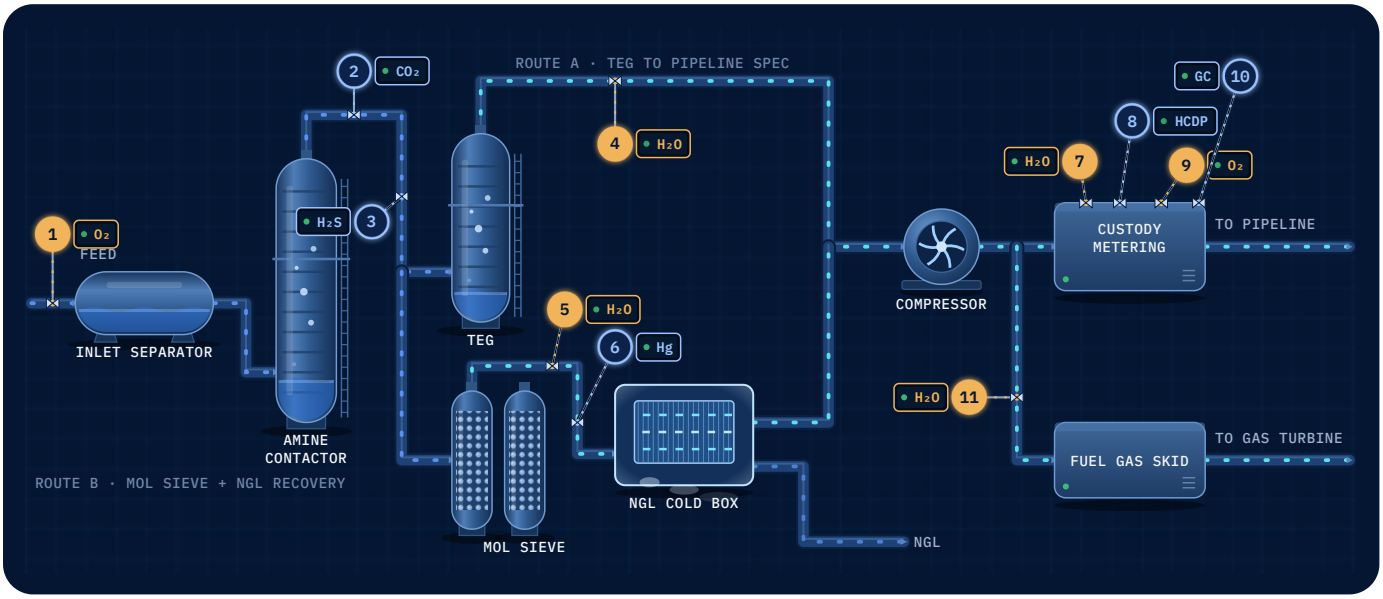
Natural gas processing: where to measure moisture, O_2 and CO_2

Follow the gas from the inlet separator to the custody meter. Each numbered point shows what is measured, the typical limit, why it matters and the analyzer that fits.



● YORK instrument ○ Integrated system (supplied through YORK)

How the process works

Raw gas from the wells arrives water-saturated and carries CO_2, H_2S and sometimes oxygen. The plant removes each of them in turn, and an analyzer after each step proves the step worked.

1. **Inlet separation.** Slug catchers and separators remove free liquids. Inlet water is calculated, not measured, because the gas is saturated.
2. **Acid gas removal.** An amine contactor absorbs CO_2 and H_2S down to the pipeline limit, or to ppm levels when the gas goes on to LNG.
3. **Dehydration.** For pipeline gas, triethylene glycol (TEG) absorbs water in a contactor. Where the gas goes to cryogenic NGL recovery, molecular-sieve beds dry it far deeper, to below 0.1 ppmv.
4. **NGL recovery.** A turbo-expander cold box condenses ethane and heavier liquids. Mercury guard beds protect its aluminium exchangers.
5. **Compression and custody transfer.** Residue gas is compressed and metered against the sales contract: water dew point, hydrocarbon dew point, O_2, CO_2, H_2S and heating value.
6. **Fuel gas.** A side stream feeds gas turbines, which need the gas superheated above its dew points.

Interactive version with animation:
https://www.yorkinstrument.ae/guides/natural-gas-processing-measurement-points/

Measurement points

#	POINT	MEASURES	TYPICAL VALUE / LIMIT	RECOMMENDED SOLUTION
1	Plant inlet / gathering header	Oxygen (ppm)	Case study: 90–100 ppmv at the inlet damaged the amine; the pipeline limit was < 2,000 ppmv	DPSS-61XX; Integrated system: trace O_2 analyzer qualified for wet sour gas
2	Amine contactor outlet	CO_2 (%)	Pipeline: ≤ 2.0 vol% (US tariff example), ≤ 2.0 mol% (UK network entry)	Integrated system: explosion-proof NDIR CO_2 analyzer with a 0–5 vol % range
3	Amine contactor outlet	H_2S and total sulfur	US tariff example: 0.5 grain/100 scf (≈ 8 ppmv); UK network entry: ≤ 5 mg/m³	Integrated system: H_2S analyzer (lead-acetate tape or UV)
4	TEG contactor outlet	Water content / water dew point at line pressure	Typically 7 lb/MMscf (≈ 147 ppmv) in US pipelines; −8 °C at 70 bar under EN 16726	DPT830, DPT990-EX, DPSS-61XX, DPT-600 Plus-EX
5	Molecular-sieve dryer outlet	Trace water (ppmv)	< 0.1 ppmv (≈ −90 °C frost point at 1 atm)	DPT830, DPT990-EX
6	Mercury guard bed outlet	Mercury	Down to 0.01 µg/Nm³ reported	Integrated system: mercury analyzer (cold-vapour atomic absorption or fluorescence)
7	Custody transfer / pipeline entry	Water dew point at stated pressure	US: ≤ 7 lb/MMscf (some ≤ 4); EU: −8 °C at 70 bar; UK: −10 °C at 85 barg. GCC: per the gas sales agreement	DPT830, DPT990-EX, DM9700, DM9800
8	Custody transfer / pipeline entry	Hydrocarbon dew point	UK entry: ≤ −2 °C at any pressure up to 85 bar; other networks −10 °C at 54–60 bar	Integrated system: automatic hydrocarbon dew point analyzer, or calculation from process GC (ISO 23874)
9	Custody transfer / pipeline entry	Oxygen	US tariff example ≤ 0.2 vol%; EN 16726: 10 ppm for sensitive users; UK entry ≤ 0.2 % above 38 barg	PGA500-EX, PGA500
10	Custody transfer / pipeline entry	Composition, heating value, Wobbe index, total sulfur	Calculated from the mole-fraction composition per ISO 6976	Integrated system: process gas chromatograph (C6+/C9+) with sulfur detection
11	Gas turbine fuel gas skid	Water dew point	Fuel must be supplied at least 11 °C (20 °F) above its highest dew point (one turbine OEM specification)	DPT810, DPT990-EX

Typical values from published standards, regulations and technical literature. Your contract, licensor or plant specification always governs. Integrated systems are supplied by YORK through its partner integration factory.

Key references

1. Gas Quality section of the Algonquin FERC Tariff — Mass.gov
2. Draft Comparison of Pipeline Natural Gas Quality Specifications (R03035) — NAESB
3. EASEE-gas CBP Hydrogen Quality Specification, additional material (EN 16726 limits) — ENTSOG
4. Network Entry Gas Quality Specification — Cadent Gas
5. PEH: Gas Treating and Processing — SPE PetroWiki