

## 出國報告（洽公）

# M9701 大林廠烷化工場計畫駐工程公司 討論設計及設備器材要求及監辦

服務機關：台灣中油股份有限公司

姓名職稱：許永明 工程師、劉祺全 工程師、  
陳義雄 組 長、陳國安 工程師

派赴國家：德國、瑞士

出國期間：99年 08月 25日至 99年 09月 03日

報告日期：99年 12月 01日

## 摘 要

民國 101 年本公司大林廠新建重油轉化工場將完工量產汽油，所面臨之狀況為汽油芳香烴含量下降問題，為達成重質油品轉化為輕質油品及改善該工場的汽油產品，全面提升產值，須建造烷化工場。烷化油具低揮發性及高辛烷值，不含烯烴及芳香烴且含硫量低，為最佳之環保汽油。國內環保法規隨國際趨勢，未來無論在 MTBE 禁用或芳香烴含量之降低，烷化油均扮演非常重要角色。

大林廠烷化工場興建，必須配合 RFCC 儘早完工量產，全面提昇汽油品質與產值，以鞏固國內汽油市場占有率，確保本公司獲利能力。而 C-1001A/B、C-1002、C-1003A/B 壓縮機為本工程關鍵性設備，交貨時間長，若有延遲交貨情況發生，將造成本工程無法如期如質完工。本次出國主要是與壓縮機製造廠家討論相關設計問題及了解其製造期程與品質管控計畫是否能符合本工程需求，並參觀了解德國、瑞士相關壓縮機製造廠家其安環衛實施情形，以作為借鏡。

## 目 錄

摘 要 .....	1
壹、目的 .....	3
貳、過程 .....	3
一、行程記要.....	3
二、參訪工廠記要.....	3
附件一 C-2001 Master Project Schedule .....	7
附件二 C-2001 Inspection and test plan .....	10
附件三 C-1001A/B Master Project Schedule .....	18
附件四 C-1001A/B Inspection and test plan.....	21
附件五 C-3001A/B Master Project Schedule .....	28
附件六 C-3001A/B Inspection and test plan.....	32
參、心得與建議 .....	37

## 壹、目的

- (1).了解主要設備離心式壓縮機 C-2001(Manturbo)，往復式壓縮機 C-1001/C-3001(Burckhardt)的製造進度，確保符合工期。
- (2).了解主要設備的設計、製造與檢測之程序，確保重要設備之製造品質。
- (3).提昇工作人員對主要設備的規劃、設計、監造、檢測及安全衛生管理之能力。

## 貳、過程

### 一、 行程記要

預定起日期	到達地點	詳細工作內容
99.08.25	高雄～杜塞爾多夫	啓程(22:20 抵達杜塞爾多夫)
08.26-28	杜塞爾多夫	參訪壓縮機廠家 Manturbo 公司製程及討論設計、製作、檢驗、交貨事宜。
08.29-09.02	蘇黎克	參訪壓縮機廠家 Burckhardt 公司及討論設計、製作、檢驗、交貨事宜。
09.03	法藍克福～高雄	回程

### 二、 參訪工廠記要

#### 1.Manturbo 公司

MAN Diesel & Turbo 公司從 1758 年即成立，為歷史悠久的公司，由採礦到目前領先之柴油引擎供應者，於機械工業產品是多方面的，壓縮機、氣體(蒸氣)透平機、膨脹機應用在各方面的工業上，由單級壓縮機到多段壓縮機與各種形式之透平推動機提供給客戶，對其高效率與高可靠度之設備提供強而有力之訓練責任。基於傳統更聚焦在研究發展創新產品方面，提供一流服務與維修，依客戶需

求完成從未製造過之設備與訓練。由其經理 Mr. Buchkremer 口中，知其對台灣與中國新建之大型烯烴裂解工場提供裂解氣體壓縮機、乙烯、丙烯冷凍壓縮機，非常有企圖心，並說明其氣體壓縮機在 EXXON 工場連續運轉 7 年之世界紀錄。

該公司位於德國 Dusseldorf 附近 Oberhausen 鎮內，僱用 12,500 人，總公司設在 Augsburg Germany，是德國前 30 大公司(DAX Share Index)之一，以其工業規模與德國工藝技術是可讓業主放心與諮詢。

#### 參訪 Manturbo 公司



C-2001 Refrigerant Compressor 係一離心式壓縮機，使用於 2000 區硫酸法烷化反應單元，為關鍵性設備之一。本壓縮機之 Speed variation 部份，採用 Hydraulic coupling 屬機械式與使用高壓變頻器者不同，具有故障較少，所需空間較小，維修較容易，成本也相對低廉。本興建工程 EPC 統包商於 99.6.29 下 P.O.，交貨期為 18 個月，MAN Diesel & Turbo 公司提出其 Master Project Schedule 如附件一，預計 100.12.27 交貨，可符合大林廠烷化工場工程興建之時程。

MAN Diesel & Turbo 公司在製造各組件與各階段均給予檢查測試與保證。各組件包括：(一)機殼檢測的化學分析、物理性質、超音波檢查、焊接、熱處理、水力壓力測試等。(二)渦流導流器檢測之化學分析、物理性質、HIC 測試、超音波檢查、焊接、熱處理等。(三)乾淨氣體密封系統檢測之物質相容性、超速檢測、平衡、性能測試等。(四)葉片焊接檢測之化學分析、物理性質、超音波檢查、葉片焊接、最後熱處理、焊縫表面裂痕測試、平衡檢查、超速測試、超速測試前後之尺寸檢查、表面裂痕檢查等。(五)黃銅葉片之化學分析、物理性質、超音波檢查、機械性質、表面裂痕檢查、平衡測試、超速測試及其前後尺寸變化等。(六)軸及轉子檢測之化學分析、物理性質、超音波檢查、表面裂痕檢查、組合轉子檢查、動力失去測試、低轉速平衡測試、高轉速平衡測試、製造場內不平衡反應分析等。(七)壓縮機組裝測試之組裝機械包括目測與尺寸檢查機殼與內部、間隙檢查、機械運轉測試、組裝壓縮機後氣體洩漏測試、目視檢測軸承，完成套件最後檢查、出貨前檢查、完成製造商 Data Book 等。(八)聯軸器(齒輪箱與主馬達)之化學分析、物理性質、目視與尺寸檢查、平衡測試。(九)齒輪箱之文件檢查、化學分析、機械性質、非破壞檢測、齒輪與小齒輪軸運轉後平衡檢查、殘留不平衡檢查、備用齒輪試轉、齒轉組試轉、試轉後軸承與齒檢查、最後目視尺寸油漆完備檢查、完成技術資料。(十)轉子轉動裝置之功能測試、電動馬達例行測試、外加保護確認。(十一)潤滑油槽與跳車滑油槽之 PMI 檢測、緊密測試、材質確認。(十二)油去沫器之電動馬達例行測試、去沫器標準測試、外加保護確認。(十三)潤滑油槽蒸氣加熱器與冷凝罐之文件檢查、材質確認、非破壞檢測、水壓測試、目視尺寸

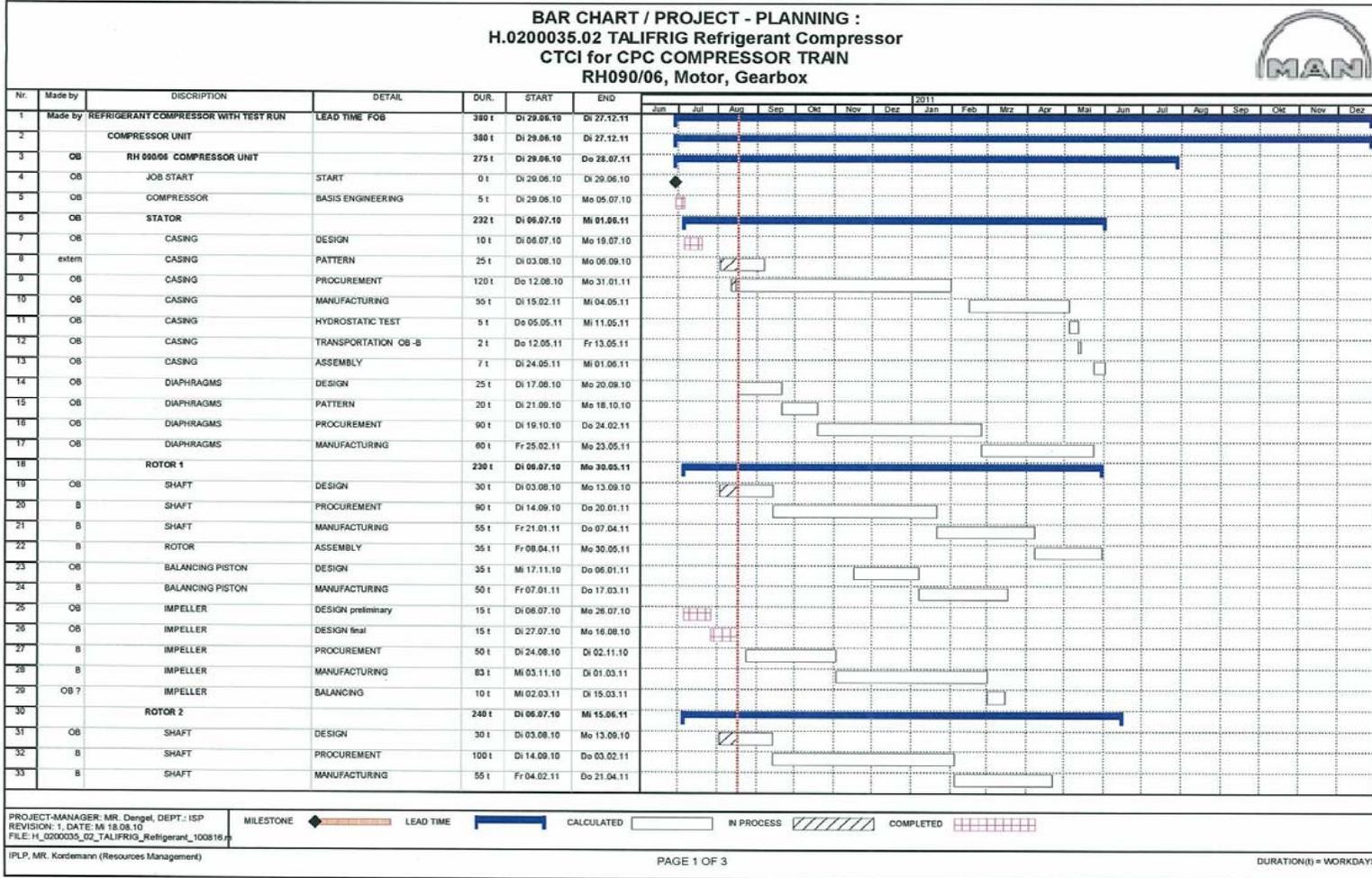
間隙檢查、加熱器標準測試、提出壓力容器製造資料。(十四)滑油泵與輔助油泵之材質確認、水力壓力測試、最終試轉。(十五)滑油泵透平機之材質確認、超音波檢查、轉子平衡、水壓測試、無負載試轉、目視尺寸檢查。(十六)滑油系統安全閥之材質確認、水壓測試、閥座試漏、設定點校正、PMI 測試、提出壓力容器製造資料。(十七)控制閥與釋壓閥之材質確認、水壓測試、閥座試漏、設定點校正、功能測試、PMI 試驗。(十八)油冷卻器過濾器蓄積器之文件檢查、材質確認、PMI 試驗、非破壞檢驗、水壓測試、目視尺寸間隙檢查、提出壓力容器製造資料。(十九)油管工作之材質確認、PMI 測試、焊道射線檢查、水壓測試。(二十)滑油系統之檢查測程序、4 小時運轉、最後目視尺寸油漆檢查、保存、包裝標示檢查、編輯技術資料。(二十一)單元控制盤與現場控制盤之依據測試程序工廠接收檢查、外加保護認證。

