



**전력비 절감 솔루션**  
고성능 프리미엄 합성유 Royal Purple

냉각탑 감속기/ 콤프레서 윤활유

SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology

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THE PERFORMANCE OIL THAT OUTPERFORMS<sup>™</sup>

제품 소개

**ROYAL**  
**PURPLE**<sup>®</sup>  
SYNTHETIC OIL

로얄퍼플 프리미엄 합성유

(주)솔지

# 로얄퍼플(ROYAL PURPLE) 소개

- 주요 생산품은 산업용 및 자동차용의 **프리미엄 합성유(Premium Synthetic Lubricants)**를 생산
- 본사는 미국 텍사스주(Texas State) 포터(Porter)시에 소재
- 시장에서 첨가제를 구입하여 기유에 블렌딩 하는 타 윤활유와 달리 로얄퍼플은 독자적인 첨가제 기술 (**SYNERLEC, 특허등록**)을 보유해서 **첨가제 자체 개발 및 생산**
- 로얄퍼플 제품들은 **강력한 유막 및 낮은 동적 마찰력**으로 악조건 하에서의 **설비 보호, 성능 및 전력비 절감**에 매우 탁월한 성능을 시장에서 입증
- 로얄퍼플 제품은 많은 고객사에 의해 **최고의 합성유(the Best Synthetic Oil)**로 인식
- 로얄퍼플의 슬로건은 "*THE PERFORMANCE OIL THAT OUTPERFORMS*"입니다.



*THE PERFORMANCE OIL THAT OUTPERFORMS*

## 오일 종류

- **Gear Oil**
- Bearing Oil
- Food Grade Oil
- Cleaning/Flushing Oil
- Mechanical Seal Oil
- **Compressor Oil**
- Turbine Oil
- Biomax Oil
- Mist Oil
- Others





로얄퍼플 프리미엄 합성유  
SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology



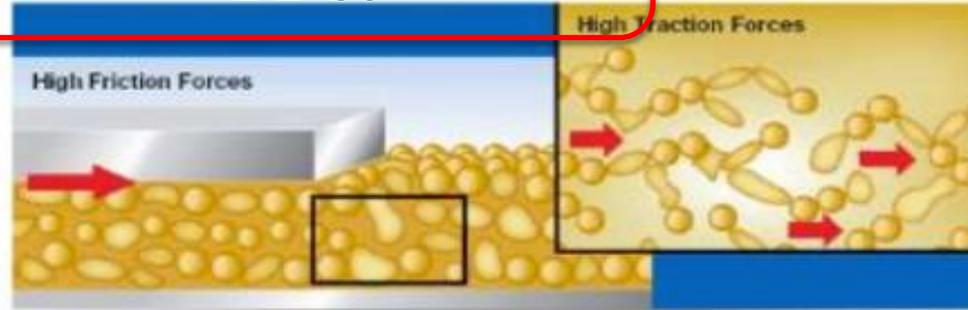
# 광유 (Mineral Oil) vs. 합성유 (Synthetic Oil)

## 광유 (Mineral Oil)

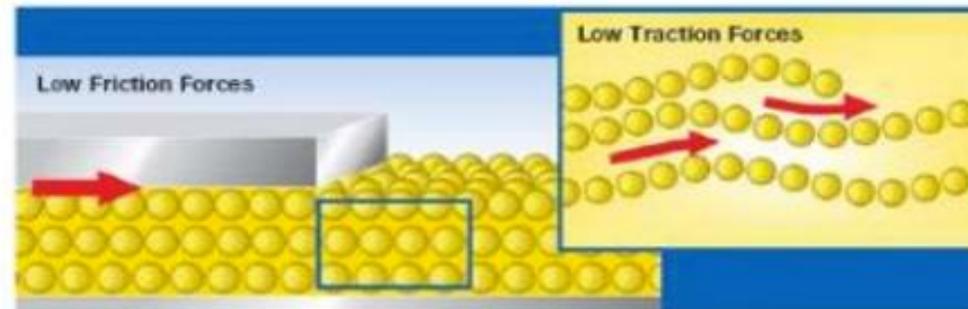
- ✓ 원유에서 추출
- ✓ 성질 - 원유의 품질과 정제 공정에 좌우
- ✓ 입자구조가 불균일

### Traction coefficients

견인계수



Mineral oil 광유



Synthetic oil 합성유

## 합성유 (Synthetic Oil)

- ✓ 과학적으로 설계된 분자들
- ✓ 입자구조가 균일 (동일한 분자 구조)
- ✓ 중합반응에 의해서 제조

# Royal Purple Synthetic Oil

## SYNFILM<sup>®</sup> GT - Synerlec<sup>®</sup> Additive Technology

- 생산성 증대 (Increases Uptime)
- 기어 수명 증대 (Lengthens Gear Life)
- 진동 감소 (Reduce Vibration)
- 전력비 절감 (Energy Savings)
- 정비 감소 (Reduces Maintenance)
- 뛰어난 유수 분리 (Excellent Water Separation)

