

**Glass Performance Days
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**Quality Control of Insulating Gas
in Insulating Glass Units**

by
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Using inert gas in IGU's

- **Inert gas enhances the thermal properties of the IGU**

Roughly:

- Argon is abt. 50% better than air; inexpensive
- Krypton is abt. 50% better than Argon; abt. 200 times more expensive than Argon

- **Market requirements:**

- U-value is typically calculated with 80% filling degree + reserve for leakage => Gas filling is typically 90-95% which is easy to reach with well operating gas press
- Product liability for the insulating glass and window suppliers last several years

Methods of measurement

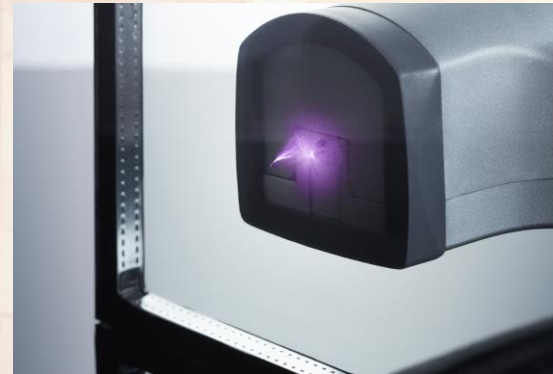
Two main methods

Invasive

- Oxygen analyzers
- Gas Chromatograph

Non-invasive / Non-destructive

- Plasma Emission Spectroscopy
- TDLAS based method



Invasive measurement; Oxygen analyzers

Operating principle:

- The invasive method penetrates through the edge of the IGU and the amount of Oxygen is measured and converted to the gas content by a separated table

Benefits:

- Affordable
- Robust technologies with good accuracy

Limitation:

- Require breaking the IG structure
>> IGU cannot be delivered to the customer or retested



Invasive measurement; Gas Chromatograph

Operating principle:

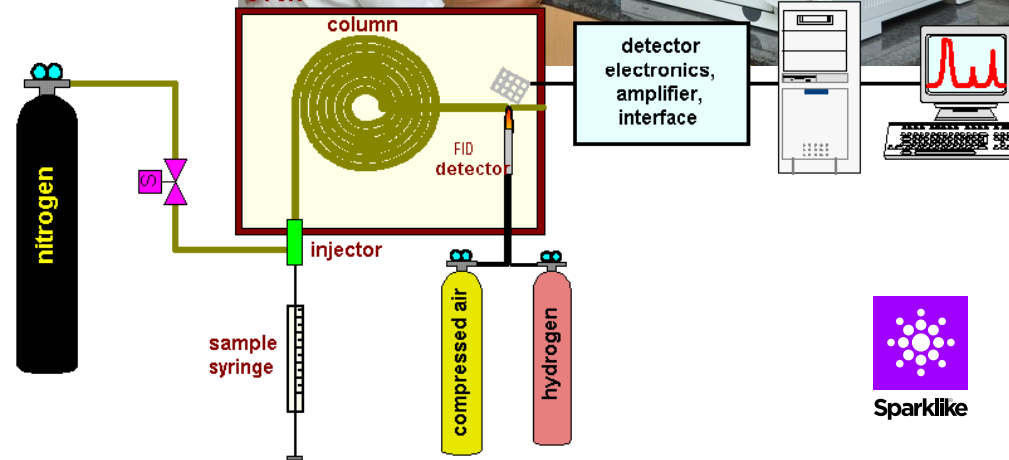
- With a syringe a sample is taken from the specimen
- The sample is analyzed in the Gas Chromatograph

Benefits:

- Normative system; however +/-1% accuracy

Limitations:

- Laboratory system
- Expensive



Non-destructive measurement; Plasma Emission Spectroscopy

Technology:

- Plasma emission spectroscopy

Operating principle:

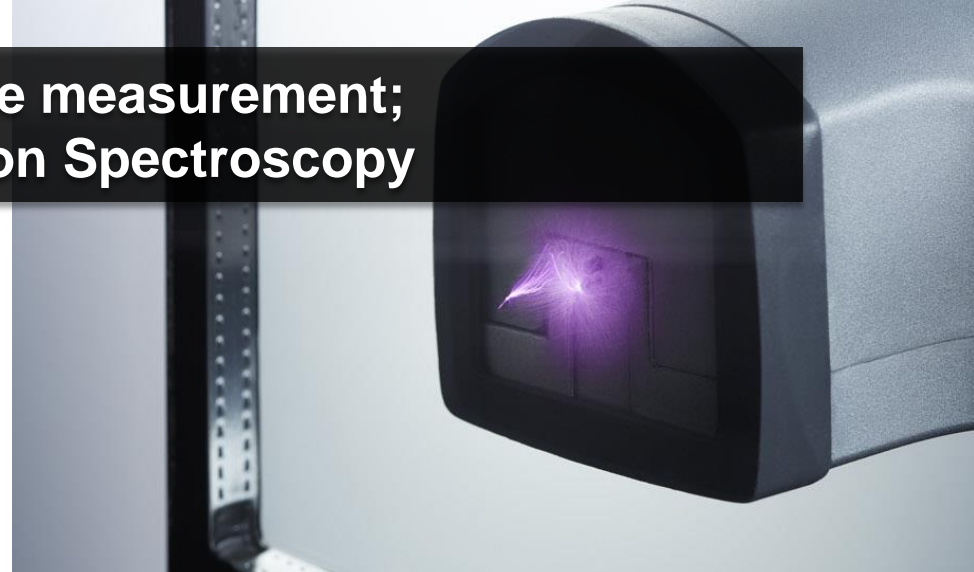
- A high voltage spark launched in the IG unit's cavity >> light emission which is analyzed further

