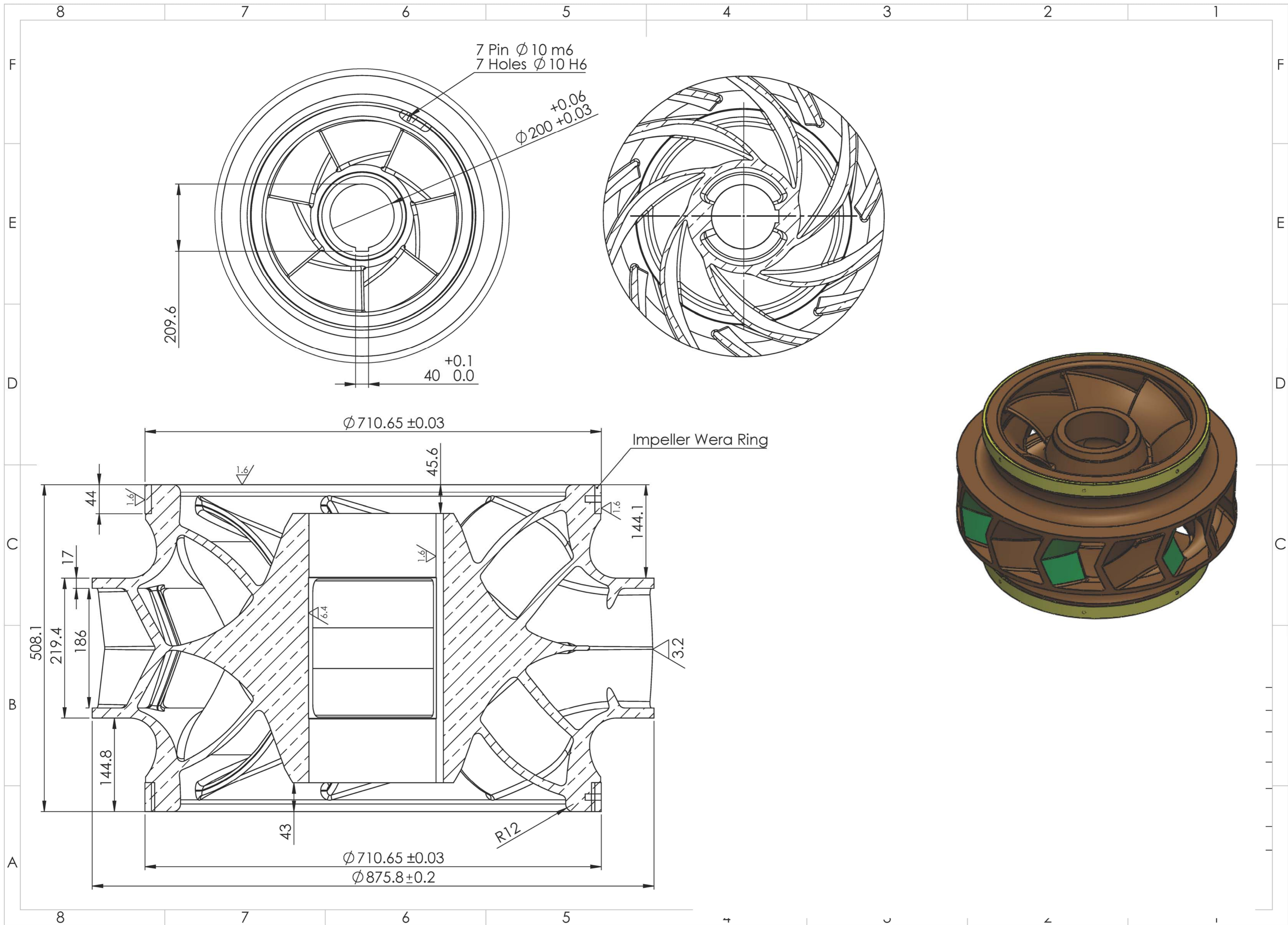






## شرح کار فنی و الزامات ساخت

الزامات بازرسی فنی جهت ساخت پروانه پمپ P-2231 به شرح ذیل است:

- (۱) پیشنهاد فنی شرکت مجری، قبل از اجرا به تایید اداره بازرسی فنی برسد.
- (۲) جنس پروانه مطابق با ASTM B148-2018 ، UNS C95800 است و ارائه گواهی نامه ترکیب شیمیایی و تعیین گرید لازم است.
- (۳) ارائه گواهی نامه آزمون مکانیکی شامل (سختی سنجی و کشش ) مطابق با استانداردهای مربوطه الزامی است.
- (۴) سیکل عملیات حرارتی پس از ریخته گری الزامی است.
- (۵) ارائه گواهی تست PT الزامی است.
- (۶) ارائه Final book الزامی است.
- (۷) ساخت کالای مورد نظر می بایست طبق نمونه اصلی انجام گردد.





