

From the desk of G. A. Aaker, Jr., PE.

Estimated Oxygen Corrosion Rates

Reference: "Corrosion of Metals in Deaerated Seawater", J.W. Oldfield, et al, BSE/NACE 2nd Corrosion Conference, Bahrain, January 1981.

KNOWN:

PipeID 20.51cm Oxygen Concentration 10ppb

FlowRate 40000

bbl day

Temperature 50DegC

KinematicViscosity .007

cm

2

s @ Temperature 50 DegC

DiffusionCoefficient 3.28 10 5 cm

2

s @ Temperature 50 DegC

time 20yr

SOLUTION:

Calculate the flowing velocity...

Velocity

FlowRate

π

PipeID

2

4

Velocity 222.786

cm s

Calculate the Reynolds Number...

ReynoldsNumber Velocity

PipeID KinematicViscosity ReynoldsNumber 6.528 105

Calculate the Prandtl Number...

PrandtlNumber

KinematicViscosity DiffusionCoefficient PrandtlNumber 213.415

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RESULTS:

The Corrosion Rate is...

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CorrosionRate

constant OxygenConcentration ρ Velocity v (ρ)

ReynoldsNumber

.125

PrandtlNumber .75 ρ

ρ ρ

CorrosionRate 0.423

mm yr

ρ ρ

The Total Corrosion for time 20 yr ρ ρ

TotalCorrosion CorrosionRate time ρ ρ ρ TotalCorrosion 8.457 mm

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