離心式壓縮機 C-2001 該公司提出之檢驗測試計畫(Inspection and test plan)及檢驗測試程序(Test and inspection procedure)，例如附件二。

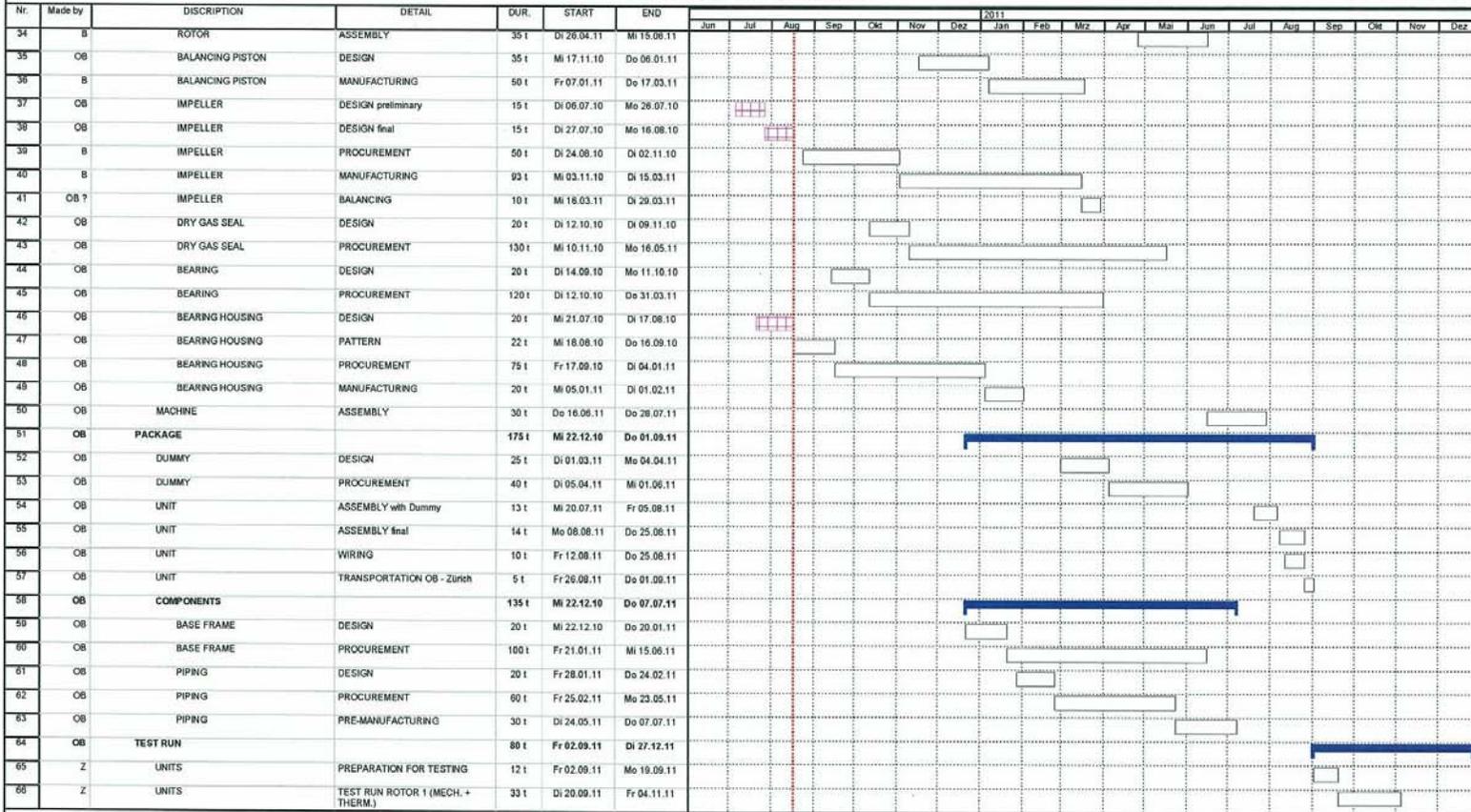
另外對於 MAN Turbo 公司製造廠房安環措施有如下之觀察：

1. 各工作區域內劃黃色警戒線，參觀人員或其他非作業人員嚴禁跨入黃線區域內，若有人不小心闖入，立即有領班出來制止。
2. 大型壓縮機甚高，外圍搭施工架，方便員工施工，發現其腳趾板尺寸優於台灣，較厚、較高。
3. MAN Turbo 公司自己正工，較少戴安全帽，但承攬商一定要戴安全帽。這屬於機械廠房，所有所有員工均穿安全鞋。
4. 製造廠內有一單梯相當長，無扶手當護欄。
5. 製造場所或整廠區很少見到工安標語。
6. 公司安環規定不多，但員工經常接受訓練及優渥的薪水，致員工從小就養成良好工安意識。

附件一 C-2001 Master Project Schedule



**BAR CHART / PROJECT - PLANNING :**  
**H.0200035.02 TALIFRIG Refrigerant Compressor**  
**CTCI for CPC COMPRESSOR TRAIN**  
**RH090/06, Motor, Gearbox**

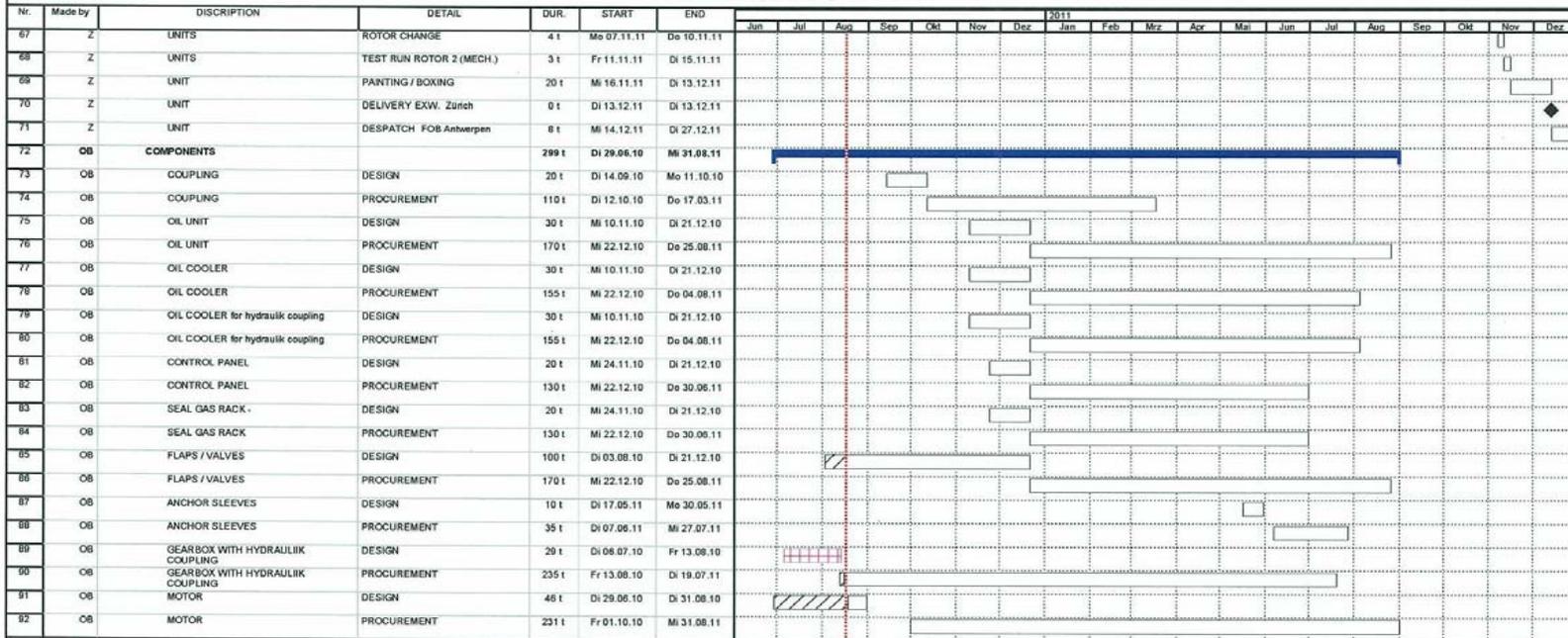


PROJECT-MANAGER: MR. Dengel, DEPT.: ISP  
 REVISION: 1, DATE: 16.08.10  
 FILE: H\_0200035\_02\_TALIFRIG\_Refrigerant\_100810.r

MILESTONE LEAD TIME CALCULATED IN PROCESS COMPLETED

IPLP, MR. Kordemann (Resources Management)

**BAR CHART / PROJECT - PLANNING :**  
**H.0200035.02 TALIFRIG Refrigerant Compressor**  
**CTCI for CPC COMPRESSOR TRAIN**  
**RH090/06, Motor, Gearbox**



PROJECT-MANAGER: MR. Dengel, DEPT.: ISP  
 REVISION: 1, DATE: Mi 18.08.10  
 FILE: H\_0200035\_02\_TALIFRIG\_Refrigerant\_100810

MILESTONE LEAD TIME CALCULATED IN PROCESS COMPLETED

IPLP, MR. Kordemann (Resources Management)

附件二 C-2001 Inspection and test plan

MAN Turbo Job No. : B. 0209132 MAN Turbo Job Code : TALIN PSP-Element-No. : .....	<b>Inspection and test plan Abnahme- und Prüfplan</b>	MAN Diesel & Turbo SE PROJECT QUALITY MANAGEMENT	
---	---	---	---

EQUIPMENT: **COUPLING**  
KOMPONENTE(N): **KUPPLUNG**

TYPE - TYP:

MACHINE-NO.:  
MASCHINEN-NR.