   SAZEH شرکت طراحی و ساختمان نفت OIL DESIGN & CONSTRUCTION CO. 中国石化工程建设公司 SINOPEC ENGINEERING INCORPORATION	<b>Shazand Arak Refinery Expansion and Upgrading Project</b>	 <b>NIOEC</b>
	<b>INSPECTION AND TEST PROCEDURE</b>	
<b>Originator Project No. :</b> I9801-01	<b>Project No :</b> 2260	
<b>Document No. :</b> PM-2-3-0101-7F-PR-001-01	<b>Rev. :</b> 01	<b>Page 5 of 14</b>

## 5. BALANCING TEST

Impellers shall be dynamically balanced in accordance with following schedule.

The impellers to be tested shall be fixed with the job shaft.

### 5.1 For Rotor

Rotor assembly shall be dynamically balanced at low speed.

#### 1) Acceptance;

The allowable eccentricity in plane of correction shall be in accordance with ISO 1940-1 G2.5.

### 5.2 For Coupling

Dynamic balance test for coupling shall carried out by itself. Acceptance balance grade is within ISO 1940-1 G6.3.

## 6. ASSEMBLY INSPECTION

### 6-1 RUNNING CLEARANCE MEASUREMENT

Prior to rotor assembly, the clearance between impeller wearing ring and case wearing ring shall be measured. The values of clearance must be as per para. 5.7.4 of API610.

Diameter of casing ring	Design diametral clearance
Φ712mm	1.500mm~1.825mm

### 6-2 ROTOR RUN-OUT MEASUREMENT

In addition to the clearance measurement, the eccentricity of shaft and impeller wearing ring shall be checked.

The values of run-out (T.I.R. = Total Indicator Readings) must be within the following limitation.

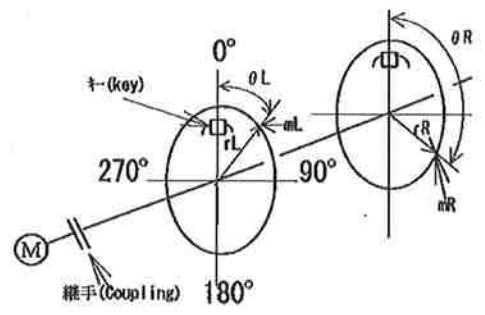
PUMP TYPE	ON SHAFT	ON IMPELLER
Horizontal	Maximum 0.025 mm	Maximum 0.05 mm

表題 SUBJECT	動力の合式検査記録 DYNAMIC BALANCING TEST RECORD		
御注文主 CUSTOMER	SINOPEC ENGINEERING INCORPORATION		荏原製番 EBARA SER. No. R083113601
御使用先 FINAL USER	SHAZAND ARAK OIL REFINING COMPANY LIMITED		機名/装置名 MODEL/EQUIP. 900x750CDGT
プロジェクト名 PROJECT NAME	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT		号機 MACHINE No. 1/3(B01)
PROJECT No.	2260-PO-PM-2-3 -0101-7F	図面 DWG. No. PR083113601/911	用途 SERVICE COOLING WATER PUMP
ITEM No.	P-2231 A	品名 PART NAME IMPELLER & SHAFT	材料 MATERIAL — 数 SET 1

1. 試験体 (Rotor)
- 使用回転速度 (Rated Rotating Speed)  $N = \underline{740} \text{ r/min}$
  - 質量 (Rotor mass)  $M = \underline{1159} \text{ kg}$
  - 釣り合い良さの等級 (Bal. quality grade)  $G \underline{2.5}$  (ISO 1940-1)  $\epsilon = \frac{9550 \times G(2.5)}{N} = \frac{9550 \times 2.5}{740} \approx 32.2$
  - 許容偏心率 (Perm. mass eccentricity)  $\epsilon = \underline{32.2} \mu\text{m}$
4. 試験機 (Balancer)
- 長浜シエンク Type H40U・3ton (NAGAHAMA Schenk)