# Royal Purple SYNFILM<sup>®</sup> GT의 사양

Typical Properties*	Method	ISO Grade										
		22	32	46	68	100	150	220	320	460	680	
Viscosity	D-445											
cSt @ 40°C		22	32	46	68	100	150	220	320	460	680	
cSt @ 100°C		4.3	6	7.5	10	13.6	17	23.2	30	37.8	50	
Viscosity Index	D-2270	120	135	135	135	130	130	125	125	125	125	
Flash Point, °F	D-92	350	455	455	485	475	465	445	445	455	455	
Pour Point, °F	D-6892	-71	-38	-38	-38	-44	-44	-44	-40	-44	-38	
Copper Corrosion Test	D-130											
3 Hrs @ 100°C		1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	
24 Hrs @ 100°C		1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	
Rust Test	D-665											
Fresh Water		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Salt Water		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Foam Test, Seq II	D-892	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	
Demulsibility Test	D-1401											
Mins @ 130°F		39/40/1 (10)	39/38/3 (10)	40/38/2 (10)	40/38/2 (5)	---	---	---	---	---	---	
Mins @ 180°F		---	---	---	---	40/39/1 (10)	39/40/2 (10)	41/38/1 (10)	43/37/0 (10)	43/37/0 (5)	43/37/0 (5)	
Cincinnati Milliron "A"	D-2070											
Corrosion / Oxidation		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
ISO Cleanliness Level	ISO 4406	**	14/13/11	14/13/11	14/13/11	N/A	N/A	N/A	N/A	N/A	N/A	
Density, lbs/gal	D-4052	7	7.05	7.08	7.14	7.19	7.22	7.27	7.31	7.35	7.4	

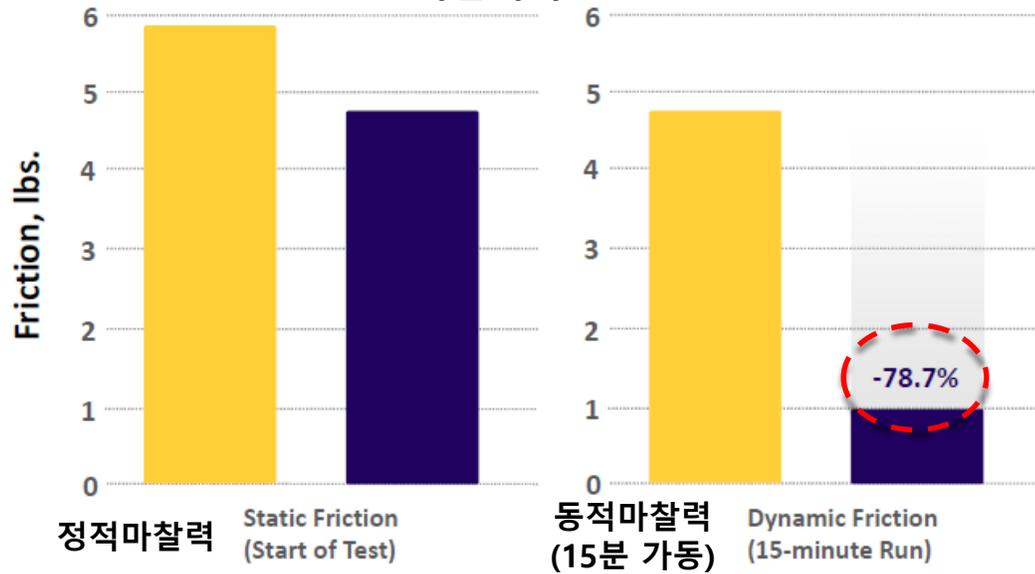
■ SYNFILM GT 선정조건 : 운전온도가 175°F (80°C)를 초과할 경우, 또는 SYNFILM 제품군에 원하는 점도가 없을 경우



