

Measurement of AdBlue®/DEF

Standard-testing method for determining the concentration of Adblue®/DEF

Controlling Urea Concentration in Real-time

AdBlue® / Diesel Exhaust Fluid (DEF) plays a crucial role in reducing harmful emissions in modern diesel engines. As part of Selective Catalytic Reduction (SCR) technology, this aqueous urea solution is injected into exhaust gases, where it decomposes into ammonia and converts nitrogen oxides (NOx) into harmless nitrogen and water vapor.

AdBlue® / DEF is a high-purity, transparent liquid consisting of 32.5% synthetic urea dissolved in demineralized water. Maintaining this exact concentration is essential for optimal SCR performance and system longevity. Continuous monitoring of the urea concentration is therefore a critical process step in AdBlue® production.

Why Monitoring is Essential

The production of AdBlue® involves mixing high-purity urea with demineralized water under controlled conditions. Typical process temperatures range from 25 °C to 50 °C, followed by cooling before storage. Alternatively, AdBlue® can be produced by dissolving solid urea granules in heated water (40–45 °C), allowing rapid formation of the final solution. In both production routes, precise control of the concentration is mandatory. According to ISO 22241, deviations beyond $\pm 0.8\%$ must be avoided. Even minor deviations can:

- Reduce NOx conversion efficiency
- Damage SCR system components
- Increase operational and maintenance costs

Traditional offline analysis methods are time-consuming and do not allow immediate corrective actions. Real-time monitoring is therefore essential for modern process control.

Refractive Index as Process Analytical Tool (PAT)

The refractive index (RI) is a reliable and widely accepted parameter for determining the concentration of urea solutions. It provides direct information about the composition of the liquid and enables continuous

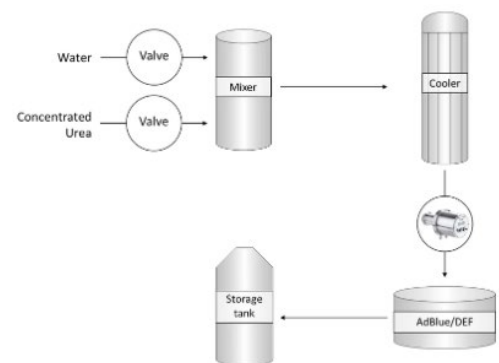
monitoring of the production process. By converting the refractive index into a calibrated urea or AdBlue® concentration scale, the process can be controlled in real time.

Inline refractive index measurement enables:

- Immediate detection of concentration deviations
- Automated adjustment of water dosing
- Stable and reproducible product quality

For optimal process control, the process refractometer should be integrated upstream of the filling stage and before transfer into the storage tanks. Depending on the plant design, the sensor can either be installed directly into the pipeline system via suitable process connections or mounted in a buffer or conditioning tank positioned before the storage tanks.

Based on the measured concentration values, the digital outputs of the refractometer can be used to control valves automatically. This allows corrective dosing of either concentrated urea solution or water in order to adjust and maintain the required AdBlue®/DEF concentration within specification.



Solution from SCHMIDT + HAENSCH

Using the SCHMIDT + HAENSCH Full-Range Inline Process Refractometer iPR FR² or Compact Inline Refractometer iPR C² provide a robust, real-time method for monitoring the Urea concentration in AdBlue®/DEF production processes. The refractometer is installed downstream of the heat exchanger before storage or filling. It continuously measures the concentration and ensures it remains within the required range of urea. If deviations occur, the system automatically adjusts the dosage of demineralized water via digital output signals, ensuring consistent product quality. For batch production using urea granules, the refractometer can be installed directly in the mixing tank. It monitors the dissolution process and controls dosing in real time, enabling fast and efficient production.



iPR C²
Compact Inline
Process Refractometer

iPR FR²
Full-range Inline
Process Refractometer

Product type	Product	ID-N°
Process Refractometer	iPR FR ² Full-Range Inline Process Refractometer	10970
Process Refractometer	iPR C ² Compact Inline Refractometer	16266
Accessories	VARINLINE® housings (several ends and diameters)	

Advantages

- Precise, reliable and fast measuring method
- Ensures unchanged high product quality
- Avoiding faulty batches
- Guarantees the efficiency as reducing agent for SCR technology

Typical industries

- Chemical industry
- Automotive industry
- Filling stations
- Service areas