2. 試験回転速度 (Testing speed)  $\underline{200} \text{ min}^{-1}$
3. 修正方法 (Method of correction)
- 除去 (Remove)     グラインダ (Grinding)  
 付加 (Add.)         溶接 (Welding)  
                                  機械加工 (Machining)

説明図 (Illustration)



5. 試験結果 (Test result)  
残留不釣り合い (Residual unbalance)

継手側 (Coupling side)				軸端側 (Shaft end side)			
角度 (Angle) $\theta L (^{\circ})$	半径 (Radius) $rL$ (mm)	不釣り合い質量 (Unbal mass) $wL$ (g)	偏心率 (Eccentricity) $\epsilon L$ ( $\mu\text{m}$ )	角度 (Angle) $\theta R (^{\circ})$	半径 (Radius) $rR$ (mm)	不釣り合い質量 (Unbal mass) $wR$ (g)	偏心率 (Eccentricity) $\epsilon R$ ( $\mu\text{m}$ )
60	380	8.6	5.6	182	380	8.3	5.4

$\epsilon = \frac{w \times r}{M/2}$      $\epsilon L = \frac{8.6 \times 380}{579.5} \approx 5.6$      $\epsilon R = \frac{8.3 \times 380}{579.5} \approx 5.4$

検査場所 (株)荏原製作所 羽田工場  
INSPECTION PLACE EBARA CORP. HANEDA PLANT

REVIEWED  
 WITNESSED  
 Date / Signature: 5.2009  
 Germanischer Lloyd Industrial Services

15-12-2009  
**SGS**  
 INDUSTRIAL  
 Witnessed  
 Reviewed

判定 RESULT **Acceptable**

御確認 INSPECTOR DEC. 5.2009

日付 DATE **AUG. 31. 2009.**

羽田工場 品質保証室  
QUALITY ASSURANCE DEPT.  
HANEDA PLANT

承認 APP'D BY

調査 CHK'D BY

係員 PREP'D BY

表題 SUBJECT	動的平衡試験記録 DYNAMIC BALANCING TEST RECORD		
御注文主 CUSTOMER	SINOPEC ENGINEERING INCORPORATION	荏原製番 EBARA SER. No.	R083113901
御使用先 FINAL USER	SHAZAND ARAK OIL REFINING COMPANY LIMITED	機名/装置名 MODEL/EQUIP.	900x750CDM
プロジェクト名 PROJECT NAME	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT	号機 MACHINE No.	1/3(B01)
PROJECT No.	2260-PO-PM-2-3 -0101-7E	図面 DWG. No.	PR083113601/911
ITEM No.	P-2231 B	品名 PART NAME	IMPELLER & SHAFT
		材料 MATERIAL	—
		数 SET	1

1. 試験体 (Rotor)

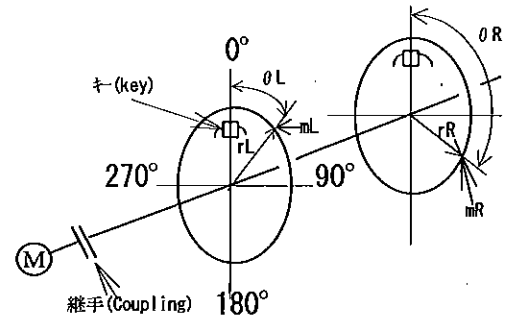
- ・使用回転速度 (Rated Rotating Speed)  $N = \underline{740} \text{ r/min}$
- ・質量 (Rotor mass)  $M = \underline{1151} \text{ kg}$
- ・釣り合い良さの等級 (Bal. quality grade)  $G \underline{2.5}$  (ISO 1940-1)
- ・許容偏心量 (Perm. mass eccentricity)  $\epsilon = \underline{32.2} \text{ } \mu\text{m}$

4. 試験機 (Balancer)

- ・長浜シエンク Type H40U・3ton (NAGAHAMA Schenk)

$$\epsilon = \frac{9550 \times G(2.5)}{N} = \frac{9550 \times 2.5}{740} \approx 32.2$$

説明図 (Illustration)



