

सीबीएम मूल्यांकन के लिए प्रयोगशाला  
उपकरण — रीति संहिता  
भाग 3 आविलता मीटर

Lab Instruments for CBM  
Evaluation — Code of Practice  
Part 3 Turbidity Meter

ICS 73.020

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## FOREWORD

This Indian Standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Method and Equipments for Underground Coal Gasification and Coal Bed Methane Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

Coal bed methane is the form of natural gas that is adsorbed into the solid matrix of coal. It is different from the conventional gas reservoirs as the methane is stored within the coal seams through the process of adsorption. The natural fractures in the coal seams (known as cleats) are responsible for the flow behaviour and provide the major channels for gas flow.

Several laboratory studies are carried out for CBM exploration/extraction as well as at the time of CBM operations. The laboratory studies includes with various geological and geochemical data collection, data analysis, quality check and quality control of operation fluid while drilling, hydro-fracturing etc. The lab studies are essential to evaluate the gas reserve as well as for strategy finalization for exploration methodologies. One of the most challenging tasks in CBM evaluation are effluent (produced water) handling.

The code of practices for lab instruments for CBM evaluation is in four parts. This standard (Part 3) covers the turbidity meter. Other parts in this series under the general title are as follows:

- Part 1 Mud balance
- Part 2 Marsh funnel and graduated cup
- Part 4 Rotational viscometer

The composition of the Committee responsible for the formulation of this standard is given in [Annex B](#).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

*Indian Standard*

# LAB INSTRUMENTS FOR CBM EVALUATION — CODE OF PRACTICE

## PART 3 TURBIDITY METER

**1 SCOPE**

Turbidity meter is a very essential and useful instrument in oil field as well as in CBM operation for characterization and quality control of injection water, waste water, effluent water, chemicals etc for measurement of turbidity.

Turbidity is an optical property of the water and it indicates the haziness or opaqueness of water. The turbidity is caused by the suspended particle and coloured material in water. In CBM, turbidity of water is measured by nephelometry (90 degree scattering with respect to the centre line of the incident light path) and turbidity is measured in NTU unit (nephelometric turbidity units). The higher intensity of scattered light, higher will be turbidity. However, the turbidity of water depends upon the size, shape and composition of the suspended particle and wavelength of the incident light also.

**2 TURBIDITY METER****2.1 Design and Requirement****2.1.1 General Features**

- a) The turbidity meter should be capable of determining turbidity of desired fluids;
- b) The system shall be complete in all respect and ready for operation as per specification;
- c) The system shall be new and of latest model;
- d) It should be made of corrosion resistant as well as rust proof material;
- e) The system shall give high end consistent and accurate measurement of turbidity;
- f) The system should be portable and rugged for field use; and
- g) Power supply — 230 V  $\pm$  10 V, 50Hz  $\pm$  1 Hz, single phase a.c.

**2.1.2 Technical Parameters**

Turbidity meter should have following minimum specifications:

<i>Sl No.</i>	<i>Parameters</i>	<i>Requirements</i>
(1)	(2)	(3)
i)	Measurement mode	Nephelometric
ii)	Light source	Tungsten lamp
iii)	Measure range	0.01 to 1 000 NTU
iv)	Resolution	0.01(0 to 9.99 NTU) 0.1 (10 to 99.9 NTU) 1.0 (100 to 1 000 NTU)
v)	Accuracy	$\pm$ 2 percent of reading
vi)	Repeatability	$\pm$ 1 percent of the measured value
vii)	Calibration	3 points calibration
viii)	Operation temperature	Ambient to 40 °C
ix)	Out put	USB or RS 232
x)	Display	LCD/Graphic digital
xi)	Sample volume	10 ml to 30 ml

### 3 CALIBRATION

The instrument will be regularly maintained and calibrated to get accurate result as per the specification. The calibration procedure of turbidity meter will be followed in accordance with manufacturer's recommended procedure. At least three-point calibration system is suggested for turbidity meter. While calibration, manufacturer supplied calibration fluid will be used or proper procedure will be followed for the preparation of the calibration fluid.