Benefits:

- Non-destructive
- Measurement can be repeated
- Fast (2s.) and accurate

Limitation:

- Measuring only through clear glass



Non-destructive measurement; TDLAS

Technology:

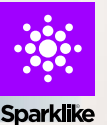
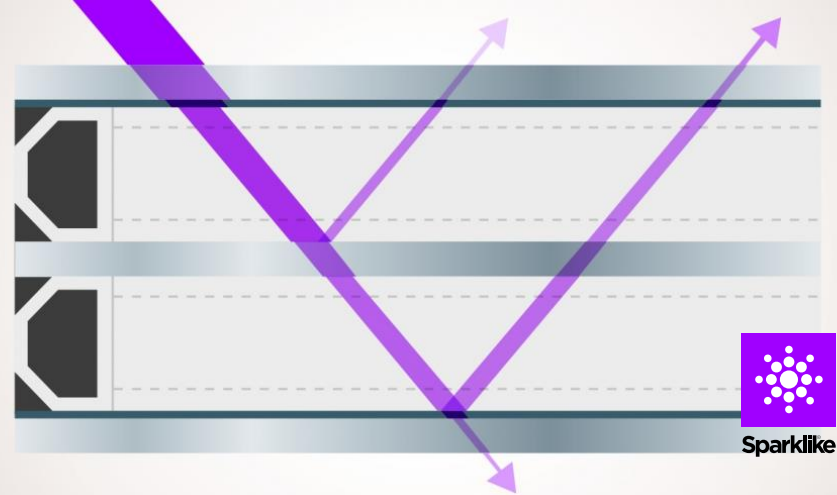
- Laser based TDLAS technology

Operating principle:

- Laser beam into the IG measuring the surfaces, intensity and harmonic changes of the returning signal >> measuring the Oxygen amount
- Oxygen amount converted into insulation gas percentage

Benefits:

- Non-destructive
- Triples, through coatings, through laminates



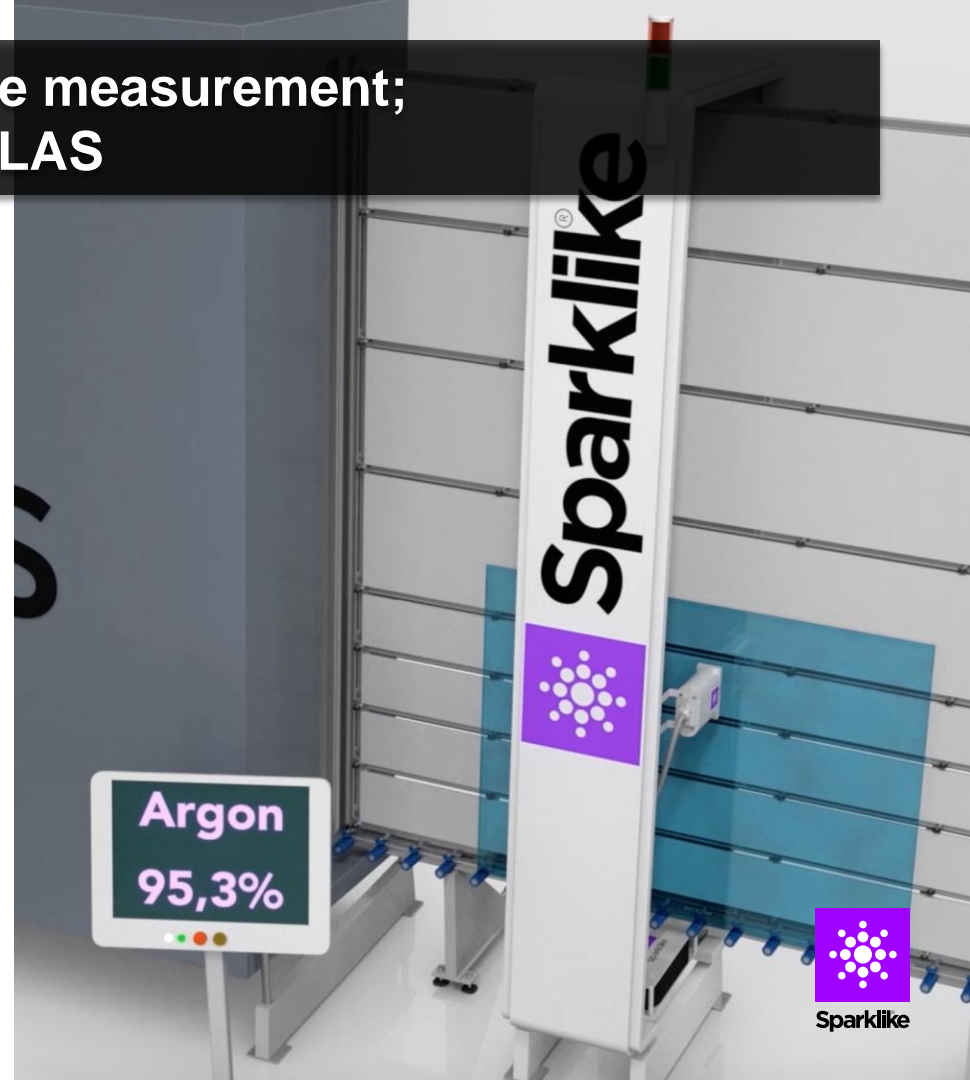
Sparklike

Non-destructive measurement; TDLAS

TDLAS based system can be Off-line or Online

Online additional benefits:

- All the glasses measured during the production
- Reporting directly to ERP or to IG-line's own
- Product traceability



Teşekkür ederim!



Sparklike