

Chemical identification and interface detection with in-line Vaisala K-PATENTS® Process Refractometer



Chemical analysis plays an important role in chemicals production and logistics operations. Basic and commodity chemicals must be produced cost-efficiently yet with top quality and minimal environmental impact. This is possible when utilizing reliable in-line process analysis, control and monitoring tools that enable fully automated product identification.

Simultaneous safe handling of multiple liquid bulk chemicals from trucks, rail or cargo to receiving tanks requires reliable chemical identification and interface detection.

Loading and unloading operations can be substantially improved with in-line chemical identification in real-time, eliminating the risk of human error and reducing the costly waiting time.

Example applications

In-line Vaisala K-PATENTS® Process Refractometer can be used in chemical identification and interface detection in various applications such as:

- Acids (acetic, citric, hydrochloric HCl, nitric HNO₃, sulphuric H₂SO₄ etc.)
- Alcohols
- Glycols
- Hydrogen peroxide H₂O₂
- Sodium hydroxide NaOH (caustic soda)
- Solvents
- Urea
- Many other (contact us to discuss your application)

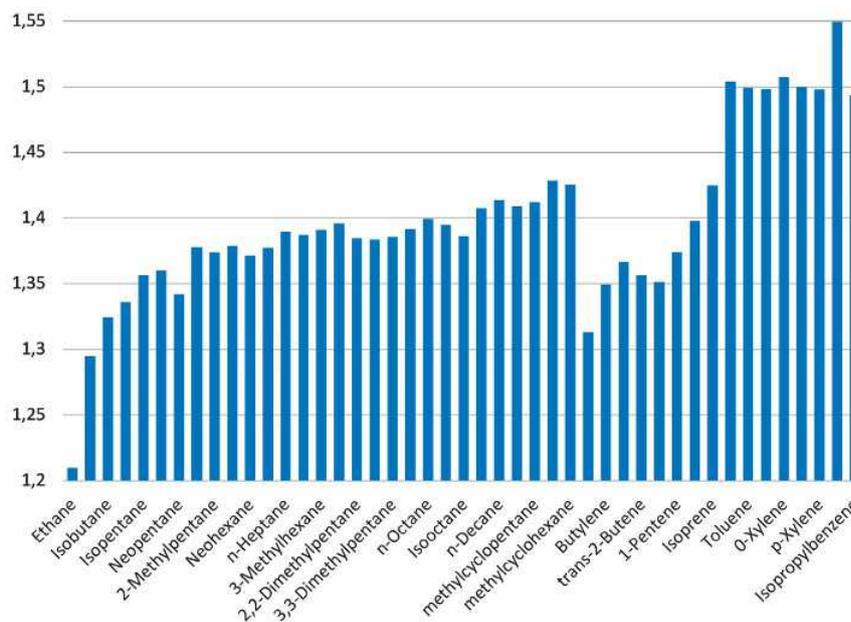


Refractive Index measurement for the most reliable and accurate chemical identification

Each chemical has a distinctive Refractive Index (nD). Based on this, the “fingerprint” of a chemical is taken by Vaisala’s digital refractometer, installed in the process line or tank.

The refractive index value can be used for chemical identification directly, temperature compensated at, for example, 20 °C/ 68°F according to the reference temperature or converted into a concentration unit. In-line process refractometer can provide the accuracy of nD +/- 0.0002 repeatably and continuously.

The refractive index property of hydrocarbons can be utilized by unloading stations for product identification. Hydrocarbons can be similar in properties and appearance, however, each hydrocarbon has a distinct refractive index (see the graph).



Graph: Distinct refractive indices of hydrocarbons

Why to choose Vaisala K-PATENTS Process Refractometer?

With safety, time and cost efficiency in mind, in-line Vaisala K-PATENTS Process Refractometer is the ideal solution for chemical identification and interface detection because:

- the refractometer output is temperature compensated and can be set in customer’s preferred scale, e.g. refractive index nD at 20 °C, concentration %-bw or other.
- it is maintenance-free and safe to use once installed in the line
- it is not influenced by undissolved solids or bubbles in the process
- it does not require regular recalibration
- it withstands demanding chemical industry process conditions and remains accurate through the full measurement range of nD = 1.3200...1.5300 corresponding to 0-100 % by weight
- the refractometer has increased safety and intrinsically safe certification.



How customers benefit from the in-line measurement by Vaisala's process refractometer

Vaisala's in-line process refractometer provides ease of use and peace of mind by ensuring safe, continuous and reliable chemicals production and logistics operations.

It enables the following:

- fast real-time product identification without sampling or product waste
- instant measurement results for continuous process control
- minimized manpower on-site
- eliminated operator errors
- increased process safety
- improved working safety
- minimized transmix of products
- uninterrupted and fast unloading and filling operations
- easy installation in tanks or pipes, horizontally or vertically, requiring no by-pass arrangements



Customer cases

Customer:

Chemical plant receiving three hydrocarbons for use in the process

Hexene nD 1.3879 at 15°C = 33.7 Brix

Butene nD 1.3494 at 15°C = 10.7 Brix

Isopentane nD 1.35631 at 15°C = 15.1 Brix

Wins with in-line refractometer:

- ✓ Quick and accurate chemical identification
- ✓ Unique Brix values that are easy for operators to understand
- ✓ No more equipment damage as a result of storing wrong material in incorrect tank
- ✓ No more laborious and unreliable manual sampling

Customer:

Chemical identification at unloading station receiving chemicals from trucks

19 different chemicals

Unloading allowed if Refractive indices of chemicals are according to standards

Wins with in-line refractometer:

- ✓ No accidental transmix of chemicals
- ✓ Replaced manual sampling
- ✓ No time delay due to lab analysis
- ✓ Efficient unloading operation
- ✓ Improved safety when handling hazardous chemicals

Customer:

Fuel terminal

Ditches around storage tanks collecting leaked chemicals and rainwater

Ethanol identification in rainwater

Unreliable density meter measurement

Wins with in-line refractometer:

- ✓ Accurate identification of ethanol before pumping away rainwater
- ✓ Reliable *watchdog* measurement for regulatory compliance

Customer:

Lubricants and technical chemicals producer

Product identification in the filling line

Multiple product lines

Laborious manual sampling and time-consuming lab analysis of samples

Wins with in-line refractometer:

- ✓ Assuring product specifications
- ✓ Considerable product waste reduction
- ✓ No more product quality variations due to lab sampling representing only a part of the production batch
- ✓ Replaced laborious manual sampling and lab analysis

Customer:

Specialty chemicals producer

Receiving multiple chemicals as raw material

Chemicals identification

Wins with in-line refractometer:

- ✓ Efficient unloading operation
- ✓ Ensuring that correct chemical within specifications is stored to the right tank
- ✓ Easy refractometer installation
- ✓ Maintenance-free and re-calibration-free operation
- ✓ Suitability for ATEX zones 0/1/2



Learn more about the **refractometer technology** and its example applications from detailed application notes on our dedicated **Chemical industry pages**.



If you cannot find your application, please contact our **application experts** at Industrial Liquid concentration measurements.



Please contact us at www.vaisala.com/contactus



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