2. 試験回転速度 (Testing speed)  $\underline{200} \text{ min}^{-1}$

3. 修正方法 (Method of correction)

- 除去 (Remove)
- 付加 (Add.)
- グラインダ (Grinding)
- 溶接 (Welding)
- 機械加工 (Machining)

5. 試験結果 (Test result)

残留不釣り合い (Residual unbalance)

継手側 (Coupling side)				軸端側 (Shaft end side)			
角度 (Angle) $\theta L$ (°)	半径 (Radius) $rL$ (mm)	不釣り合い質量 (Unbal mass) $wL$ (g)	偏心量 (Eccentricity) $\epsilon L$ (μm)	角度 (Angle) $\theta R$ (°)	半径 (Radius) $rR$ (mm)	不釣り合い質量 (Unbal mass) $wR$ (g)	偏心量 (Eccentricity) $\epsilon R$ (μm)
102	380	4.2	2.8	333	380	3.5	2.3

$$\epsilon = \frac{w \times r}{M/2} \quad \epsilon L = \frac{4.2 \times 380}{575.5} \approx 2.8 \quad \epsilon R = \frac{3.5 \times 380}{575.5} \approx 2.3$$

検査場所 (株)荏原製作所 羽田工場  
INSPECTION PLACE EBARA CORP. HANEDA PLANT

判定 RESULT Acceptable

御確認 INSPECTOR



日付 DATE JULY. 1. 2009.

SEP. 11. 2009

羽田工場 品質保証室  
QUALITY ASSURANCE DEPT.  
HANEDA PLANT

承認 APP'D BY

調査 CHK'D BY

係員 PREP'D BY

*[Signatures]*

表題 SUBJECT	動的平衡試験記録 DYNAMIC BALANCING TEST RECORD		
御注文主 CUSTOMER	SINOPEC ENGINEERING INCORPORATION		荏原製番 EBARA SER. No. R083113601
御使用先 FINAL USER	SHAZAND ARAK OIL REFINING COMPANY LIMITED		機名/装置名 MODEL/EQUIP. 900x750CDGT
プロジェクト名 PROJECT NAME	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT		号機 MACHINE No. 2/3 (B02)
PROJECT No.	2260-PO-PM-2-3 -0101-7E	図面 DWG. No. PR083113601/911	用途 SERVICE COOLING WATER PUMP
ITEM No.	P-2231 C	品名 PART NAME IMPELLER & SHAFT	材料 MATERIAL — 数 SET 1

1. 試験体 (Rotor)

- ・使用回転速度 (Rated Rotating Speed)  $N = \underline{740} \text{ r/min}$
- ・質量 (Rotor mass)  $M = \underline{1166} \text{ kg}$
- ・釣り合い良さの等級 (Bal. quality grade)  $G \underline{2.5}$  (ISO 1940-1)
- ・許容偏心量 (Perm. mass eccentricity)  $\epsilon = \underline{32.2} \text{ } \mu\text{m}$

4. 試験機 (Balancer)

・長浜シエンク Type H40U・3ton (NAGAHAMA Schenk)

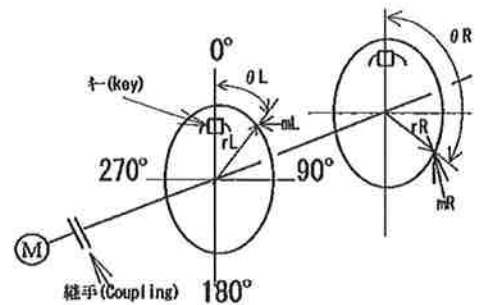
$$\epsilon = \frac{9550 \times G(2.5)}{N} = \frac{9550 \times 2.5}{740} \approx 32.2$$

2. 試験回転速度 (Testing speed)  $\underline{200} \text{ min}^{-1}$

3. 修正方法 (Method of correction)

- 除去 (Remove)
- 付加 (Add.)
- グラインダ (Grinding)
- 溶接 (Welding)
- 機械加工 (Machining)

説明図 (Illustration)



5. 試験結果 (Test result)

残留不釣り合い (Residual unbalance)