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# Royal Purple 윤활유 강점

Falex No. 1 Friction Test  
마찰력테스트



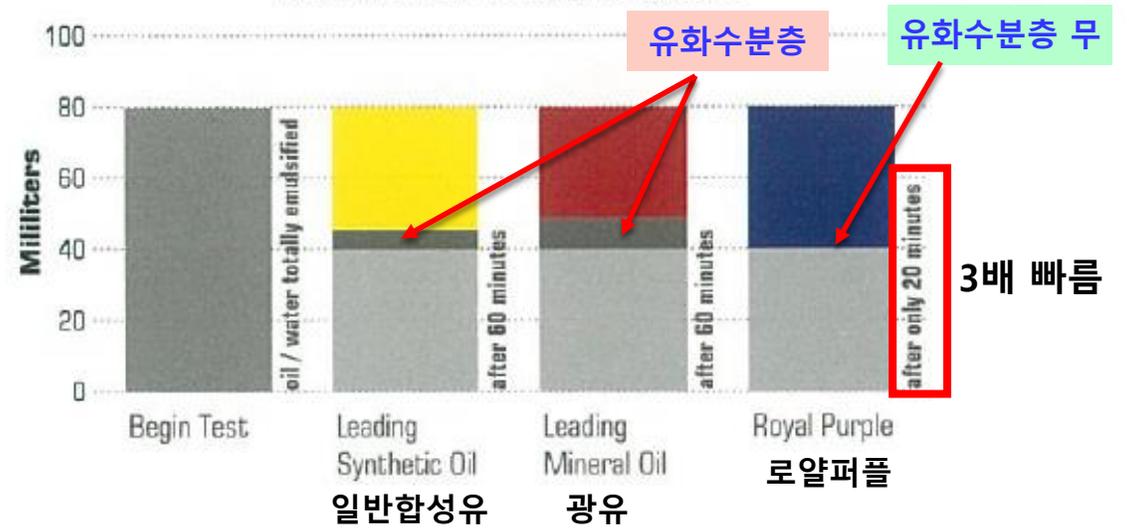
## 에너지 절감

MICRO-MENDING 현상으로 동적마찰력을 78.7% 까지 감소 시켜 전력비 절감 효과



항유화성 테스트

ASTM D-1401 Demulsibility Test



## 뛰어난 유수 분리

로얄퍼플 프리미엄 합성유는 수분을 신속히 분리 시키주며 유화수분층을 생성시켜주지 않아 베어링 수명을 증대시킴



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# Royal Purple 뛰어난 유수분리성 (항유화성)

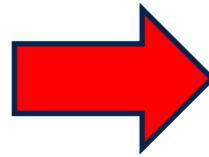
Life Extension Factor (LEF)

Current Moisture Level (PPM)	Life Extension Factor (LEF)									
	A \ B	2x	3x	4x	5x	6x	7x	8x	9x	10x
50,000	12,500	6,500	4,500	3,125	2,500	2,000	1,500	1,000	782	
25,000	6,250	3,250	2,250	1,563	1,250	1,000	750	500	391	
10,000	2,500	1,300	900	625	500	400	300	200	156	
5,000	1,250	650	450	313	250	200	150	100	78	
2,500	625	325	225	156	125	100	75	50	39	
1,000	250	130	90	63	50	40	30	20	16	
500	125	65	45	31	25	20	15	10	8	
250	63	33	23	16	13	10	8	5	4	
100	25	13	9	6	5	4	3	2	2	

## 뛰어난 유수 분리 (Demulsibility)

좌측 도표의 경우 오일내의 수분함량이 500 ppm에서 45 ppm으로 감소될 경우 설비의 수명은 4배(400%) 증대됨.

# ROYAL PURPLE 의 우수분리성 (항유화성) 비교 테스트



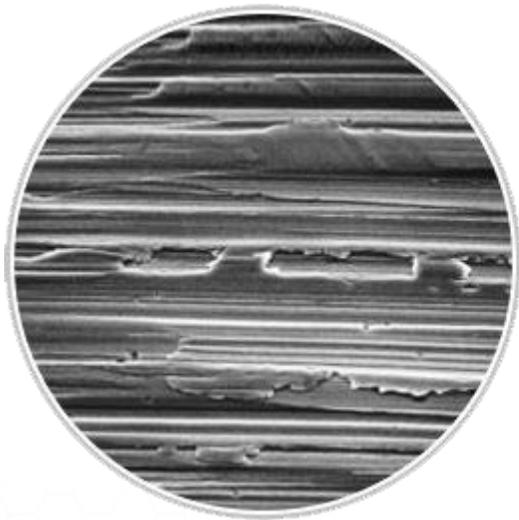
VS

유화수분층  
잔존



# Royal Purple 마이크로 멘딩효과

## 로얄퍼플 마이크로 멘딩 현상 (Micro-Mending )



새 베어링 표면  
1,500배 확대 촬영



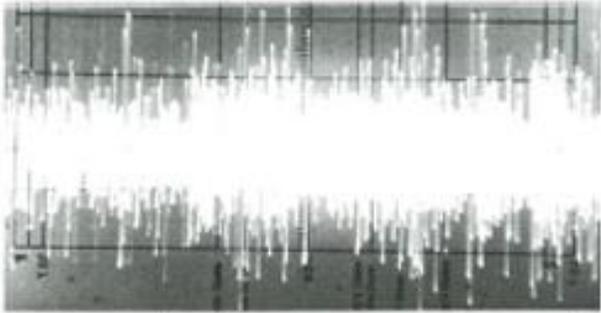
경쟁사 일반 합성유  
사용후 동일 베어링  
표면 1,500배 확대 촬영



