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Trihasco **Utama**
Inspection and Engineering company



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**“Inspeksi, Assessment,
Re-Engineering dan Sertifikasi Tangki Penimbun.”**

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Dalam upaya mendapatkan Surat Kelayakan penggunaan Peralatan (SKPP) Migas, perlu dilakukan pekerjaan inspeksi (pemeriksaan), Assessment (pengujian) dan Re-Engineering terhadap peralatan Tangki Penimbun oleh para pengguna 348 Tangki Penimbun milik klien besar yang tersebar di 12 Field, di wilayah Indonesia, Peralatan tersebut harus di inspeksi, assesment dan re-engineering sebelum di ajukan ke Dit. Jend Migas untuk proses sertifikasi. PT. Trihasco Utama beserta Tim dalam proyek ini melaksanakan scope pekerjaan Assessment & Re-Engineering.

Lingkup Pekerjaan Assessment :

- Penelaahan Dokumen data hasil pengukuran dan pemeriksaan lapangan berdasarkan code / standard / peraturan pemerintah yang berlaku.
- Penilaian terhadap hasil pengukuran dan pemeriksaan berdasarkan data yang sudah ada meliputi :
 - ─ Atap Tangki (*Roof Tank*)
 - ─ Dinding Tangki (*Shell Tank*)
 - ─ Pondasi Tangki
 - ─ Proteksi terhadap kebakaran
 - ─ Peralatan pengaman
 - ─ Alat Pengendali Korosi
- Penilaian terhadap kondisi *Ladder, Stairway, plat form* dan *walkway* diperiksa secara visual terhadap adanya kemungkinan korosi, bagian yang rusak (patah), pengelupasan cat (paint failure), dan kondisi sambungan las sehingga aman untuk digunakan.



CONCLUSION AND RECCOMENDATIONS

Generally the STORAGE TANK T-06 SP3 was NOT good condition and NOT fit for service as per the following parameters:

ASSESSMENT TO API STD 653

Data	:September, 2013	Tank Diam.	: 119,09 inch
Tag No	: T-04 SP5 KWN	Tank Height	: 153,93 inch
		Specific Gravity	: 1,00
		Design Pressure	: Atmospheric
		Design Temperature	: 100°F
		Year Reconstructed	: 1940
Shell Course	Height	Material	
1	59,05 inch	Unknown	Liquid Level Max
2	146,06 inch	Unknown	
3	45,27 inch	Unknown	
	51,18 inch	Unknown	

There was significant anomaly found during inspection that might affect the ability of the storage tank to continue safe operation.

It is recommended to repair the tank conditions to stay in fit for services as the following recommendations:

- Perform rectification on spot settlement which out-of-tolerance.
- Repair the roof plate due to 90% hollow based visual inspection
- Repair the shell plate due to seepage based result visual inspection



Lingkup Pekerjaan Re-Engineering :

- Melakukan penelaahan dokumen hasil Assessment, data hasil pengukuran dan pemeriksaan lapangan berdasarkan kode / standart / peraturan pemerintah yang berlaku.
- Membuat perhitungan Desain Ulang (*Re-design Calculation*) berdasarkan data eksisting, meliputi :
 - ─ Desain sambungan
 - ─ Faktor-faktor yang menjadi perhatian termasuk faktor beban luar (*external load*), tekanan luar (*external pressure*) dan sebagainya.
 - ─ Desain alas (*bottom design*) dan pelat melingkar alas (annular bottom plate)
 - ─ Desain dinding, termasuk tebal desain (td), tebal hydrostatic test (tt) dan tegangan yang diijinkan (*allowable stress*) dengan menggunakan 1-foot method atau variable-design-point method.
 - ─ Pembukaan dinding (*shell opening*) termasuk *nozzle, reinforcement, manhole, flange, fitting*.
 - ─ Piranti pendukung pada tangki.
 - ─ Penopang lingkaran puncak (*top/intermediate wind girder*)
 - ─ Desain Atap (*roof*)
 - ─ Beban-beban yang bekerja, seperti *dead load, hydrostatic load, Over pressure vapour load, partial vacuum load, wind load, earthquake*.
 - ─ Sistem venting/pernafasan.
 - ─ *Corrosion Rate* dan *Remaining Life* Tangki.
 - ─ Membuat Gambar Konstruksi Ulang (*Re-Drawing*) berdasarkan dimensional tangki sesuai persyaratan spesifikasi dan spesifikasi / code / standart yang di gunakan.

ENGINEERING CALCULATIONS

THICKNESS AND SETTLEMENT

Current conditions of STORAGE TANK T-04 SP5 Kawengan was presented in the following table.

Component	Min. Actual Thickness (mm)	Required Thickness (mm)	Remarks
Roof	2,10	5,00	Not Acceptable
Shell 1	5,50	2,54	Acceptable
Shell 2	6,70	2,54	Acceptable
Shell 3	6,50	2,54	Acceptable

*Data for internal roof support not available, and calculated as cone roof without support.

Settlement

Maximum Allowed out of plane deflection (in) : $\pm 2,002$ mm

Point	Angle (deg)	Elevation Value (mm)	Out of Plane Settlement (mm)	Deflection (mm)	Allowable Deflection (mm)	Remarks
1	0°	8,38	3,448	4,584	$\pm 2,002$	Out of tolerance
2	45°	2,38	-1,229	-2,048	$\pm 2,002$	Out of tolerance
3	90°	-1,63	-1,809	-1,547	$\pm 2,002$	
4	135°	-2,63	0,704	0,932	$\pm 2,002$	
5	180°	-3,63	1,352	0,986	$\pm 2,002$	
6	225°	-3,63	0,029	0,098	$\pm 2,002$	
7	270°	-1,63	-1,491	-1,003	$\pm 2,002$	
8	315°	2,38	-1,004	-1,982	$\pm 2,002$	

REMAINING LIFE

Corrosion Rate

$$\text{Corrosion rate}(LI) = \frac{t_{\text{initial}} - t_{\text{actual}}}{\text{time between } t_{\text{initial}} \text{ and } t_{\text{actual}}(\text{years})}$$

Remaining Life

$$\text{Remaining life} = \frac{t_{\text{actual}} - t_{\text{required}}}{\text{corrosion rate}}$$

Calculation results of corrosion rate and remaining life STORAGE TANK T-04 SP5 Kawengan was summarised in the following table:

Component	T initial (mm)	T actual (mm)	T required (mm)	Corrosion rate (mm/year)	Remaining Life (years)
Roof	2,10	2,10	5,00	0,03	RL > 20
Shell 1	5,50	5,50	2,54	0,026	RL > 20
Shell 2	5,50	6,70	2,54	0,001	RL > 20
Shell 3	5,50	6,50	2,54	0,007	RL > 20

• * Year built in 1940.