REFERENCE DOCUMENTS: **MAN Turbo JOB SPECIFICATION / API 671 3<sup>TH</sup> EDITION WITH MAN Turbo COMMENTS AND EXCEPTIONS**  
REFERENZDOKUMENTE: **MAN Turbo AUFTRAGSSPEZIFIKATION / API 671 3<sup>TE</sup> AUSGABE MIT MAN Turbo KOMMENTAREN UND AUSNAHMEN**

CONTRACTOR/CLIENT:  
KUNDE: **CTCI , TAIWAN**

CLIENTS ITEM NO.:  
KUNDEN-ITEM-NR.:

CLIENTS PROJECT CODE:  
KUNDEN-PROJEKT-NAME:

CLIENTS REFERENCE NO.:  
KUNDEN-REFERENZ-NR.:

VERTEILER / DISTRIBUTION

Erstellt / Prepared	Ersterstellung / First Issue		Revision		Dokumenten-Nr. / Document-No.	Dok.-art	Teil/Part	Revision
	Datum / Date	Name-Abteilung / Name-Department	Datum/ Date	Name-Abteilung / Name-Department				
	19.05.2010	ECKARDT / IQ-OBH			<b>B0209132</b>	<b>INS</b>	<b>000</b>	<b>00</b>
Geprüft / Checked					<b>TYPICAL</b>		Seite/page	von/of
							<b>1</b>	<b>6</b>

Schutzvermerk nach DIN 34 beachten! / The copyright of the present document and of all annexes always remains the property of MAN Turbo. It is not permitted either to copy this document wholly or partly or made it available to third persons without our written consent.

MAN Turbo Job No. : B. 0209132	<b>Inspection and test plan Abnahme- und Prüfplan</b>	MAN Diesel & Turbo SE	
MAN Turbo Job Code : TALIN		Project Quality Management	
PSP-Element-No. : ....			

**GENERAL:** All MAN Turbo specifications referenced in the column "Test Specifications" are shown for information only. None of these specifications will be passed to contractor/client or his representatives for information, review or comment. They can be made available to the contractor/client or his representatives for review during the visit at MAN Turbo.

ADVICES HOW TO READ THE INSPECTION PLANS

**LEGEND:** The legend at the bottom of the page shows options for kind of inspection activity (Hold Point, Observation Point, Random Inspection or Review of certificates) and for the party who will attend the inspection step (MAN Turbo (M), contractor/client or his representative (C) or Independent Inspection Agency (TP)).  
Hold point: A hold shall be applied to the production schedule. Continue only after inspection and release with contractor/client or his representative in attendance or waiving of inspection by contractor/client or his representative.  
Observation point: To give sufficient notice of the timing of the inspection. However inspection shall be performed as scheduled. No hold of production.  
The column "Certification" shows the type of certification for the inspection step. All certificates listed in this column are part of the certification data book and will be given to our customer.

**NOTE:** If otherwise not stated in the contract, please advise your comments and/or your approval of this document within 4 weeks after receipt in order to maintain engineering and manufacturing schedules. We need your approval to this document in any case.  
If we do not receive your answer after 4 weeks latest we consider this issue as approved and we will proceed with this issue.

**ALLGEMEIN:** Alle MAN Turbo Spezifikationen, die in der Spalte "Prüfvorschriften" als Referenz verwendet werden, sind nur zur Information aufgeführt. Keine dieser aufgeführten Spezifikationen wird an den Kunden oder seinen Repräsentanten zur Information, Durchsicht oder Kommentar weitergereicht.  
Sie können während des Besuchs des Kunden oder seines Repräsentanten bei MAN Turbo zur Durchsicht zur Verfügung gestellt werden.

HINWEISE ZUR LESART DER INSPEKTIONSPLÄNE

**LEGENDE:** Die Legende unten auf der Seite erklärt, welche Optionen für die Art des Prüfschrittes (Haltepunkt, Meldepunkt, Stichprobenkontrolle und Dokumentenprüfung) vorhanden sind und wer an diesen Prüfschritten teilnehmen kann (MAN Turbo (M), Kunde/Repräsentant des Kunden (C) oder unabhängige Prüforganisation (TP)).  
Haltepunkt: Stopp der Fertigung, Fortsetzung nach Durchführung der Prüfung und Freigabe durch den Kunden/Repräsentanten des Kunden oder eindeutiger Verzicht des Kunden/Repräsentanten des Kunden auf die Teilnahme.  
Meldepunkt: Rechtzeitige Einladung des Kunden/Repräsentanten des Kunden oder seines Vertreters zur Prüfung. Durchführung der Prüfung laut Plan. Kein Stopp der Fertigung.  
In der Spalte "Zeugnis" ist der Typ des zu erstellenden Zertifikats festgelegt. Alle in dieser Spalte aufgeführten Zertifikate sind Bestandteil der Qualitätsdokumentation und werden dem Kunden ausgehändigt.

**HINWEIS:** Wenn vertraglich nicht anders vereinbart senden Sie bitte ihre Kommentare und/oder Ihren Genehmigungsvermerk innerhalb von 4 Wochen nach Erhalt dieses Dokuments an MAN Turbo, damit Kommentare ihrerseits von uns noch fristgerecht eingearbeitet werden können.  
Ihren Genehmigungsvermerk für dieses Dokument benötigen wir in jedem Fall. Falls nach spätestens 4 Wochen keine Antwort von Ihnen eingeht, betrachten wir diese Revision des Dokuments als genehmigt und arbeiten damit weiter.

	Dokumenten-Nr. / Document-No.	Dok.-art	Teil/Part	Revision
	<b>B0209132</b>	<b>INS</b>	<b>000</b>	<b>00</b>
	<b>TYPICAL</b>		Seite/page	von/of
			<b>2</b>	<b>6</b>

The copyright of the present document and of all annexes always remains the property of MAN Turbo. It is not permitted either to copy this document wholly or partly or made it available to third persons without our written consent.



MAN Turbo Job No. : B. 0209132		<b>Inspection and test plan Abnahme- und Prüfplan</b>						MAN Diesel & Turbo SE Project Quality Management			
MAN Turbo Job Code : TALIN											
PSP-Element-No. : ....											
BAUTEIL: ITEM:		<b>COUPLING: STEAM TURBINE – AXIAL FLOW COMPRESSOR + SPARE / KUPPLUNG: DAMPFTURBINE – AXIALVERDICHTER + RESERVE</b>									
POS.	PSP	AKTIVITÄT / ART PRÜFUNGEN	PRÜF-/ABNAHMEVORSCHRIFTEN	Prüfung/Abnahme durch-Test/inspection by					Zeugnis	BEMERKUNGEN	REV.
STEP		ACTIVITY / KIND OF TESTS	TEST/ACCEPTANCE SPECIFICATION	S	M	C	TP	TPIA	Certificate	REMARKS	
1		Chemical composition Chemische Analyse	chemical Analysis / chemische Analyse	X	R	R		R	3.1		
2		Mechanical properties Mechanische Eigenschaften	Manufacturer's standard Herstellerstandard	X	R	R		R	3.1		
3		Visual and dimensional check Maß - und Sichtprüfung	Drawing Zeichnung	X	R	R		R	3.1		
4		Resonant frequency measuremet (axial) Frequenzmessung (axial)	Calculation / Berechnung Manufacturer's standard Herstellerstandard	X	R	R		R	3.1		
5		Balancing Wuchten	API 671	X	R	R		R	3.1		
6		PMI Test (if possible) Verwechslungsprüfung (wenn möglich)	MAN Turbo Dok. 10000660965 MAN Turbo Doc. 10000660965		X	R		R	3.1		

<b>Legende / legend:</b> X = Ausführer / Ort der Prüfung / Originator/Location of test - S = Unterlieferant / Subsupplier - M = MAN Turbo – C = Kunde oder dessen Repräsentant / Contractor/client or his representative - TP = Unabhängige Prüforganisation / Independent Inspection Agency - TPIA = Third party for client H = Haltepunkt / Witness Point (API) / Hold Point (ANSI) – W = Meldepunkt / Anwesenheit / Observation Point (API) – SW = Stichprobe / Random inspection – R = Dokumentenkontrolle / Review of documents / certificates <b>ZEUGNISSE WERDEN GEMÄß EN 10204 IN DEUTSCH UND ENGLISCH GELIEFERT./</b> <b>TEST CERTIFICATES WILL BE SUPPLIED ACCORDING EN 10204 IN GERMAN AND ENGLISH LANGUAGE.</b>	Dokumenten-Nr. / Document-No.		Dok.-art	Teil/Part	Revision
	<b>B0209132</b>		<b>INS</b>	<b>000</b>	<b>00</b>
	<b>TYPICAL</b>			Seite/page	von/of
The copyright of the present document and of all annexes always remains the property of MAN Turbo. It is not permitted either to copy this document wholly or partly or made it available to third persons without our written consent.					

<b>Legende / legend:</b> X = Ausführer / Ort der Prüfung / Originator/Location of test - S = Unterlieferant / Subsupplier - M = MAN Turbo - C = Kunde oder dessen Repräsentant / Contractor/client or his representative - TP = Unabhängige Prüforganisation / Independent Inspection Agency - TPIA = Third party for client H = Haltepunkt / Witness Point (API) / Hold Point (ANSI) – W = Meldepunkt / Anwesenheit / Observation Point (API) – SW = Stichprobe / Random inspection – R = Dokumentenkontrolle / Review of documents / certificates <b>ZEUGNISSE WERDEN GEMÄß EN 10204 IN DEUTSCH UND ENGLISCH GELIEFERT./</b> <b>TEST CERTIFICATES WILL BE SUPPLIED ACCORDING EN 10204 IN GERMAN AND ENGLISH LANGUAGE.</b>	Dokumenten-Nr. / Document-No.	Dok.-art	Teil/Part	Revision	
	<b>B0209132</b>			<b>INS</b>	<b>000</b>
	<b>TYPICAL</b>		Seite/page	von/of	
			<b>5</b>	<b>6</b>	
The copyright of the present document and of all annexes always remains the property of MAN Turbo. It is not permitted either to copy this document wholly or partly or made it available to third persons without our written consent.					