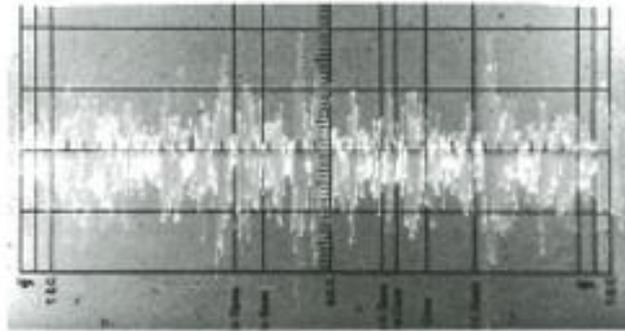
로얄퍼플 합성유 사용후  
동일 베어링 표면  
1,500배 확대 촬영

# GAS TURBOCHARGER 진동 테스트 자료

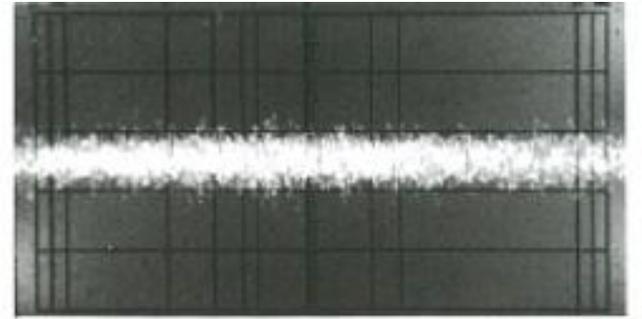
(Pictures taken with Tektronik 5113 Engine Analyzer)



Gas engine turbocharger on premium grade oil.



Same turbocharger after 2 days on Royal Purple.



Turbocharger after 3 months on Royal Purple.

