INSPECTION PROCEDURE FOR SHELL AND TUBE HEAT EXCHANGERS

guidelines to ensu
of shell and tube heat ex
containing parts of the exchange

Safety Data Sheets (MSDS) are electroni
to in the MSDS program by equipment num
by searching by manufacturer, product name, o
edure user is responsible for referring to the appro

rporate Safety Procedures shall be referred to for all s
ney are accessible electronically plant wide by going to t
Services tab on the Intranet. Personnel are responsible for
appropriate safety procedures.

National Board Inspection Code ANSI-NB-23, Latest Edition

API-510 Pressure Vessel Inspection Code: Maintenance Insp
Repair, and Alteration; Latest Edition

American Society of Mechanical Engineers (ASME), Section

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Applicable Local, Stale and Federal Regulations

Applicable Engineering Standards and Practices API

P571 Conditions Causing Deterioration and Failure

RP572 Inspection of Pressure Vessels

750 Management of Process Hazards

Maintenance Inspection Procedures

for the vessel being inspe

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- n history
- rent mechanical design requirements
- Previous repair history
- Re-rating history material degradation
- Corrosion rates

The Authorized inspector should take into consideration op
and the process chemistry the equipment is subjected to ar
potential degradation mechanisms.

External Inspection

- External inspection of an air cooled exchanger is part
determination of mechanical integrity.
- Then Authorized Inspector should examine platforms
stairways, and their supports (including fireproofing),
serviceability.
- The concrete pedestals, foundations and steels stru
examined for cracks, chips, spalling, or deteriorati
connections should be inspected to insure that the
- The Authorized Inspector should ensure that the
stamped or identified.
- lozzles should be examined for distortions
gradation.
- ations should be made to det
using Ultrasonic testi
facility

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[redacted]als for Shell and Tube ex[redacted]
[redacted]els as defined in API 510 Vess[redacted]
[redacted]pection at vessel half remaining life, [redacted]
[redacted]de also provides for extensions based o[redacted]

[redacted]nal Inspection intervals for Shell and Tube Exch[redacted]
[redacted]rdance with pressure vessels as defined in API 5[redacted]
[redacted]e. Generally, this interval is 5 years.

[redacted]nternal Inspection

NOTE: The below scopes for Internal and external Inspecti[redacted]
considered the limits of inspection. Inspector is respo[redacted]
inspecting in accordance with and on the basis of ref[redacted]
Documents.

Internal Inspections should be performed by or under the dire[redacted]
Authorized Inspector as defined by Code. An External Inspec[redacted]
performed in conjunction with each Internal Inspection.

- The Inspector should examine the internal walls of th[redacted]
and nozzles for cracking, pitting, general corrosion a[redacted]
Indications should be quantified through use of pit d[redacted]
ultrasonics (straight or angle beam). Locations and[redacted]
plotted on an equipment drawing

- Scale buildup or sludge deposits should be note[redacted]
location on the shell or nozzle.

[redacted]All gasket surfaces should be examined for a[redacted]

[redacted]mine condition of pass partition plate[redacted]
[redacted]ng) and gasket surfaces for met[redacted]

[redacted] bundle is rem[redacted]

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inlet nozzles.

he bundle is cleaned, a thorough
ormed on tubes, tube ends and tube
eneral corrosion. A representative portion
measured using appropriate instruments. Da
OD tube measurements, and pit depths. Findi
equipment drawing.

ternal Lining Inspection

- Metallic and nonmetallic linings (e.g. strip and plate
internal coatings, refractory) shall be examined duri
inspections of pressure vessels.

- The inspection scope and methods recommended in
metallic and nonmetallic linings should be followed to
condition of the lining and the vessel surface beneath

- A visual inspection of the accessible internal lining sh
each internal inspection interval. The lining should be
damage such as separation, bulging, spalling, holes,
chipping, and erosion.

- If lining damage is detected, representative portions
should be removed to assess the condition/effectiv
the metal beneath the lining. Alternatively, ultraso
external surface may be used to asses the dama

Thermography (IR) is an accepted on-stream i
detect refractory damage. Reference Mainten
INSP-029. Infrared.

spection

s should be included a

INSPECTION PROCEDURE FOR SHELL AND TUBE HEAT EXCHANGERS

spected to insure th

coating should be examined for b
pose the vessel to corrosive elements
hould be examined for integrity of sealing
corrosion under insulation.

- Condition of Data Plates and ID Markings.

- Nozzles should be examined for distortions, crack
degradation. Reinforcements should be examined
leakage. Weep holes should be open.

- Any ancillary equipment such as level bridles, tempe
gauge connections, should be inspected for external
leakage, and condition of support

- The Inspector should examine the surfaces of the she
covers, and heads for possible cracks, bulges, and o
deterioration. Attention should be given to support sa
external supports.

- Follow-up examinations should be made to determin
channel wall thickness (using Ultrasonic testing) in s
is observed.

epairs and Alterations

- All repairs end alterations performed on shells,
be done in accordance with Maintenance Proc
Vessel Repair/Alteration Procedure, and in a
Codes.

irs to bundles (tube pluggings) or
nted by the Inspector in the
d be mapped on equi

INSPECTION PROCEDURE FOR SHELL AND TUBE HEAT EXCHANGERS

...ition - Any change in the condition
...ginal Manufacturer's Data Report (U-1
...epair/Alterations Reports that affects the
of the pressure vessel.

- Non-conformance conditions will be reviewed b
Team (typically Area Inspector and Area Mainte
will make repair or alteration recommendations in
Maintenance Procedure; MNT-INSP-027, Inspecti
Process, to assure continued integrity and Code co

- Non-conformance issues should be forwarded to Re
if proper resolution is not reached in a timely manne

Reports

At a minimum, condition of the following should be indicated
Report:

1. Recommendations and Repairs Completed during cu
Event.

2. Condition of the following:

    a. Bundle

        i. Tubes (ID and OD)

        ii. Tubesheet (face a, baffle and

        iii. Floating Head (ID and OD
        surfaces)

        iv. Spacers, baffles, in

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hannel

i. Dollar Plate (Channel Cov

ii. Pass Partition and gaskets su

iii. Nozzle Necks and gasket surfac

NOTE: External Checklist should be used for Exte

Documentation

Inspection Reports should become a part of the Equ
Progressive Inspection Records.

Documentation and results on inspections should be
Equipment Files and/or in Plant Condition Monitoring
Base.

END OF PROCEDURE