継手側 (Coupling side)				軸端側 (Shaft end side)			
角度 (Angle) $\theta L (^{\circ})$	半径 (Radius) $rL$ (mm)	不釣り合い質量 (Unbal. mass) $wL$ (g)	偏心量 (Eccentricity) $\epsilon L$ ( $\mu\text{m}$ )	角度 (Angle) $\theta R (^{\circ})$	半径 (Radius) $rR$ (mm)	不釣り合い質量 (Unbal. mass) $wR$ (g)	偏心量 (Eccentricity) $\epsilon R$ ( $\mu\text{m}$ )
78	380	7.9	5.1	78	380	6.6	4.3

$$\epsilon = \frac{w \times r}{M/2} \quad \epsilon L = \frac{7.9 \times 380}{583} \approx 5.1 \quad \epsilon R = \frac{6.6 \times 380}{583} \approx 4.3$$

検査場所 (株)荏原製作所 羽田工場  
INSPECTION PLACE EBARA CORP. HANEDA PLANT

REVIEWED  
 WITNESSED  
Date / Signature: 15.12.2009  
Germanischer Lloyd Industrial Services

Witnessed  
 Reviewed  
**SGS**  
INDUSTRIAL  
15.12.2009

判定 RESULT **Acceptable**

御確認 INSPECTOR DEC. 15 2009

日付 DATE **SEP. 10. 2009.**

羽田工場 品質保証室  
QUALITY ASSURANCE DEPT.  
HANEDA PLANT

承認 APP'D BY

調査 CHK'D BY

係員 PREP'D BY

表題 SUBJECT	動力釣合器具検査記録 DYNAMIC BALANCING TEST RECORD		
御注文主 CUSTOMER	SINOPEC ENGINEERING INCORPORATION		荏原製番 EBARA SER. No. R083113601
御使用先 FINAL USER	SHAZAND ARAK OIL REFINING COMPANY LIMITED		機名/装置名 MODEL/EQUIP. 900x750CDGT
プロジェクト名 PROJECT NAME	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT		号機 MACHINE No. 3/3 (B03)
PROJECT No.	2260-PO-PM-2-3 -0101-7F	図面 DWG. No. PR083113601/911	用途 SERVICE COOLING WATER PUMP
ITEM No.	P-2231 D	品名 PART NAME IMPELLER & SHAFT	材料 MATERIAL — 数 SET 1

1. 試験体 (Rotor)

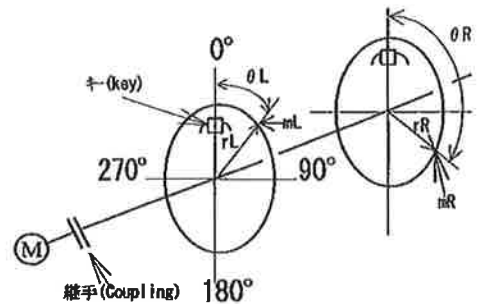
- ・使用回転速度 (Rated Rotating Speed)  $N = \underline{740} \text{ r/min}$
- ・質量 (Rotor mass)  $M = \underline{1155} \text{ kg}$
- ・釣り合い良さの等級 (Bal. quality grade)  $G \underline{2.5}$  (ISO 1940-1)
- ・許容偏心量 (Perm. mass eccentricity)  $\epsilon = \underline{32.2} \mu\text{m}$

4. 試験機 (Balancer)

・長浜シェンク Type H40U・3ton (NAGAHAMA Schenk)

$$\epsilon = \frac{9550 \times G(2.5)}{N} = \frac{9550 \times 2.5}{740} \approx 32.2$$

説明図 (Illustration)



2. 試験回転速度 (Testing speed)  $\underline{200} \text{ min}^{-1}$

3. 修正方法 (Method of correction)

- 除去 (Remove)
- 付加 (Add.)
- グラインダ (Grinding)
- 溶接 (Welding)
- 機械加工 (Machining)

5. 試験結果 (Test result)

残留不釣り合い (Residual unbalance)

継手側 (Coupling side)				軸端側 (Shaft end side)			
角度 (Angle) $\theta L (^{\circ})$	半径 (Radius) $rL$ (mm)	不釣り合い質量 (Unbal mass) $wL$ (g)	偏心量 (Eccentricity) $\epsilon L$ ( $\mu\text{m}$ )	角度 (Angle) $\theta R (^{\circ})$	半径 (Radius) $rR$ (mm)	不釣り合い質量 (Unbal mass) $wR$ (g)	偏心量 (Eccentricity) $\epsilon R$ ( $\mu\text{m}$ )
94	380	6.9	4.5	231	380	6.3	4.1

$$\epsilon = \frac{w \times r}{M/2} \quad \epsilon L = \frac{6.9 \times 380}{577.5} \approx 4.5 \quad \epsilon R = \frac{6.3 \times 380}{577.5} \approx 4.1$$