타사 프리미엄급 오일

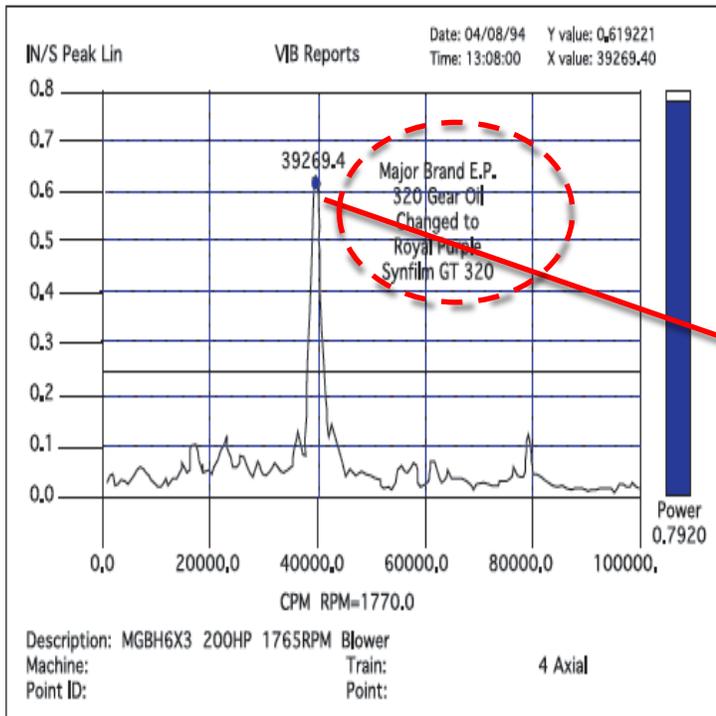
로얄퍼플 2일 경과

로얄퍼플 3개월 경과

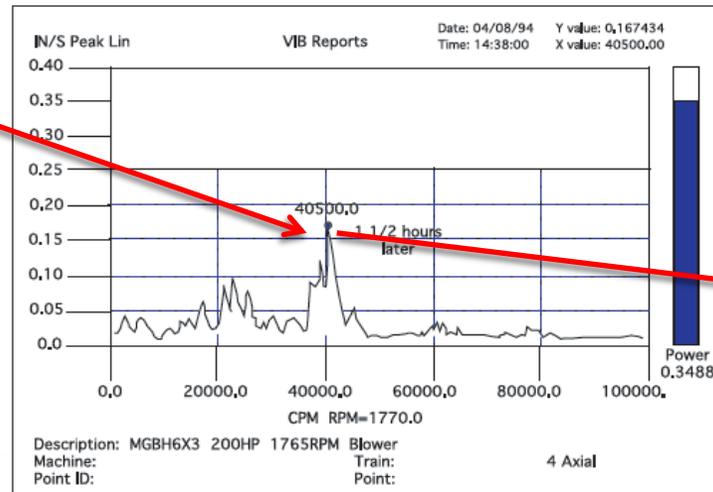
# Royal Purple 윤활유 강점

로얄퍼플 마이크로 멘딩 현상 (Micro-Mending) 은 **진동을 감소시킴**

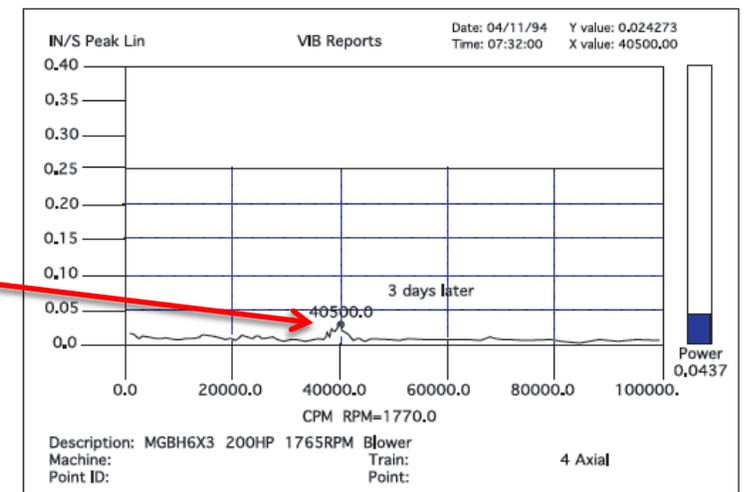
Major Brand EP 320 Gear Oil 을 로얄퍼플 SYNFILM GT 320 으로 변경후 진동테스트



변경전



변경후 1.5 시간후



변경후 3일후



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# Royal Purple 윤활유 강점

## 진동 감소가 베어링 수명에 미치는 영향

**Impact of Vibration Reduction  
on Bearing Life**  
(Assumes dynamic load is the major force component)

% Reduction in Vibration	Percent Increase in Bearing Life	
	Ball Bearing Types	Other Rolling Element Bearing
5	17	19
10	37	42
15	63	72
20	95	110
25	137	161
30	192	228
40	363	449
50	700	908

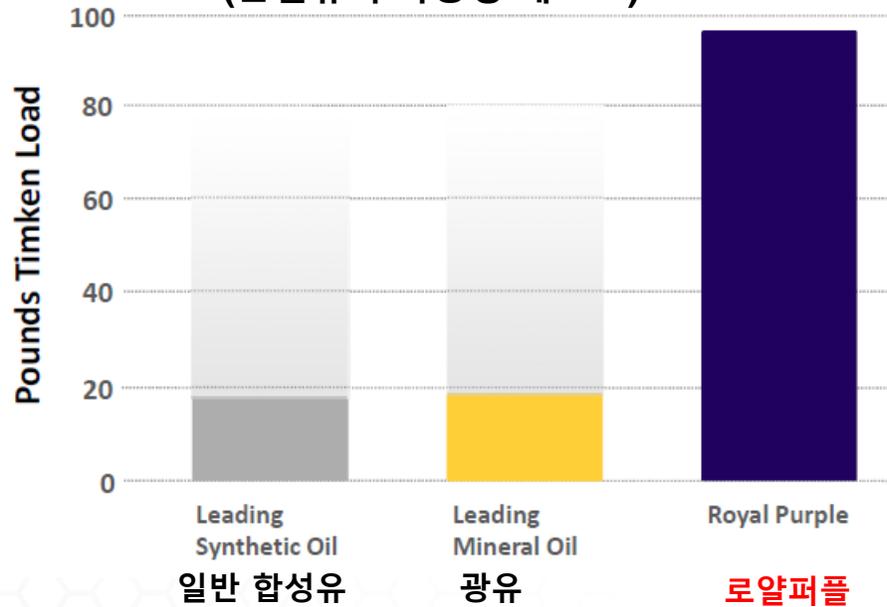
진동 20% 감소시  
베어링 수명은 2배 증대

# SYNFILM® GT 낮은 동적마찰력으로 전력비 절감

- 경쟁사 합성유 제품보다 낮은 마찰계수를 제공하며 마찰감소는 진동감소로 이어집니다.  
Provide lower coefficient of friction rather than competitor's synthetic oils and reduced friction leads lower vibration.
- 최종적으로 경쟁사 광유 및 합성유보다 **현저한 전력비 절감**을 경험할 수 있습니다.  
Finally our customers can experience remarkable energy savings rather than typical mineral oils and competitor's synthetic oils.
- SYNFILM GT는 저유조 온도가 175°F (80°C)를 초과할때 추천합니다.
- 평균적으로 **광유 대비 5-12% 전력비 절감, 경쟁사 합성유 대비 2-6% 전력비 절감**  
Achieve more 5-12% of energy savings than other mineral oils and 2-6% of energy savings compared to competitor's synthetic oils.