MAN Turbo Job No. : B. 0209132		<b>Inspection and test plan Abnahme- und Prüfplan</b>				MAN Diesel & Turbo SE Project Quality Management				
MAN Turbo Job Code : TALIN										
PSP-Element-No. : ....		<b>COUPLING: STEAM TURBINE – GEAR BOX + SPARE / KUPPLUNG: DAMPFTURBINE – GETRIEBE + RESERVE</b>								
BAUTEIL: ITEM:										
POS.	PSP	AKTIVITÄT / ART PRÜFUNGEN	PRÜF-/ABNAHMEVORSCHRIFTEN					Zeugnis	BEMERKUNGEN	REV.
STEP		ACTIVITY / KIND OF TESTS	TEST/ACCEPTANCE SPECIFICATION					Certificate	REMARKS	
			S	M	C	TP	TPIA			
1		Chemical composition Chemische Analyse	chemical Analysis / chemische Analyse	X	R	R		R	3.1	
2		Mechanical properties Mechanische Eigenschaften	Manufacturer's standard Herstellerstandard	X	R	R		R	3.1	
3		Visual and dimensional check Maß - und Sichtprüfung	Drawing Zeichnung	X	R	R		R	3.1	
4		Balancing Wuchten	API 671	X	R	R		R	3.1	

<b>Legende / legend:</b> X = Ausführer / Ort der Prüfung / Originator/Location of test - S = Unterlieferant / Subsupplier - M = MAN Turbo - C = Kunde oder dessen Repräsentant / Contractor/client or his representative - TP = Unabhängige Prüforganisation / Independent Inspection Agency - TPIA = Third party for client H = Haltepunkt / Witness Point (API) / Hold Point (ANSI) – W = Meldepunkt / Anwesenheit / Observation Point (API) – SW = Stichprobe / Random inspection – R = Dokumentenkontrolle / Review of documents / certificates <b>ZEUGNISSE WERDEN GEMÄß EN 10204 IN DEUTSCH UND ENGLISCH GELIEFERT./</b> <b>TEST CERTIFICATES WILL BE SUPPLIED ACCORDING EN 10204 IN GERMAN AND ENGLISH LANGUAGE.</b>	Dokumenten-Nr. / Document-No.		Dok.-art	Teil/Part	Revision
	<b>B0209132</b>		<b>INS</b>	<b>000</b>	<b>00</b>
	<b>TYPICAL</b>			Seite/page	von/of
				<b>5</b>	<b>6</b>
The copyright of the present document and of all annexes always remains the property of MAN Turbo. It is not permitted either to copy this document wholly or partly or made it available to third persons without our written consent.					

MAN Turbo Job No. : B. 0209132		<b>Inspection and test plan Abnahme- und Prüfplan</b>					MAN Diesel & Turbo SE Project Quality Management				
MAN Turbo Job Code : TALIN											
PSP-Element-No. : ....											
BAUTEIL: ITEM:		COUPLING: GEAR BOX – MAIN MOTOR + SPARE / KUPPLUNG: GETRIEBE – HAUPTANTRIEBSMOTOR +RESERVE									
POS.	PSP	AKTIVITÄT / ART PRÜFUNGEN	PRÜF-/ABNAHMEVORSCHRIFTEN	Prüfung/Abnahme durch-Test/inspection by					Zeugnis	BEMERKUNGEN	REV.
STEP		ACTIVITY / KIND OF TESTS	TEST/ACCEPTANCE SPECIFICATION	S	M	C	TP	TPIA	Certificate	REMARKS	
1		Chemical composition Chemische Analyse	chemical Analysis / chemische Analyse	X	R	R		R	3.1		
2		Mechanical properties Mechanische Eigenschaften	Manufacturer's standard Herstellerstandard	X	R	R		R	3.1		
3		Visual and dimensional check Maß - und Sichtprüfung	Drawing Zeichnung	X	R	R		R	3.1		
4		Balancing Wuchten	API 671	X	R	R		R	3.1		

<b>Legende / legend:</b> X = Ausführender / Ort der Prüfung / Originator/Location of test - S = Unterlieferant / Subsupplier - M = MAN Turbo - C = Kunde oder dessen Repräsentant / Contractor/client or his representative - TP = Unabhängige Prüforganisation / Independent Inspection Agency - TPIA = Third party for client H = Haltepunkt / Witness Point (API) / Hold Point (ANSI) - W = Meldepunkt / Anwesenheit / Observation Point (API) - SW = Stichprobe / Random inspection - R = Dokumentenkontrolle / Review of documents / certificates <b>ZEUGNISSE WERDEN GEMÄß EN 10204 IN DEUTSCH UND ENGLISCH GELIEFERT./</b> <b>TEST CERTIFICATES WILL BE SUPPLIED ACCORDING EN 10204 IN GERMAN AND ENGLISH LANGUAGE.</b>	Dokumenten-Nr. / Document-No.	Dok.-art	Teil/Part	Revision
	<b>B0209132</b>	<b>INS</b>	<b>000</b>	<b>00</b>
	<b>TYPICAL</b>		Seite/page	von/of
			<b>6</b>	<b>6</b>
The copyright of the present document and of all annexes always remains the property of MAN Turbo. It is not permitted either to copy this document wholly or partly or made it available to third persons without our written consent.				

## 2. Burckhardt 公司

Burckhardt Compression 公司位於瑞士 Zurich 附近 Winterthur 處，建立於 1834，目前為往復式壓縮機之領導廠商之一，唯一提供完整範圍 Laby (labyrinth piston), Laby-GI, Process Gas Compressor and Hyper Compressors 製造廠商。秉持瑞士品質製造，通過 ISO 9001: 2008 認證之品質保證。Laby-Labyrinth Piston Compressors - 無油壓縮機之最佳選擇。獨一無二的無接觸曲折密封技術，對顆粒與污染氣體無影響。5722-GI Compressor-氣體壓縮至 350 Bar。完全平衡設計無振動，非複合式壓縮機低維修費用與操作簡單，彈性地解決各種氣體處理。Process Gas Compressor - 符合 API 618 可信賴瑞士品質。簡單與堅固耐用的壓縮機設計，潤滑的可至 1,000 Bar，與非潤滑可至 300 Bar。最低產品壽命花費設計。Hyper Compressor - 從 1951 客製 LDPE 壓縮機。市場上最少級數之設計，高品質之關鍵零件提供安全操作與壽命。

參訪 Burckhardt 公司



C-1001A/B Circulated Regenerant Compressor 係一往復式壓縮機，使用於 1000 區選擇性加氫單元，Burckhardt 公司提出其 Master Project Schedule 如附件三，工程統包商於 99.8.4 下 P.O.，交貨期約為 14 個月，預計 100 年 9 月 7 日交貨，符合大林廠烷化工場工程興建之時程應無問題。

往復式壓縮機 C-1001A/B 該公司提出之檢驗測試計畫(Master Inspection Test Plan)及使用規範(Applicable Specifications)如附件四；Burckhardt 公司在製造各組件與各階段均予檢查測試與保證。各組件包括：(一)壓縮機之曲軸外殼與 Distance piece、曲軸、連桿、汽缸、十字頭、氣缸內襯、活塞、壓縮機閥、整體壓縮機。(二)轉助設備之緩衝器、內部連接氣體管線。(三)儀電之主電動馬達、儀器、盤面。(四)滑油系統之冷卻器、油泵、過濾器、整體系統。(五)PMI 檢測之進口過濾器、進出口閥、儀器導管。(六)裝箱之檢視、尺寸檢查、緩衝支撐組件、油漆檢查、包裝檢查、文件準備等事項。

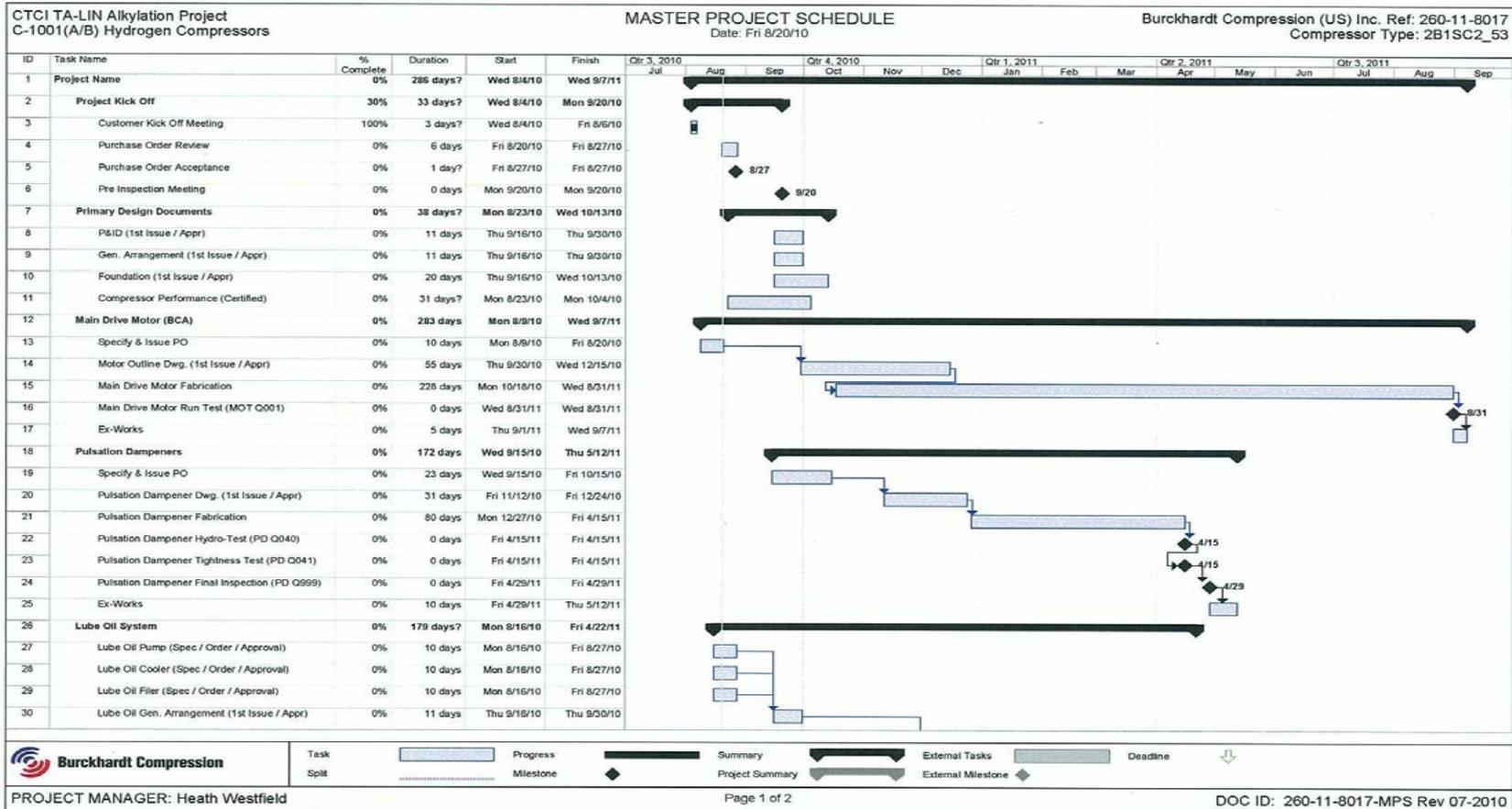
C-3001A/B First Stage and Second Stage Makeup Compressor 也是往復式壓縮機，使用於 3000 區正丁烷異構化單元，亦為關鍵性設備之一。該公司提出其 Master Schedule 如附件五，工程統包商於 99.7.8 下 P.O.，交貨期為 14 個月，預計 100 年 8 月 15 日交貨，可符合大林廠烷化工場工程興建之時程。

