marcogaz

Technical Association of the European Gas Industry

Oxygen Management in Biomethane in Europe

Executive Overview

Frédéric VULOVIC – MARCOGAZ Group 5: Gas Quality & Metering Chair - NaTran

ENTSOG Gas Quality Workshop 2026 – 05/11/26

Study Coverage

- Wide European Participation
  - The study includes **22 contributions from 14 countries**, ensuring a comprehensive European perspective on oxygen management.
- Diverse Operator Input
  - Inputs come from transmission, distribution, and storage system operators, covering various network sizes and regulatory environments
- Shared Challenges and Differences
  - The study reveals common challenges and differences in O2 management practices across countries, highlighting the need for benchmarking
- Foundation for Strategic Discussions
  - Consolidated insights support best practice sharing and guide future policy and operational developments at the European level

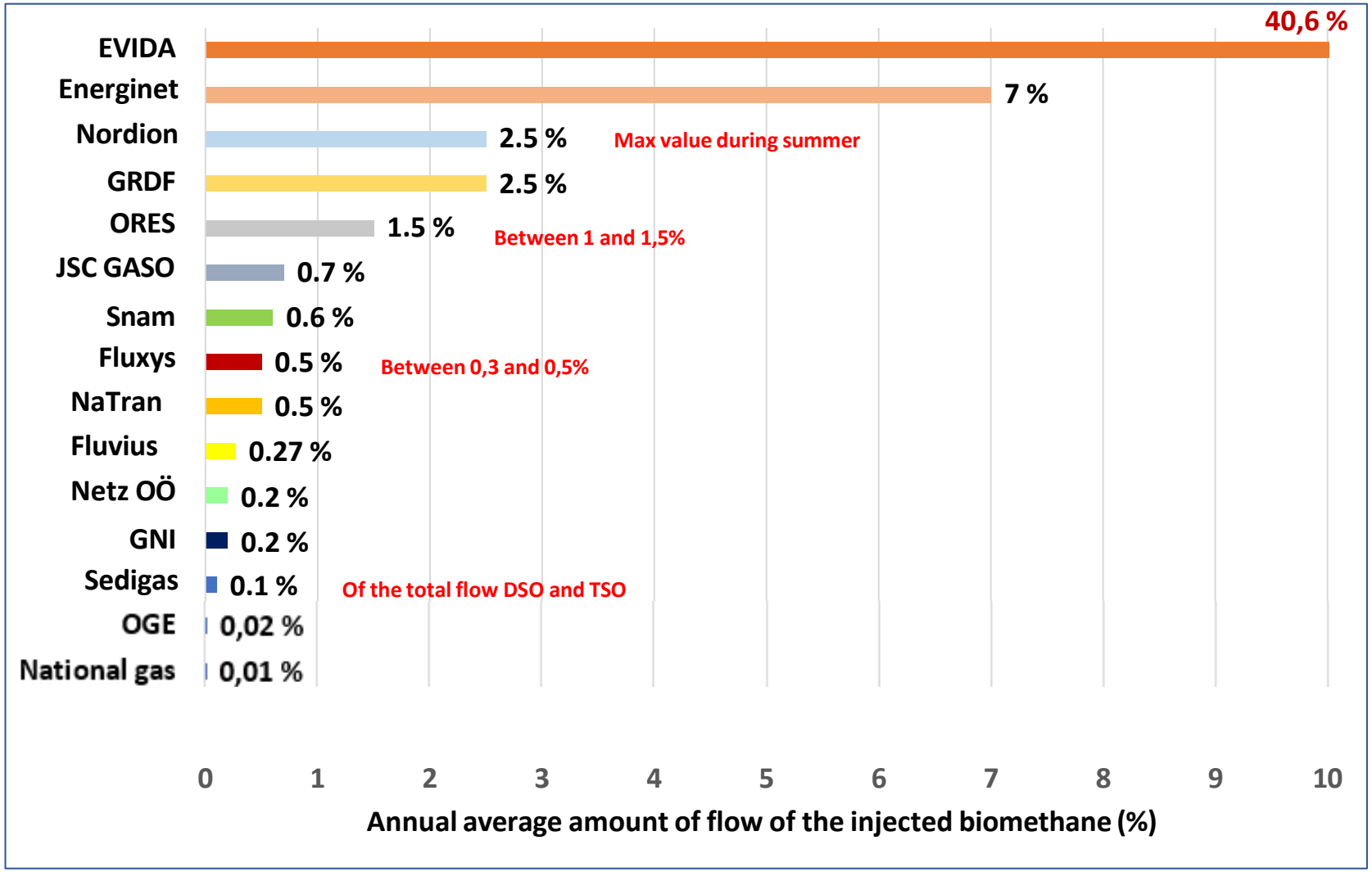
marcogaz

Annual average amount (in %) of flow of the injected biomethane compared to the total flow of gas in the grid

Companies with no response to this question :

- **Enagas**
- **Italgas**
- **Netz Niederösterreich GmbH, (NNOe)**
- **Storengy**