# Royal Purple 윤활유 강점

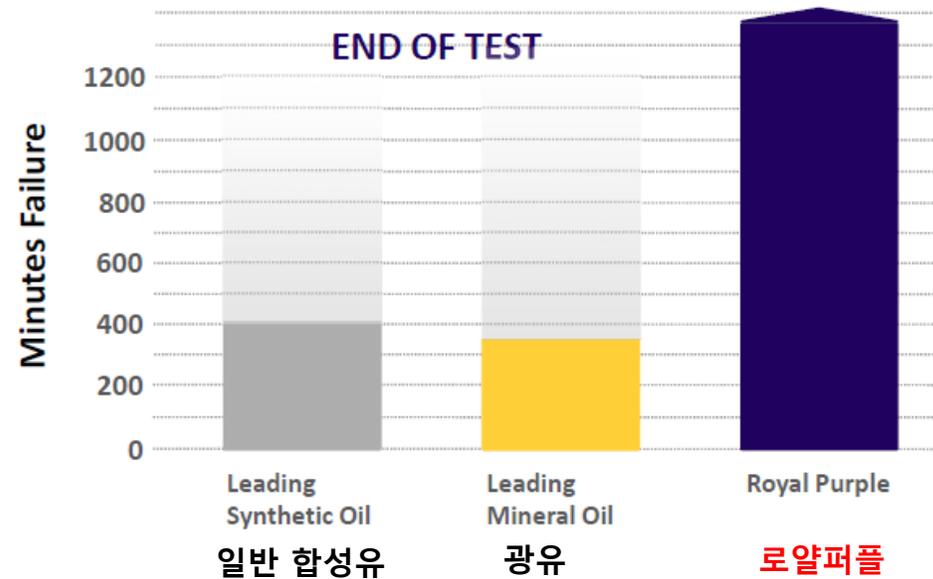
ASTM D-2782 Timken OK Load Test  
(윤활유 부하용량 테스트)



## 고강도 유막

강력한 유막으로 악조건 하에서도 점도저하 없이  
타 윤활유 대비 5배 고부하 용량 지지

TFOUT Oxidation Test Result ASTM D-2893  
(윤활유 산화안정성 테스트)



## 보다 긴 오일 수명

로얄퍼플의 프리미엄 합성유의 높은 산화안정성은 경쟁사대비  
10배 이상 우수하여 긴 수명을 보장합니다.



THE PERFORMANCE OIL THAT YOU PERFORM WITH

# SYNFILM® GT 고강도 유막

## 탁월한 기어 보호 (Superior Gear Protection)

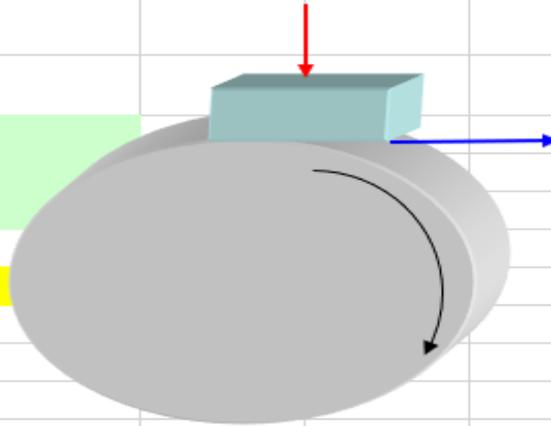
- 매우 우수한 **고강도 유막**의 형성은 고부하, 충격을 받는 설비에 적합 합니다.  
Exhibits exceptionally high film strength, helpful for withstanding high-load, heavy-shock application.
- 기어 뿌리(Gear Root)에 침적됨이 없이 금속 표면에 강력한 유막이 형성됩니다.  
Clings tenaciously to metal surfaces, without accumulating in the gear root.
- 유체동력학적 윤활 상태에서 운전이 이루어집니다.  
Operates within a state of hydrodynamic lubrication.

# 유막강도 비교 테스트

## Film Strength (유막 강도) 계산

### 1. Test 조건 (Timken Method :ASTM D2783)

1)하중	120 pound	54.421769 kg
2)회전수	800 rpm	
3)직경	34 mm	
4)속도	1.4234667 m/sec	
5)무부하전류	1.72 Ampare	
6)전압	220 Volts	
7)역율	0.89	
8)무부하소비동력P0	0.336776 kw	
9)무부하Torque	410.02478 Kg-mm	



$$kw = \frac{F \cdot V}{102} [kg_f \cdot m / s] \text{--- (1)}$$

$$T = F \cdot \frac{D}{2} [kg_f \cdot m] \text{--- (2)}$$

$$V = \frac{\pi \cdot D \cdot N}{60} [m / s] \text{--- (3)}$$

식(1)과 (2), (3)을 이용하면 ,

$$T = 974000 \frac{kw}{N} [kg_f \cdot mm] \text{--- (4)}$$

$$\text{마찰력 } F' = \mu \cdot F \text{--- (5)}$$

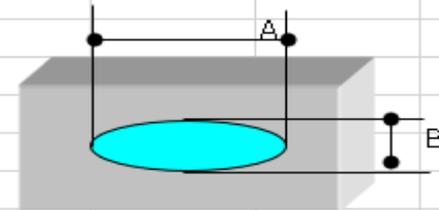
임으로 마찰계수를 비교할수 있다

### 사례 연구

#### 시료1

#### 시료2 (Royal Purple)

1.무부하 전류	1.72 Ampare	1.72 Ampare
2.부하 전류	<b>6 Ampare</b>	<b>1.83 Ampare</b>
3.소요전류	<b>4.28 Ampare</b>	<b>0.11 Ampare</b>
4.소요동력P1	0.838024 kw	0.021538 kw
5.소요 Torque	1020.2942 kg-mm	26.222515 kg-mm
6.마찰계수	<b>1.103409</b>	<b>0.028359</b>
7.마모 단면길이A1	10 mm	3 mm
8.마모단면길이B1	4 mm	2 mm
단면적	31.4 mm^2	4.71 mm^2
하중	72.562358 kg	72.562358 kg
전단응력	<b>2.310903</b>	<b>15.40602</b>



전단응력은

$$\tau = \frac{F}{A} \left[ \frac{kg_f}{mm^2} \right] \text{--- (6)}$$

$$A = \frac{\pi}{4} \cdot A \cdot B [mm^2] \text{--- (7)}$$

결국 전단응력은 유막강도와 동일한 의미임.