往復式壓縮機 C-3001A/B 該公司提出之檢驗測試計畫(Inspection Test Plan)及使用規範(Applicable Specifications)如附件六。

另外對於 Burckhardt 公司製造廠房安環措施有如下之觀察：

- 1.工場製造區劃黃色管制區
- 2.沒人戴安全帽
- 3.五 S 未實施
- 4.吊裝作業未管制
- 5.吊鈎無防滑舌片
6. H2 comp's 試驗區-管制(防爆區)發現有人打行動電話
- 7.製造部經理未穿安全鞋
- 8.堆高機非常小心操作

# 附件三 C-1001A/B Master Project Schedule





**TA-LIN REFINERY**

**PROGRESS-REPORT**

BCA order:2001087, Typ: 2B1SC2.53\_1,  
Serial No.: 200156, 200157, Unit(s):2

Activity	Stat. %	Sub-order	2010											
			Jun	Jul	Aug	Sep	Okt	Nov	Dez	Jan	Feb	Mrz	Apr	Mai
<b>COMPRESSOR COMPL.</b>	18%		[Gantt bar from Jun to Apr]											
<b>MOTION WORK</b>	27%		[Gantt bar from Jun to Jan]											
FRAME(S) BASEPL(S) FOUNDRY	50%	P.O. 194012	[Gantt bar from Jun to Sep]											
FRAME(S) BASEPL(S) MACHINING	0%	F.O. X'XXX'XXX	[Gantt bar from Sep to Dec]											
CROSSHEAD(S) FOUNDRY	100%	IN STOCK	[Gantt bar from Jun to Jul]											
CROSSHEAD(S) MACHINING	0%	F.O. 1151202 1151193	[Gantt bar from Aug to Dec]											
CRANKSHAFT(S) MACHINING	25%	P.O. 195582	[Gantt bar from Jul to Dec]											
CONNECTING ROD (S) FORGE	100%	IN STOCK	[Gantt bar from Jun to Jul]											
CONNECTING ROD (S) MACHINING	0%	F.O. 1151517	[Gantt bar from Aug to Dec]											
CONNECTING ROD (S) ASSEMBLY	0%	F.O. X'XXX'XXX	[Gantt bar from Dec to Jan]											
ASSEMBLY-DEPARTM. MOTION WORK	0%	F.O. X'XXX'XXX	[Gantt bar from Dec to Jan]											
BEARING(S) MACHINING	20%	VARIOUS	[Gantt bar from Jul to Dec]											
<b>CYL.-BLOCK(S) 1.STAGE</b>	10%		[Gantt bar from Jun to Jan]											
CYL.-BLOCK(S) 1.STAGE FOUNDRY	25%	P.O. 194971	[Gantt bar from Jul to Sep]											
CYL.-BLOCK(S) MACHINING	0%	F.O. X'XXX'XXX	[Gantt bar from Sep to Dec]											
CYL.-BLOCK(S) TESTING	0%	F.O. X'XXX'XXX	[Gantt bar from Dec to Jan]											
PISTON(S) FOUNDRY	0%	VARIOUS	[Gantt bar from Nov to Dec]											
PISTON(S) MACHINING	0%	VARIOUS	[Gantt bar from Dec to Jan]											
PISTON ROD(S) MACHINING	5%	F.O. 1151195	[Gantt bar from Aug to Dec]											
VALVES ASSEMBLY	0%	2'0001'087	[Gantt bar from Dec to Jan]											
OTHER PARTS	0%	2'001'087	[Gantt bar from Feb to Mar]											
FLYWHEEL(S) MACHINING	0%	P.O. 195501	[Gantt bar from Nov to Dec]											
<b>ASSEMBLY AND TESTRUN</b>	0%		[Gantt bar from Jan to Apr]											
ASSEM. COMPR./PIPEFITTER	0%	F.O. X'XXX'XXX	[Gantt bar from Jan to Feb]											
TESTRUN/PAINTER	0%	F.O. X'XXX'XXX	[Gantt bar from Feb to Mar]											
SHIPPING-DEPARTMENT	0%	15.04.2010	[Gantt bar from Mar to Apr]											
EX WORKS	0%	15.04.2010	[Gantt bar from Apr to May]											



Process Mile stone

Progress Sammelvorgang

Application Engineer: R. Wolfer

Issue: 19.08.10

Modification: 0, Rev. Date: Do 19.08.10

## 附件四 C-1001A/B Inspection and test plan

### LEGEND

**Client Document Code:** Document submittal codes assigned by the Client/Purchaser.  
**Responsible Party:** The organization (Party) that provides the document or activity and is ultimately responsible for revisions and certification.  
**Specification:** Specification, Standard or Procedure that governs acceptance.  
**Acceptance Criteria:** Specification, Standard or Procedure that governs acceptance.  
**Verification:** Definition of the inspection level for indicated Parties. See Verification Codes listed below.

Verification Codes	
CODE	Description
-	Source of Task or Document, Not Applicable
AD	Document: Approval, Document considered ON-HOLD until approved
AI	Authorized Inspector: ASME, CSA, UL etc (Signature Not Required)
DR	Document: Review / Audit / Verify
F	Final Document: Delivered with final documentation package
H	HOLD Point: Mandatory, Notice Required, HOLD until released for Witness when specified.
IR	Inspection: Random as deemed necessary (Observation & Surveillance)
W	WITNESS INSP: Mandatory, Notice Required, Hold ONLY with written request.

Inspection Notification (Working Days): 20

**NOTES:**

1. The Activities define planned project Inspection and Testing activities for each commodity item and activity listed.
2. The Inspection and Test items listed in this document are subject to change as the project matures to correct oversights, infeasible listings or erroneous listings that are not required by project specifications.
3. References to any Industrial Standards is considered the latest edition and all applicable addendums unless specified in contract.
4. Specifications and Acceptance Criteria defined as "Order Spec." consists of referenced specifications and specifications issued with the purchase order for product or service listed. Referenced specifications and specifications defined in the purchase order supercede summarized information listed.

260-11-8017-MITP

Master Inspection Test Plan

Print Date 20-Aug-2010

Page 2 of 39



Equipment Description: Project Engineering											ENG
INDEX	Client DOC Code	Required Document or Activity	Responsible Party	Specification	Acceptance Criteria	Verification				Certifying Document	REV
						Vend	BCU	3rd Prty	Client		
A002		Burckhardt Compression Contract Pre-Inspection Meeting (PIM)	Sub-Supplier	Order Spec.	Order Spec.	H	H	-	W	MOM or Sign-Off	0
Remark:											
Q001		Burckhardt Compression Project Master Inspection Test Plan	BCU	BCU Standard	BCU Standard	AD	AD	-	AD	Approved ITP	0
Remark:											
R002		Burckhardt Compression Project Master Quality Dossier	BCU	BCU Standard Order Spec.	BCU Standard Order Spec.	DR	DR	-	AD	Manufacturing Record Book	0
Remark:											

### Applicable Specifications

Ndx	Rev	Specification	Client Doc. Number	Title	Spec Rev.	Pgs
001	0	-	-	Minutes of Meeting - PreAward Meeting Agreements		0

End of Applicable Specifications

260-11-8017-MITP	Master Inspection Test Plan	Print Date 20-Aug-2010
		Page 3 of 39



Equipment Description: Instrument and Electrical										ENGIE	
INDEX	Client DOC Code	Required Document or Activity	Responsible Party	Specification	Acceptance Criteria	Verification				Certifying Document	REV
						Vend	BCU	3rd Prty	Client		
Q001		Instrument Installation Inspection	BCU	BCU Standard	BCU Standard	H	H	-	DR	Inspection Record	0
Remark:											
Q002		Instrument Nameplate & Tag Inspection	BCU	BCU Standard	BCU Standard	H	H	-	W	Inspection Record	0
Remark:											
Q003		Instrument Calibration / Scale Verification	BCU	BCU Standard	BCU Standard	H	H	-	DR	Inspection Record	0
Remark:											
Q004		Instrument Area Classification Verification	BCU	BCU Standard	BCU Standard	H	H	-	DR	Inspection Record	0
Remark:											

### Applicable Specifications

Ndx	Rev	Specification	Client Doc. Number	Title	Spec Rev.	Pgs
001	0	-	-	Minutes of Meeting - PreAward Meeting Agreements		0
101	0	DS-104-0001-1	-	Engineering Specification for Electrical Work		0
143	0	PS16-0014	-	General Requirements of Instrument for Rotary Machine		0
142	0	XH11-0000-001	-	General Specification for Instrumentation of Packaged Equipment		0

End of Applicable Specifications

260-11-8017-MITP	Master Inspection Test Plan	Print Date 20-Aug-2010
		Page 4 of 39



Equipment Description: Compressor Packages, Skid Mount											PKG	
INDEX	Client DOC Code	Required Document or Activity	Responsible Party	Specification	Acceptance Criteria	Verification				Certifying Document	REV	
						Vend	BCU	3rd Prty	Client			
E002		Weld Procedures (WPS / PQR), Structural	Sub-Supplier	ASME IX	ASME IX	H	AD	-	AD	Document	0	
Remark:												
Q005		Dimensional Inspection	BCU	Mfr. Standard	Mfr. Standard	H	H	-	H	Inspection Record	0	
Remark:												
Q006		Purchaser Tie Point Verification	BCU	Drawing	Drawing	H	H	-	W	Inspection Record	0	
Remark:												
Q007		Piping & Instrument Diagram (P&ID) Verification	BCU	Drawing	Drawing	H	H	-	DR	Inspection Record	0	
Remark:												
Q008		Pipe Stress Verification	BCU	Stress Free	Stress Free	H	H	-	DR	Inspection Report	0	
Remark:												
Q010		Paint, Final Inspection - Mill thickness, quality, even coverage & color	Sub-Supplier	Order Spec.	Order Spec.	W	W	-	W	Inspection Record	0	
Remark:												
Q011		Foundation Bolt Location Verification	BCU	Drawing	Drawing	H	H	-	W	Inspection Record	0	
Remark:												
Q013		Final Inspection	BCU	Drawing Order Spec.	Drawing Order Spec.	H	H	-	H	Inspection Record	0	
Remark:												
260-11-8017-MITP										Master Inspection Test Plan		Print Date 20-Aug-2010
											Page 5 of 39	