検査場所 (株)荏原製作所 羽田工場  
INSPECTION PLACE EBARA CORP. HANEDA PLANT

判定 RESULT **Acceptable**

御確認 INSPECTOR

REVIEWED  
 WITNESSED  
Date / Signature: 5. 2009  
Germanischer Lloyd Industrial Services

Witnessed  
 Reviewed

SGS INDUSTRIAL  
15-12-2009

日付 DATE **SEP. 11. 2009.**

羽田工場 品質保証室  
QUALITY ASSURANCE DEPT.  
HANEDA PLANT

承認 APP'D BY

調査 CHK'D BY

係員 PREP'D BY



表題 SUBJECT 動的合試験記録 DYNAMIC BALANCING TEST RECORD

御注文主 CUSTOMER	SINOPEC ENGINEERING INCORPORATION		荏原製番 EBARA SER.No.	R083113901	
御使用先 FINAL USER	SHAZAND ARAK OIL REFINING COMPANY LIMITED		機名/装置名 MODEL/EQUIP.	900x750CDM	
プロジェクト名 PROJECT NAME	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT		号機 MACHINE No.	2/3 (B02)	
PROJECT No.	2260-PO-PM-2-3-0101-7E	図面 DWG. No.	PR083113601/911	用途 SERVICE	COOLING WATER PUMP
ITEM No.	P-2231 E	品名 PART NAME	IMPELLER & SHAFT	材料 MATERIAL	— 数 SET 1

1. 試験体 (Rotor)

- ・使用回転速度 (Rated Rotating Speed)  $N = \underline{740} \text{ r/min}$
- ・質量 (Rotor mass)  $M = \underline{1140} \text{ kg}$
- ・釣り合い良さの等級 (Bal. quality grade)  $G \underline{2.5}$  (ISO 1940-1)
- ・許容偏心量 (Perm. mass eccentricity)  $\varepsilon = \underline{32.2} \text{ } \mu\text{m}$

4. 試験機 (Balancer)

・長浜シェンク Type H40U・3ton (NAGAHAMA Schenk)

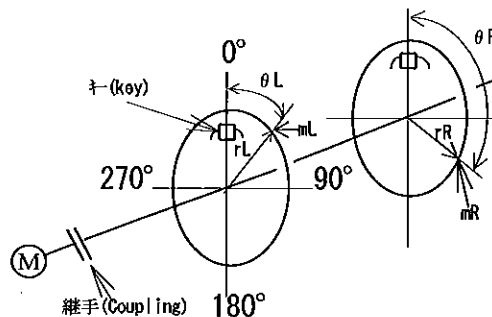
$$\varepsilon = \frac{9550 \times G(2.5)}{N} = \frac{9550 \times 2.5}{740} \approx 32.2$$

2. 試験回転速度 (Testing speed)  $\underline{200} \text{ min}^{-1}$

3. 修正方法 (Method of correction)

- 除去 (Remove)
- 付加 (Add.)
- グラインダ (Grinding)
- 溶接 (Welding)
- 機械加工 (Machining)

説明図 (Illustration)



5. 試験結果 (Test result)

残留不釣り合い (Residual unbalance)

継手側 (Coupling side)				軸端側 (Shaft end side)			
角度 (Angle) $\theta_L$ (°)	半径 (Radius) $r_L$ (mm)	不釣り合い質量 (Unbal mass) $w_L$ (g)	偏心量 (Eccentricity) $\varepsilon_L$ (μm)	角度 (Angle) $\theta_R$ (°)	半径 (Radius) $r_R$ (mm)	不釣り合い質量 (Unbal mass) $w_R$ (g)	偏心量 (Eccentricity) $\varepsilon_R$ (μm)
261	380	7.2	4.8	96	380	7.8	5.2

$$\varepsilon = \frac{w \times r}{M/2} \quad \varepsilon_L = \frac{7.2 \times 380}{570} \approx 4.8 \quad \varepsilon_R = \frac{7.8 \times 380}{570} \approx 5.2$$

検査場所 INSPECTION PLACE (株)荏原製作所 羽田工場 EBARA CORP. HANEDA PLANT

判定 RESULT Acceptable

御確認 INSPECTOR



日付 DATE JULY. 14. 2009.