### 유막 강도 차이

**6.6667 배**

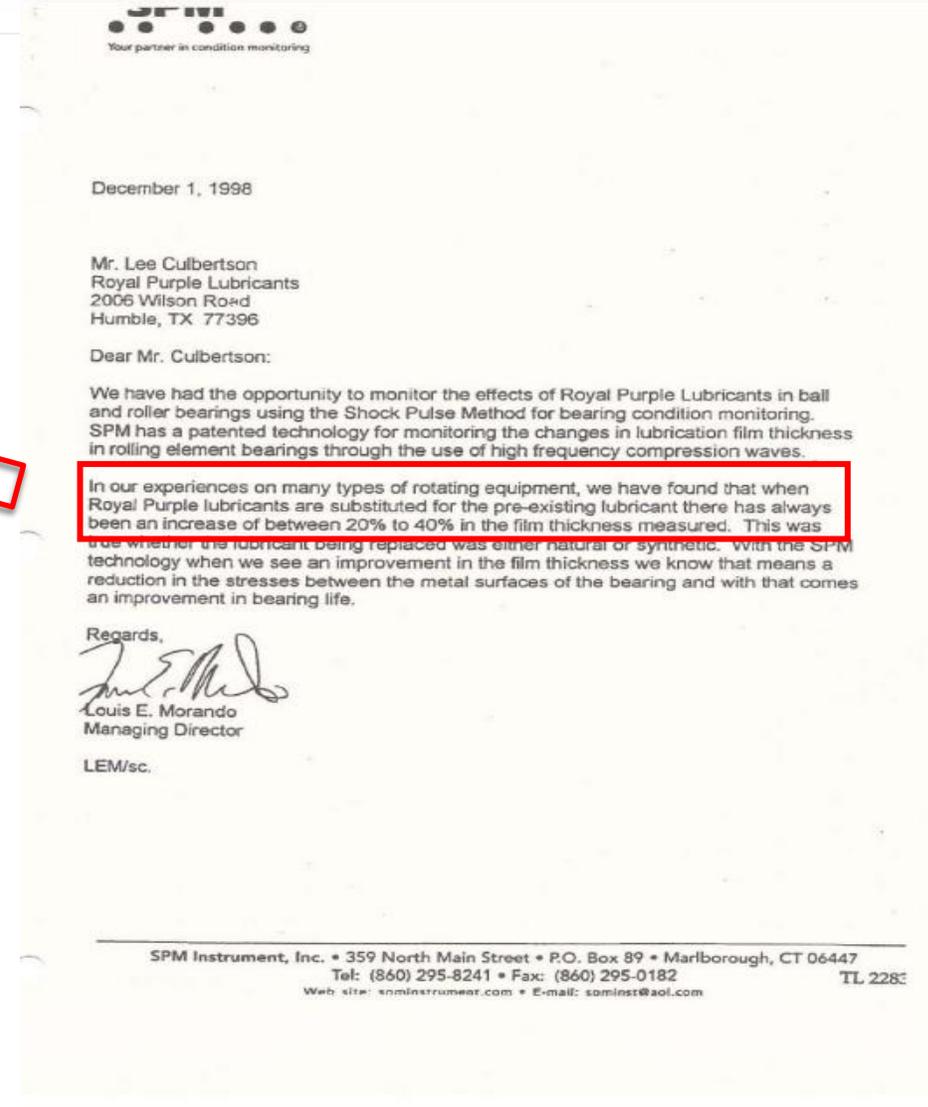


# 유막강도 언급 LETTER (SPM INSTRUMENT, INC)

타윤활유 대비 유막두께 20%-40% 증가

In our experiences on many case of rotating equipment, we have found that when Royal Purple lubricants are substituted for the pre-existing lubricant there has always been an increase of 20% to 40% in the film thickness measured. This was .....

회전 장비의 많은 사례에 대한 경험에서 우리는 기존 윤활유를 Royal Purple 윤활유로 대체했을 때 측정된 유막 두께가 항상 20%~40% 증가한 것을 발견했습니다.....