<b>Equipment Description:</b> Compressor Packages, Skid Mount							PKG				
INDEX	Client DOC Code	Required Document or Activity	Responsible Party	Specification	Acceptance Criteria	Verification				Certifying Document	REV
						Vend	BCU	3rd Prty	Client		

**Applicable Specifications**

Ndx	Rev	Specification	Client Doc. Number	Title	Spec Rev.	Pgs
001	0	-	-	Minutes of Meeting - PreAward Meeting Agreements		0
111	0	DS-102-0001-1	-	Engineering Specification for Piping		0
101	0	DS-104-0001-1	-	Engineering Specification for Electrical Work		0
112	0	XL10-0000-001	-	Construction Specification for Painting		0

End of Applicable Specifications

<b>260-11-8017-MITP</b>	<b>Master Inspection Test Plan</b>	Print Date 20-Aug-2010
		Page 6 of 39

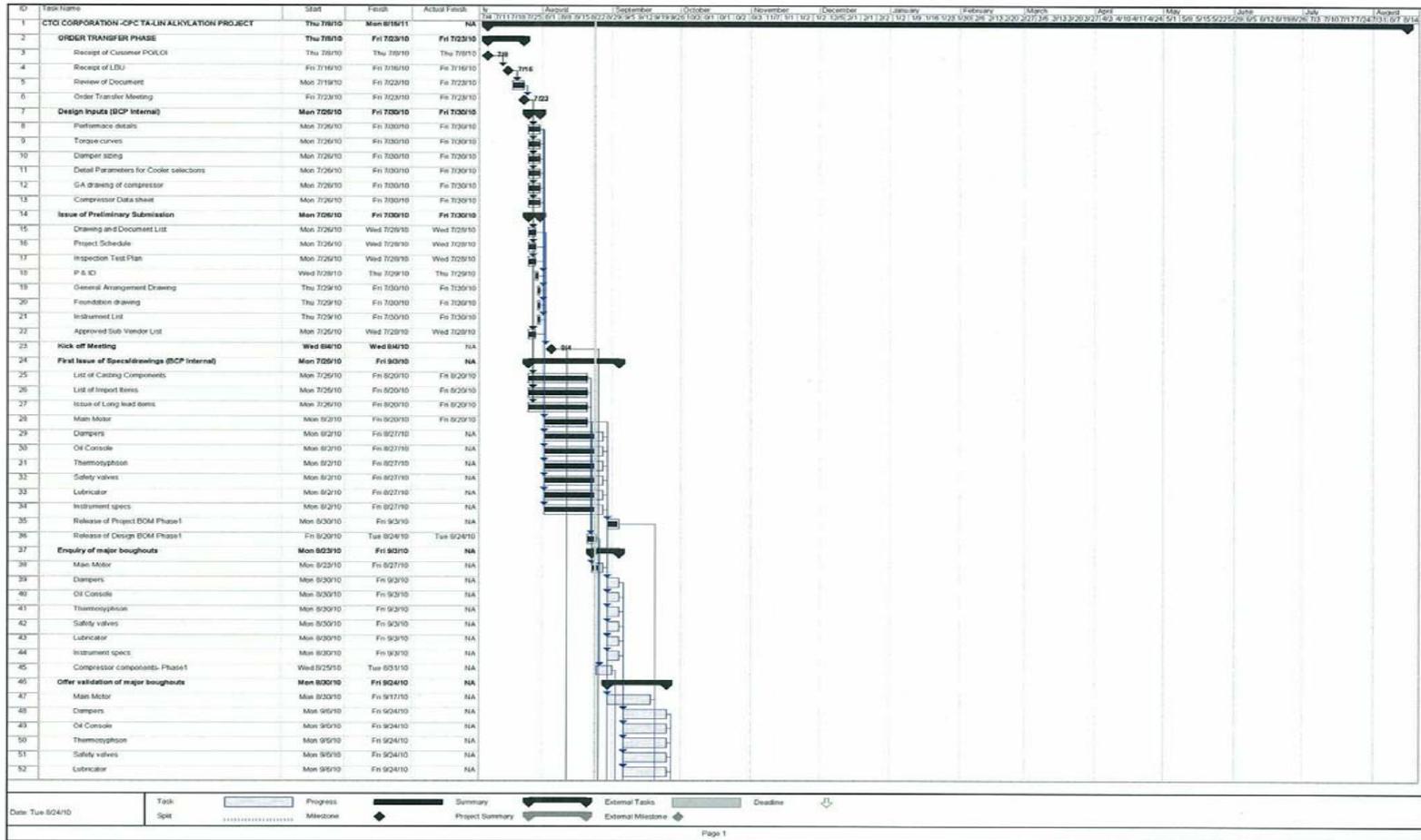


Burckhardt Compression				INSPECTION AND TESTPLAN BS - COMPRESSOR										QUALITY ASSURANCE												
MATERIAL AND TECHNICAL DELIVERY SPECIFICATION MATERIAL UND TECHNISCHE SPEZIFIKATION				TESTS, INSPECTIONS AND CERTIFICATION TESTS, KONTROLLEN UND BESCHEINIGUNG																						
PARTS, COMPONENTS OR ASSEMBLY EINZELTEILE ODER ZUSAMMENBAU	MATERIAL DESIGNATION WERKSTOFF BEZEICHNUNG	MATERIAL STANDARD WERKSTOFF NORM	EQUIVALENT ASTM MATERIAL GLEICH- WERTIGER ASTM WERKSTOFF	CHEM. ANALYSIS	TESNILE TEST ZUGPROBE	IMPACT TEST KERBSCHLAG	HARDNESS HÄRTE	DIMENSION CHECK MASSPRÜFUNG	ULTRASONIC ULTRASCHALL	MAGNET POWDER MAGNETPULVER	PENETRANT TEST FÄRBEINDR.- PRÜFUNG	MBV	TEST CERTIFICATE ACC. TO EN 10204 BESCHEINIGUNG GEMÄSS EN 10204			HYDROSTATIC TEST HYDRAULIK TEST	HELIUM LEAK TEST DICHTHEITSPRÜF.	ROUGHNESS RAUHEIT	POSITIV. MAT. IDENTIFICATION SPECTRALANALY.	CLEARANCE CHECK SPIEL MESSUNG	BAR OVER TEST DURCHDREHTEST	MECH. TEST RUN PROBELAUF	FINAL INSPECTION SCHLUSSPRÜF.	PAINTING CHECK FARBE / SCHICHTDICKE	MANUFACTURER DATABASE	DOKUMENTATION Revision
													2.1 DOC	3.1 INSPECTION REPORT	3.2											
2.3	VALVE COVER VENTILDECKEL	S355J2+N	EN 10025-1+2	A 572 Gr.50	T	T	T	a)	T, 8)			529	T													
2.4	CYLINDER LINER ZYLINDERBÜCHSE	EN-GJLP-HB280	EN 1561 (EN 1560)	—	T	T	T	a)				539	T			T										
2.5	PISTON BELOW PART KOLBENUNTERTEIL	EN-GJS-400-15	EN 1563	A 538 Gr. 60-40-18	T	T	T	a)				440	T													
2.6	PISTON TOP PART KOLBENBERTEIL	EN-GJS-400-15	EN 1563	A 538 Gr. 60-40-18	T	T	T	a)				440	T													
2.7	PISTON SHIRT KOLBENMANTEL	EN-GJS-400-15	EN 1563	A 538 Gr. 60-40-18	T	T	T	a)				440	T													
2.8	PISTON ROD KOLBENSTANGE	34CrNiMo8 + QT WK-Beschichtet	EN 10083-3	A 322 Gr. E4340 TC-Coated	T	T	T	a)	T, 8)	T, 10)	T, e) 16)	178 560	T			T										
3	NON RETURN VALVE (HOUSING) RÜCKSCHLAGVENTIL (GEHÄUSE)		SS (Stainless Steel)		T	T	T	a)					T, A		T, 4)		T, A	MAX. ALLOW. WORKING PRESSURE HYDROSTATIC TEST PRESSURE		xx bar g xx bar g						A
4	COMPRESSOR COMPLETE KOMPRESSOR KOMPLETT												T					T, c)	W T, 17) k)	W T, 6), l)	W, T	T	R	A		

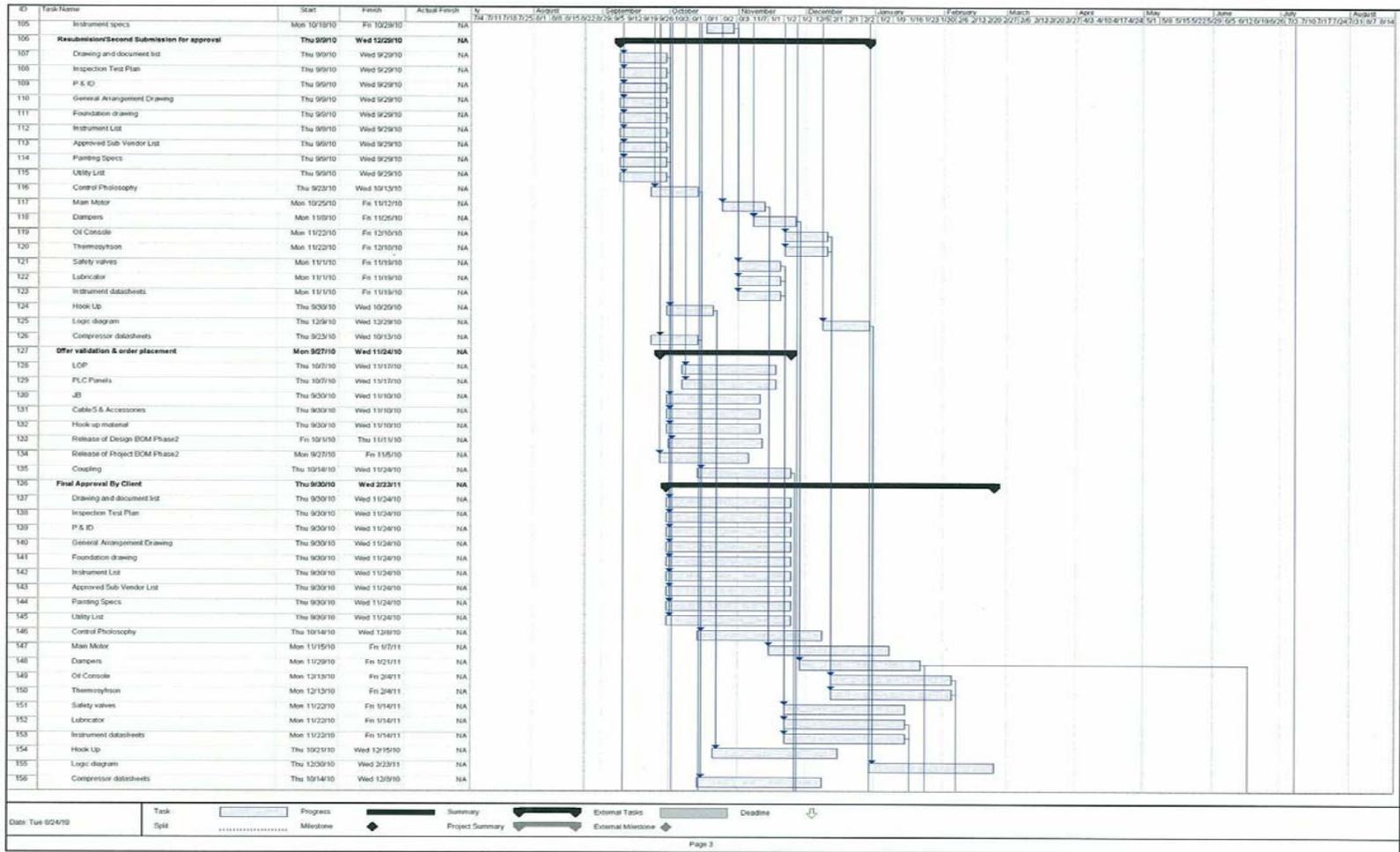
General:  
Customer Agreement regarding Casting repair (VBCA 550001)

