ISO 3171:1988-12 (E)

Petroleum liquids; automatic pipeline sampling

Contents

Page

0 Introduction 1

1 Scope and field of application 1

2 References 2

3 Definitions 2

4 Principles 4

5 Selection of sampling point (including stream conditioning) 6

6 Profile testing 7

7 Sampling probe design 9

8 Sampler design and installation; 9

9 Control equipment 10

10 Flow measurement 11

11 Sample receivers and Containers 12

12 Sample handling 13

13 Safety precautions 15

14 Operating procedures 15

15 Proving the sampling system 17

16 Estimation of overall sampling system uncertainty 20

17 Bibliography 23

Annexes

A Estimating water-in-oil dispersion 32

B Example of water concentration profile tests at a crude oil terminal 51

C Guide for initial Screening of Potential sampling locations 54

Tables

1 Recommended sampler characteristics for crude oil and refined products 11

2 Typical operating Parameters for intermittent fixed-grab-volume samplers 16

3 Typical sampler maintenance and Performance report for an intermittent grab sampler 18

4 Sampling test ratings for injected water concentrations of 1 % and above 20

5 Symbols 34

6 Suggested resistance coefficients 36

7 Values of ß for bends 37

8 Expected concentration ratio 37

9 Acceptability of profile 38

10a Water concentration profile test at a crude oil terminal (set 1) 52

10b Water concentration profile test at a crude oil terminal (set 2) 53

11 Suggested minimum flow rates versus mixing elements 54

Figures

1 Initial or periodic Validation of a sampling system 24

2 Graphical representation of concentration profiles in a horizontal pipe 25

3 Location of sampling point 25

4 Multipoint probe for profile sampling 26

5 Arrangement of multipoint probe in horizontal pipeline for 300 mm diameter pipelines or larger 27

6 Typical timing diagram for sampler system testing 28

7 Bar graph presentation of automatic profile test at three locations 29

8 Results from profile tests (typical profiles) 30

9 Typical sampling systems 31

10 Energy rate and drop size 45

11 Settling rate 47

12 Turbulence (diffusivity) 49

13a Water concentration profile test at a crude oil terminal (example 1) 52

13b Water concentration profile test at a crude oil terminal (example 2) 53