SEP. 11. 2009

羽田工場 品質保証室 QUALITY ASSURANCE DEPT. HANEDA PLANT

承認 APP'D BY

調査 CHK'D BY

係員 PREP'D BY

表題 SUBJECT 動釣合試験記録 DYNAMIC BALANCING TEST RECORD

御注文主 CUSTOMER	SINOPEC ENGINEERING INCORPORATION		荏原製番 EBARA SER. No.	R083113901
御使用先 FINAL USER	SHAZAND ARAK OIL REFINING COMPANY LIMITED		機名/装置名 MODEL/EQUIP.	900x750CDM
プロジェクト名 PROJECT NAME	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT		号機 MACHINE No.	3/3 (B03)
PROJECT No.	2260-PO-PM-2-3 -0101-7E	図面 DWG. No.	PR083113601/911	用途 SERVICE COOLING WATER PUMP
ITEM No.	P-2231 F	品名 PART NAME	IMPELLER & SHAFT	材料 MATERIAL — 数 SET 1

1. 試験体 (Rotor)

- 使用回転速度 (Rated Rotating Speed)  $N = \underline{740} \text{ r/min}$
- 質量 (Rotor mass)  $M = \underline{1162} \text{ kg}$
- 釣り合い良さの等級 (Bal. quality grade)  $G \underline{2.5}$  (ISO 1940-1)
- 許容偏心量 (Perm. mass eccentricity)  $\varepsilon = \underline{32.2} \mu\text{m}$

4. 試験機 (Balancer)

- 長浜シェンク Type H40U・3ton (NAGAHAMA Schenk)

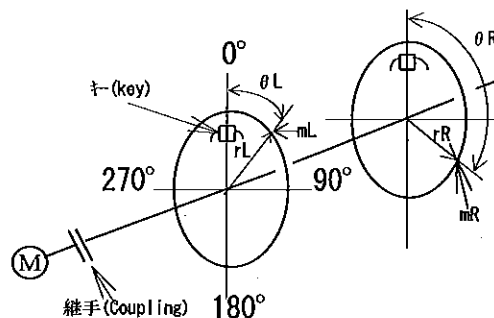
$$\varepsilon = \frac{9550 \times G(2.5)}{N} = \frac{9550 \times 2.5}{740} \approx 32.2$$

2. 試験回転速度 (Testing speed)  $\underline{200} \text{ min}^{-1}$

3. 修正方法 (Method of correction)

- 除去 (Remove)
- 付加 (Add.)
- グラインダ (Grinding)
- 溶接 (Welding)
- 機械加工 (Machining)

説明図 (Illustration)



5. 試験結果 (Test result)

残留不釣り合い (Residual unbalance)

継手側 (Coupling side)				軸端側 (Shaft end side)			
角度 (Angle) $\theta L (^{\circ})$	半径 (Radius) $rL (\text{mm})$	不釣り合い質量 (Unbal mass) $wL (\text{g})$	偏心量 (Eccentricity) $\varepsilon L (\mu\text{m})$	角度 (Angle) $\theta R (^{\circ})$	半径 (Radius) $rR (\text{mm})$	不釣り合い質量 (Unbal mass) $wR (\text{g})$	偏心量 (Eccentricity) $\varepsilon R (\mu\text{m})$
295	380	7.0	4.6	262	380	6.9	4.5

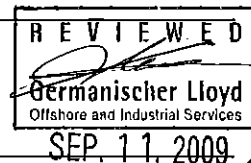
$$\varepsilon = \frac{w \times r}{M/2} \quad \varepsilon L = \frac{7.0 \times 380}{581} \approx 4.6 \quad \varepsilon R = \frac{6.9 \times 380}{581} \approx 4.5$$

検査場所 (株)荏原製作所 羽田工場  
INSPECTION PLACE EBARA CORP. HANEDA PLANT

判定 RESULT Acceptable

御確認 INSPECTOR

日付 DATE JULY. 15. 2009.



羽田工場 品質保証室  
QUALITY ASSURANCE DEPT.  
HANEDA PLANT

承認 APP'D BY

調査 CHK'D BY

係員 PREP'D BY

*(Signatures)*