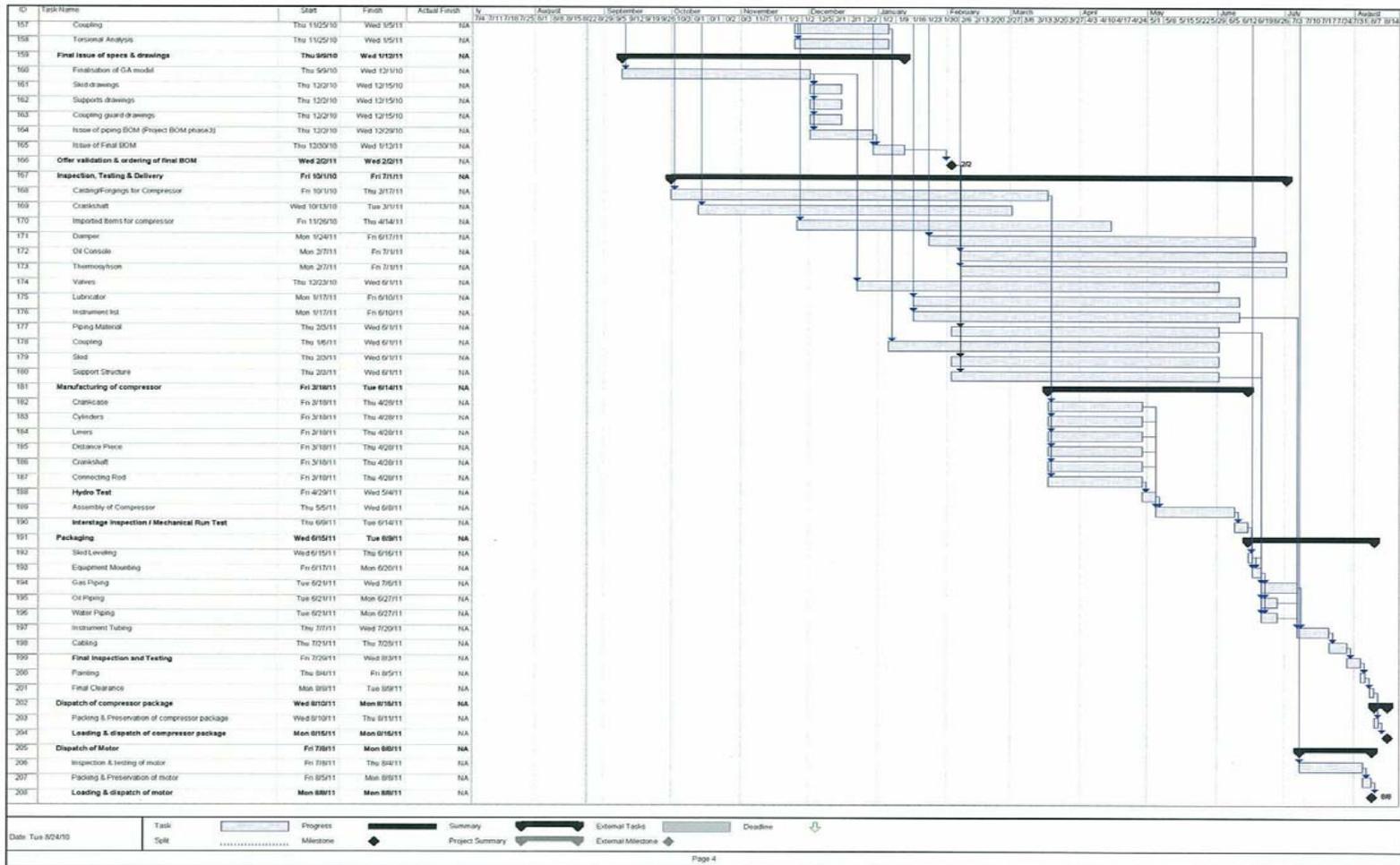
ABBREVIATION / ABKÜRZUNG	TEST	TEST ACC. TEST NACH	APPLICATION / ANWENDUNG	INSPECTION AND TESTPLAN „JOB MADE“ INSP.- UND TESTPLAN „AUFTR.BEZOGEN“
T	BCA-STANDARD TEST TEST REPORT PROVIDED	4) KV 4009 5) KV 5009 6) KV 6000	BCA OFFER No BCA ANGEBOT : 2010.020-2	Q
A	ADDITIONAL TEST	7) KV 6002 8) KV 6002	BCA ORDER No BCA AUFTRAG : 2001087	COMPRESSOR TYPE KOMPRESSOR TYP : 2B1SC2.53_1
W	WITNESS POINT: TEST ATT. BY AUTHORIZED INSPECTOR AND / OR CLIENT'S INSPECTOR	9) KV 6010 10) KV 6011 11) KV 6011	CLIENT / KUNDE CLIENT REF. KUNDE REF. : CTCI Corporation, Talpel, TAIWAN LOI 10P0374A	COMPRESSOR No KOMPRESSOR Nr. : 200156 & 200157
TC	TUNGSTEN CARBIDE	12) KV 4023 13) KV 6015 14) KV 5008	KUNDE SPEC. KUNDE SPEZ. : LOI 10P0374A	PURCHASE TAG No TAG-Nr. : C-1001 A/B
MBV	MATERIAL ORDER SPECIFICATION (FOR BCA INTERNAL USE ONLY)	15) KV 4023 16) KV 6015 17) KV 5008	KUNDE SPEZ. PLANT / ANLAGE : Chinese Petroleum Corp., Ta-Lin Refinery	Dok.Nr. (oDK) : 1014913
KV	BCA CONTROL SPECIFICATION		GAS : H2+N2	Rev. : A
R	REVIEW OF DOCUMENTS		EX WORK : 15.04.2011	Dat. : 12.08.2010
BCA	BURCKHARDT COMPRESSION AG		SUCTION TEMP. : +38 °C	Sig. : KRAMER_U
DOC	DECLARATION OF COMPLIANCE WITH THE ORDER		SAUG TEMP. : +38 °C	Sig. : FEJZUL_B
			INSP.INVITATION : MIN. 10 WORKDAYS BEFORE INSPECTION	Sig. : VANROOJEN_J

# 附件五 C-3001A/B Master Project Schedule









附件六 C-3001A/B Inspection and test plan

Burckhardt Compression		QUALITY ASSURANCE Inspection and Test Plan for Compression Package				Project		CPC TALIN ,Alkylation		
						Project No.		M9701		
Stage	Activity & Type of Inspection	Reference	Acceptance Criteria	Verifying Document	Type Of Certificate	Inspection By				Remark
						V	P			
1.	<b>PRE-INSPECTION MEETING</b>									
1.1.	Pre-inspection Meeting					M	H			
2.	<b>COMPRESSOR</b>									
2.1.	<b>Crank Case &amp; Distance Piece</b>									
2.1.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Mill certificate	3.1	M	R			
2.1.2.	Kerosene Leak Test (24 Hrs.)	Approved procedure	Approved procedure	Test Report		M	R			Procedure No.QP001
2.2.	<b>Crank Shaft</b>									
2.2.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Test Certificate	3.1	M	R			
2.2.2.	Ultrasonic Test ( After finish machining before Drilling )	Approved Procedure/ASTMA 503	Approved Procedure/ASTM A503	Test Report		M	R			Procedure No.KV6002
2.2.3.	Dye Penetrant Test (after finish machining)	Approved Procedure	Approved Procedure	Test Report		M	R			Procedure No.KV6015
2.3.	<b>Connecting Rod</b>									
2.3.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Test certificate	3.1	M	R			
2.3.2.	Ultrasonic Test on Raw material	Approved Procedure	Approved Procedure	Test Report		M	R			Procedure No. KV6000
2.3.3.	Dye Penetrant Test after finish machining	Approved Procedure	Approved Procedure	Test Report		M	R			Procedure No. KV6015
2.4.	<b>Piston Rod</b>									
2.4.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Test certificate	3.1	M	R			
2.4.2.	Ultrasonic Test before coating	Approved Procedure	Approved Procedure	Test Report		M	R			Procedure No. KV6000
2.4.3.	Dye Penetrant Test after finish machining	Approved Procedure	Approved Procedure	Test Report		M	R			Procedure No. KV6015

Abbreviations				Application		Inspection and Testplan N° (QDK) : P1110002040051		
V	Manufacturer ( BCP/Sub vendor )	H	Hold point	Client	CTCI Corporation, Taiwan	Prepared	SPP	22.07.10
P	Purchaser ( CTCI ) / TPIA	W	Witness point			Reviewed	SVD	22.07.10
		R	Review of documents	Plant	Alkylation	Approved	SVD	22.07.10
		M	Monitor	Client's Ref.-N° PR:	LOI 10P0347A-F0003	Revision	0A	22.07.10