### 4 INSTALLATION AND TESTING

Installation and testing will be done as per the manufacturer recommended standard procedure. However, following common practices may be followed:

- a) Turbidity meter (nephelometer) measures the turbidity of water in NTU unit;
- b) If possible, measure turbidity of water sample immediately. Otherwise mix the sample gently and avoid generation of air bubble;
- c) The sample glass tube must be clean, scratch free and clean the glass tube with non-abrasive cloth;
- d) Rinse two sample tubes with sample water and followed by fill with sample water;
- e) Insert the sample tube in chamber. Place the sample tube in proper orientation and while

placing the sample tube should be handled with cap not with glass;

- f) Push the read button for measurement and record the result;
- g) Take the third reading with new sample if the first two readings are significantly different;
- h) Turn off the meter and remove the sample tube from chamber; and
- j) Keep the instrument securely.

### 5 DOCUMENTATION

- a) Past track record of at least last two years for turbidity meter supplied in oil industry that is purchase orders, inspection release notes, user feedback with their communication details etc shall be provided;
- b) Manufacturer's data and descriptive literature for the equipment and materials of construction by ASTM reference and grade, coating(s) specifications etc;
- c) Calibration and test report of manufacturer shall be furnished;
- d) Installation and operation manual in English language shall be provided along with the supply; and
- e) Warranty/Performance guarantee certificate shall be furnished.

## ANNEX A

(Normative)

## TURBIDITY METER-DATA SHEET



<i>Sl No.</i>	<i>Description</i>	<i>Details</i>
(1)	(2)	(3)
i)	Measurement mode	Nephelometric
ii)	Light source	Tungsten lamp
iii)	Measure range	0.01 to 1 000 NTU
iv)	Resolution	0.01(0 to 9.99 NTU) 0.1 (10 to 99.9 NTU) 1.0 (100 to 1 000 NTU)
v)	Accuracy	± 2 percent of reading
vi)	Repeatability	± 1 percent of the measured value
vii)	Calibration	3 points calibration
viii)	Operation temperature	Ambient to 40 °C
ix)	Out put	USB or RS 232
x)	Display	LCD/Graphic digital
xi)	Sample volume	10 ml to 30 ml
xii)	Calibration kit/calibration fluid	0 NTU, 20 NTU, 100 NTU and 800 NTU
xiii)	Empty cell	02 No.

## ANNEX B

*(Foreword)*

## COMMITTEE COMPOSITION

Method and Equipments for Underground Coal Gasification and Coal Bed Methane Sectional Committee, MED 37

<i>Organization</i>	<i>Representative(s)</i>
Oil and Natural Gas Corporation Limited, New Delhi	SHRI UDAY PASWAN ( <b>Chairperson</b> )
Atlas Copco Construction and Mining Sales, Pune	SHRI ANIMESH NANDY
Bharat Heavy Electrical Limited, New Delhi	SHRI TIRUPATHI NAIDU CHINTALA
Bharat Heavy Electricals Limited, Project Engineering Management, Noida	SHRI RAJESH RANJAN SHRI SAUMEN KUMAR BHAUMIK ( <i>Alternate I</i> ) SHRI PRADEEP KUMAR SHARMA ( <i>Alternate II</i> )
Central Electricity Authority, New Delhi	SHRI SUNIT GUPTA SHRI ASIF IQBAL DEPUTY ( <i>Alternate</i> )
Central Mine Planning and Design Institute Limited, Ranchi	DR AKHILESH SINGH
CSIR - Central Institute for Mining and Fuel Research, Dhanbad	DR DEBADUTTA MOHANTY SHRI JAYWARDHAN KUMAR ( <i>Alternate</i> )
CSIR - Central Mechanical Engineering Research Institute, Durgapur	<b>DR MALAY KUMAR KARMAKAR (<i>Alternate</i>)</b>  <b>DR CHANCHAL LOHA (<i>Alternate</i>)</b>
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SHRI K. V. RAO, SCIENTIST 'F'/SENIOR DIRECTOR AND  
HEAD (MECHANICAL ENGINEERING)[REPRESENTING  
GENERAL (*Ex-officio*)]

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SHRI AMAN DHANAWAT  
SCIENTIST 'C'/DEPUTY DIRECTOR  
(MECHANICAL ENGINEERING), BIS







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