For **PSGAZ** and **DESFA**: None



O2 Management in Biomethane

- Importance of Oxygen Control
  - Managing O2 levels is crucial to maintain gas quality and protect infrastructure in biomethane networks
- Regulatory Diversity in Europe
  - Different European countries have varied regulations governing O2 limits in biomethane distribution (sometimes depending on MOP)
- Operational Challenges and Responses
  - Operators face challenges from O2 presence and respond with monitoring, policy adaptation, and collaboration
- Strategic Decision-Making
  - This topic requires strategic focus to ensure safe, efficient integration of renewable gases into infrastructure

marcogaz

European Situation

- Diverse Regulatory Practices
  - European countries apply varied O2 limits and operational rules based on infrastructure and national standards
- Cross-Border Challenges
  - Interconnected gas networks may face operational and contractual challenges due to inconsistent O2 management practices
- Need for Coordination
  - Growing recognition exists for harmonized O2 management to support biomethane growth and market stability
- Fragmented but Evolving
  - Current European gas network oxygen management is fragmented but progressing through regulatory dialogue and cooperation

marcogaz

EN16726

- Oxygen Content upper limit
  - EN 16726 sets a maximum oxygen limit of 1% in gas networks to ensure safe and efficient gas quality across Europe
- Flexible Application
  - The standard allows flexibility for lower oxygen limits down to 0,001% in sensitive installations based on network characteristics and risks
- Harmonization Challenges
  - O_2 limits varies according to national requirements, network conditions and the type of sensitive installation concerned

Parameter	Maximum limit
Oxygen	***1% or below 1% to 0,01% or below 0,01% to 0,001% according to assessment process***

NOTE 1 : Most applications can accept a level of 0,01 % of oxygen or higher; certain types of underground storages are sensitive to oxygen contents higher than 0,001 %.
On a case-by-case basis, it can be required to identify the techno-economical optimal solution enabling the level of O2 acceptable for the part of the gas grid affected, e.g. from biomethane producers to installations sensitive to O2. The assessment process for identification of installations sensitive to O2, and evaluation of the applicable threshold and responsibilities need to be stipulated to facilitate the application of the standard requirement on O2 content.

NOTE 2 : Considering the expected development of biomethane production, the lower maximum limit of 0,01% will probably have to be reassessed upwards in the coming years.

NOTE 3 : 1% is equal to 10000 ppm and 0,001% is equal to 10 ppm.

marcogaz

Identified Risks

- **Pipeline Deposits Formation**
  - Deposits like sulfur and particles form inside pipelines, causing fouling and increased maintenance needs
- **Operational Constraints Impact**
  - Adjusting gas flows and network configurations can limit system flexibility and add complexity
- **Oxygen and Gas Interactions**
  - Interactions between oxygen and other gas components may cause unexpected effects needing further study
- **Risk Management Strategies**
  - Monitoring, operational adjustments, and research are essential to manage risks as biomethane volumes rise

Sensitive Uses

- **Underground Gas Storage Sensitivity**
  - O2 may can cause chemical reactions that compromise storage integrity and gas quality in underground facilities
- **Industrial Feedstock Sensitivity**
  - Industrial users relying on gas as feedstock require strict O2 control to avoid interference in production processes
- **Network Interfaces**
  - Interfaces between gas networks may need gas quality control to maintain compatibility and safe operation
- **Targeted Oxygen Management**
  - Operators implement blending, flow management, and injection controls to keep oxygen within safe limits for sensitive users

Current Situation

- **Oxygen Levels Status**
  - Oxygen levels in European gas networks are generally low and within acceptable limits, indicating stable integration of biomethane
- **Variability Across Networks**
  - Variations in oxygen levels exist between countries and networks due to biomethane penetration, configurations, and regulations
- **Need for Monitoring**
  - Continuous monitoring and proactive management are essential to address local oxygen increases and ensure system reliability
- **Future Challenges**
  - Increasing biomethane production raises oxygen levels, requiring adaptable operations and robust monitoring systems

marcogaz

Operator Possible Approach

- **Injection Point Analysis**
  - Operators analyse biomethane injection points to assess O2 impact on gas quality through location evaluation
- **Sensitive Customer Identification**
  - Identifying sensitive customers and installations ensures strict O2 limits for critical facilities like storage and industry.
- **Oxygen Monitoring Systems**
  - Real-time and periodic O2 monitoring using analysers and modelling tools supports proactive risk management
- **Collaborative Management**
  - Collaboration between TSOs, DSOs, and stakeholders ensures effective, consistent O2 management across networks

marcogaz

Actions and Outlook

- **Limiting Oxygen at Source**
  - Improving production and upgrading processes helps reduce oxygen content early, minimizing downstream interventions.
- **Network Operation Adaptation**
  - Blending gas streams and managing flows dilute oxygen concentrations within the distribution network effectively.
- **Enhanced Monitoring and Data Analysis**
  - Strengthened monitoring and data analysis improve visibility and support informed decisions on oxygen management.
- **Collaboration and Innovation**
  - Operators, regulators and stakeholders collaborate on best practices and develop technologies to manage O2 effects. Innovations investigating O2 removal technologies

marcogaz

marcogaz

Technical Association of the European Gas Industry

Thank you!

marcogaz@marcogaz.org | @marcogaz_EU

marcogaz.org | be.linkedin.com/company/marcogaz