Burckhardt Compression		QUALITY ASSURANCE Inspection and Test Plan for Compression Package				Project		CPC TALIN ,Alkylation		
						Project No.		M9701		
Sta-ge	Activity & Type of Inspection	Reference	Acceptance Criteria	Verifying Document	Type Of Certificate	Inspection By				Remark
						V	P			
<b>2.5. Cylinder</b>										
2.5.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Mill certificate	3.1	M	R			
2.5.2.	Hydro Test of Gas & Water Passage.	Approved Procedure /Data Sheet	Approved Procedure	Test Report		M	W			Procedure No. KV4009
2.5.3.	Helium Leak Test	Approved Procedure /Data sheet	Approved Procedure	Test Report		M	R			Procedure No. KV4023
<b>2.6. Cross Head</b>										
2.6.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Mill certificate	2.1	M	R			
2.6.2.	Dye Penetrant Test (Lined Surface)	Approved Procedure	Approved Procedure	Test Report		M	R			Procedure No. KV6015
<b>2.7. Cylinder Liner</b>										
2.7.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Mill certificate	3.1	M	R			
<b>2.8. Piston</b>										
2.8.1.	Material Receiving & review of Chemical & Physical analysis	Data Sheet	Applicable Specification	Mill certificate	2.1	M	R			
<b>2.9. Compressor Valves</b>										
2.9.1.	Material Receiving & review of Compliance Certificates	Data Sheet	Applicable Specification	Compliance certificate	2.1	M	R			
<b>2.10. Compressor Complete</b>										
2.10.1.	Barring over to check clearance/ Rod Run out	Clearance Table	Clearance Table	Test Record		M	W			
2.10.2.	Mechanical Run Test with available shop driver (4 hrs)	Approved Procedure	Approved Procedure	Test Report		M	H			Procedure No. KV5009
2.10.3.	Strip Check & Internal Inspection	Approved Procedure	Approved Procedure	Test Report		M	H			Procedure No. KV5009
<b>Abbreviations</b>		<b>Application</b>			<b>Inspection and Testplan N° (QDK) :</b>			<b>P1110002040051</b>		
<b>V</b>	Manufacturer ( BCP/Sub vendor )	<b>H</b>	Hold point	<b>Client</b>	CTCI Corporation, Taiwan	Prepared	SPP	22.07.10		
<b>P</b>	Purchaser ( CTCI ) / TPIA	<b>W</b>	Witness point			Reviewed	SVD	22.07.10		
		<b>R</b>	Review of documents	<b>Plant</b>	Alkylation	Approved	SVD	22.07.10		
		<b>M</b>	Monitor	<b>Client's Ref.-N° PR:</b>	LOI 10P0347A-F0003	Revision	0A	22.07.10		
<b>Page 5/8</b>										

Burckhardt Compression		QUALITY ASSURANCE Inspection and Test Plan for Compression Package				Project		CPC TALIN ,Alkylation		
						Project No.		M9701		
Sta-ge	Activity & Type of Inspection	Reference	Acceptance Criteria	Verifying Document	Type Of Certificate	Inspection By				Remark
						V	P			
3.	<b>AUXILLARY PARTS</b>									
3.1.	<b>PULSATION DAMPENR (ASME U Stamp)</b>									
3.1.1.	Manufacturer's QAP duly approved by Authorised Inspector shall be submitted for review/approval									
3.2.	<b>INTERCONNECTING GAS PIPING</b>									
3.2.1.	Material Receiving & review of Chemical & Physical analysis for Pipe, Fittings, Flanges & Valves	Approved Drawing / Data sheet	Applicable Specification.	Test certificate	3.1	M	R			
3.2.2.	Welding Book -WPS WPQ PQR	ASME Code Sect. IX	ASME Code Sect. IX	Weld Procedure		M	R			
3.2.3.	100% Radiographic Examination of butt weld Joints	ASME Code Sect. V	ASME SEC.VIII Div .1 & ASME B31.3	Inspection Report	3.1	M	R			Review of radiographs
3.2.4.	Hydraulic Testing of prefabricated Pipes	Approved Procedure /Drawings & B 31.3	Approved Procedure	Test Report	3.1	M	W			Procedure No. KV5029
3.2.5.	Visual Check for Cleaning of Equipment piping	KV5026	Cleaned For Process Gas	Inspection Report	3.1	M	R			Procedure No. KV5026
4.	<b>ELECTRICAL &amp; INSTRUMENTATION</b>									
4.1.	<b>Main Electric Motor, Instrumentation , &amp; Panel</b>									
4.1.1.	Manufacturer's QAP shall be submitted for review/approval for Main Electric Motor									
4.1.2.	Material Receiving & review of Instruments & PSV	Approved instrument Data Sheet	Approved instrument Data Sheet	Manufacturer's TC		M	R			
4.1.3.	Functional & Continuity Check for panel	Approved drawing	Approved drawing	Test Report	3.1	M	W			

Abbreviations				Application		Inspection and Testplan N° (QDK) :			P1110002040051
V	Manufacturer ( BCP/Sub vendor )	H	Hold point	Client	CTCI Corporation, Taiwan	Prepared	SPP	22.07.10	
P	Purchaser ( CTCI ) / TPIA	W	Witness point			Reviewed	SVD	22.07.10	
		R	Review of documents	Plant	Alkylation	Approved	SVD	22.07.10	
		M	Monitor	Client's Ref.-N° PR:	LOI 10P0347A-F0003	Revision	0A	22.07.10	
									Page 6/8

Burckhardt Compression		QUALITY ASSURANCE Inspection and Test Plan for Compression Package				Project	CPC TALIN ,Alkylation			
						Project No.	M9701			
Stage	Activity & Type of Inspection	Reference	Acceptance Criteria	Verifying Document	Type Of Certificate	Inspection By				Remark
						V	P			
5.	<b>LUBE OIL SYSTEM</b>									
5.1.	<b>Lube Oil Cooler ( ASME U Stamp )</b>									
5.1.1.	Manufacturer's QAP duly approved by Authorised Inspector shall be submitted for review/approval									
5.2.	<b>Lube Oil Pump</b>									
5.2.1.	Manufacturer's Test Certificates	Approved Data Sheet	Approved Data Sheet	Manufacturer's TC	2.2	M	R			
5.3.	<b>Duplex Oil Filter (ASME U Stamp)</b>									
5.3.1.	Manufacturer's QAP duly approved by Authorised Inspector shall be submitted for review/approval									
5.4.	<b>Lube Oil System</b>									
5.4.1.	Visual inspection as per P& ID	Approved P& ID	Approved P& ID	Inspection Report	3.1	M	W			
5.4.2.	Mechanical Run Test (4 hour)	Approved Procedure	Approved Procedure	Test Report	3.1	M	W			Procedure No. KV5024

Abbreviations				Application		Inspection and Testplan N° (QDK) :			P1110002040051
<b>V</b>	Manufacturer ( BCP/Sub vendor )	<b>H</b>	Hold point	<b>Client</b>	CTCI Corporation, Taiwan	Prepared	SPP	22.07.10	
<b>P</b>	Purchaser ( CTCI ) / TPIA	<b>W</b>	Witness point			Reviewed	SVD	22.07.10	
		<b>R</b>	Review of documents	<b>Plant</b>	Alkylation	Approved	SVD	22.07.10	
		<b>M</b>	Monitor	<b>Client's Ref.-N° PR:</b>	LOI 10P0347A-F0003	Revision	0A	22.07.10	<b>Page 7/8</b>

		<b>QUALITY ASSURANCE</b> <b>Inspection and Test Plan for Compression Package</b>				Project		CPC TALIN ,Alkylation		
						Project No.		M9701		
Stage	Activity & Type of Inspection	Reference	Acceptance Criteria	Verifying Document	Type Of Certif	Inspection By				Remark
						V	P			

<b>6. PMI Inspection</b>										
6.1.	Suction Strainer ( SS304 )	CPC Spec. IS-115-0006-0	CPC Spec. IS-115-0006-0	Inspection Report	3.1	M	R			
6.2.	Suction & Discharge Valve ( Valve Seat & Valve Guard & Valve Plate )	CPC Spec. IS-115-0006-0	CPC Spec. IS-115-0006-0	Compliance Certificate	3.1	M	R			
6.3.	Piston Rod Pressure Packing case (SS)	CPC Spec. IS-115-0006-0	CPC Spec. IS-115-0006-0	Compliance Certificate	3.1	M	R			
6.4.	Instrument Tubing with an O.D. above ¾" in S.S./A.S. Material	CPC Spec. IS-115-0006-0	CPC Spec. IS-115-0006-0	Inspection Report	3.1	M	R			
<b>7. PACKAGE</b>										
7.1.	Final Visual & Dimension Check of package as per G.A. & P& ID .	Approved Drawing	Approved Drawing	Inspection Report	3.1	M	W			
7.2.	Shop Fit-Up of Pulsation Supp. Devices & all associated Gas piping	Approved Drawing	Approved Drawing	Inspection Report	3.1	M	R			
7.3.	Painting Inspection	Approved Spec.	Approved Spec.	Inspection Report	3.1	M	W			
7.4.	Packing Inspection	Approved Spec.	Approved Spec.	Inspection Report	3.1	M	W			
<b>8. QUALITY DOSSIER</b>										
8.1.	Final Documentation	Approved QAP	Approved QAP	-		M	R			

Abbreviations				Application		Inspection and Testplan N° (QDK) :			P1110002040051
V	Manufacturer ( BCP/Sub vendor )	H	Hold point	Client	CTCI Corporation, Taiwan	Prepared	SPP	22.07.10	
P	Purchaser ( CTCI ) / TPIA	W	Witness point			Reviewed	SVD	22.07.10	
		R	Review of documents	Plant	Alkylation	Approved	SVD	22.07.10	
		M	Monitor	Client's Ref.-N° PR:	LOI 10P0347A-F0003	Revision	QA	22.07.10	Page 8/8

## 參、心得與建議

大林廠烷化工場以重油轉化工場粗丁烯及大林廠自產 LPG 為進料，而重油轉化工場預定於民國 101 年初試車量產，故烷化工場興建工程須配合 RFCC 儘早完工量產。C-1001A/B、C-1002、C-1003A/B 壓縮機為本工程關鍵性設備，交貨時間長，若有延遲交貨情況發生，將造成本工程無法如期如質完工。

職等參觀 Manturbo 公司及 Burckhardt 公司二家壓縮機製造廠家並與其討論本公司相關壓縮機之製造規劃時程，均能符合 EPC 統包工程施工建造期程。對於品管要求之檢驗測試計畫及檢驗測試程序等亦有詳細規劃。藉由本次參觀並與其相關人員充分溝通討論，一方面了解本工程案主要設備壓縮機期程及品管外，另一方面對於壓縮機製造有更深入了解，對於往後工作推動進行將有極大助益。對於壓縮工場之工安環保衛生管理之觀察，德國、瑞士共通特性-公司工安環保法規比中油公司少，但員工薪水高，每位員工從小就養成愛惜自己生命及守法觀念。在製造廠保持良好工安績效，仰賴員工的預知危險觀念，而不是靠公司的安環法規。

如上所述 C-1001A/B、C-1002、C-1003A/B 壓縮機為本工程關鍵性設備，未來交貨試車及工場運轉後，其性能影響操作穩定性及生產產量，建議在檢驗停留點時派員參與監督及會驗。