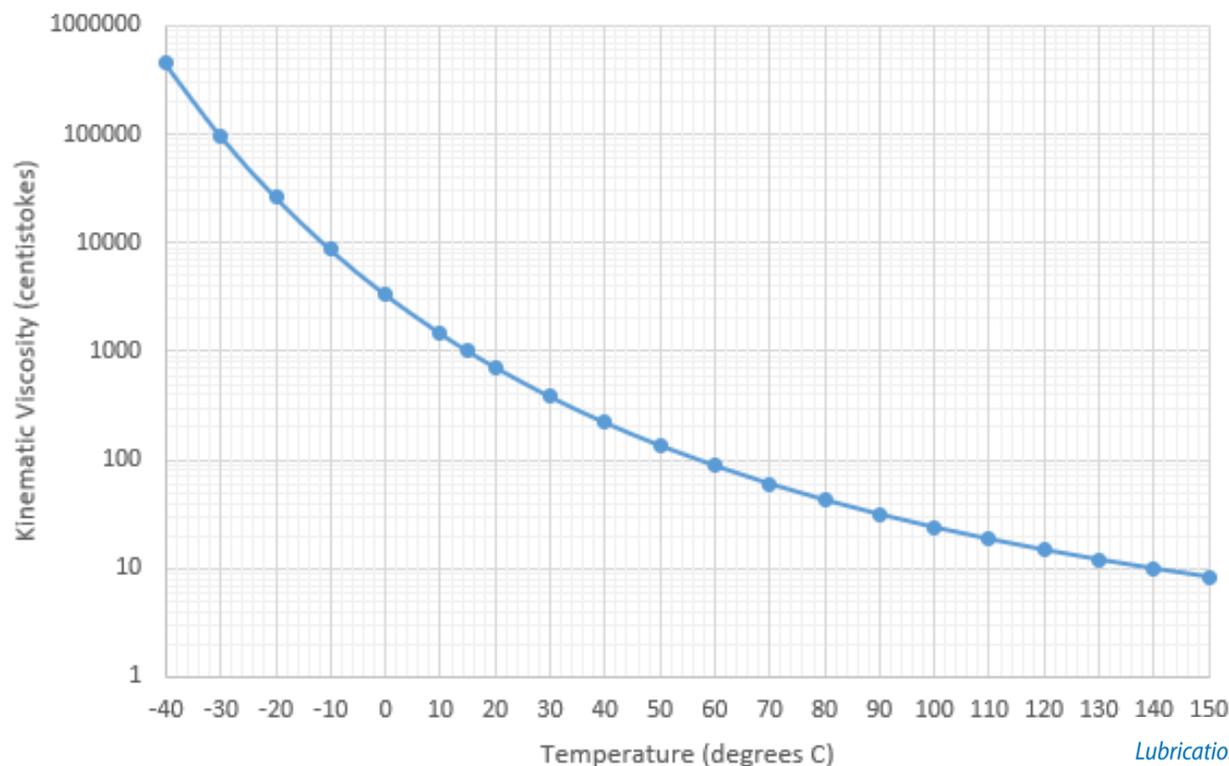
# SYNFILM GT 점도 vs 온도

## (Ex) SYNFILM GT 220 (Viscosity Index 125)

Synfilm GT 220

Temp. C	Temp. F	Vis. cSt	Sp.G.
-40	-40	455,042	0.912
-30	-22	97,927	0.905
-20	-4	26,591	0.898
-10	14	8,732	0.891
0	32	3,354	0.884
10	50	1,467	0.877
15	60	1,011	0.874
20	68	715	0.870
30	86	382	0.863
40	104	220	0.856
50	122	135	0.849
60	140	88.0	0.842
70	158	60.0	0.835
80	176	42.6	0.828
90	194	31.3	0.821
100	212	23.8	0.813
110	230	18.5	0.806
120	248	14.7	0.798
130	266	11.9	0.792
140	284	9.87	0.784
150	302	8.28	0.777

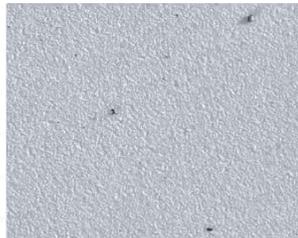
Synfilm GT 220, Viscosity vs. Temperature



# SYNFILM® GT 신유의 높은 청정도

## 높은 청정도(Extremely High Oil Cleanliness)

- 신유의 높은 청정도 (ISO 4406:99 - **14/13/11**)  
Provide extremely high oil cleanliness of new oil; 14/13/11.
- 타사의 일반적인 신유의 청정도는 **24/22/19**. (Source: HY-PRO)  
Typically oil cleanliness of competitor's new oil is 24/22/19.
- 정유기 사용이 어려운 냉각탑 여건상 신유의 청정도는 매우 중요함  
Oil cleanliness is very important under the operating condition with a difficulty of applying filtering machine
- 청정도 사진 (예)  
Example of oil cleanliness



ISO 14/13/12



ISO 22/19/17

타사

본사

ISO 4406:99 Cleanliness Level Standards		
Range Number	Number of Particles per ml	
	More Than	Up to and Including
24	80,000	160,000
23	40,000	80,000
22	20,000	40,000
21	10,000	20,000
20	5,000	10,000
19	2,500	5,000
18	1,300	2,500
17	640	1,300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
9	2.5	5
8	1.3	2.5
7	.64	1.3
6	.32	.64



## 케이스 스터디 Case Study

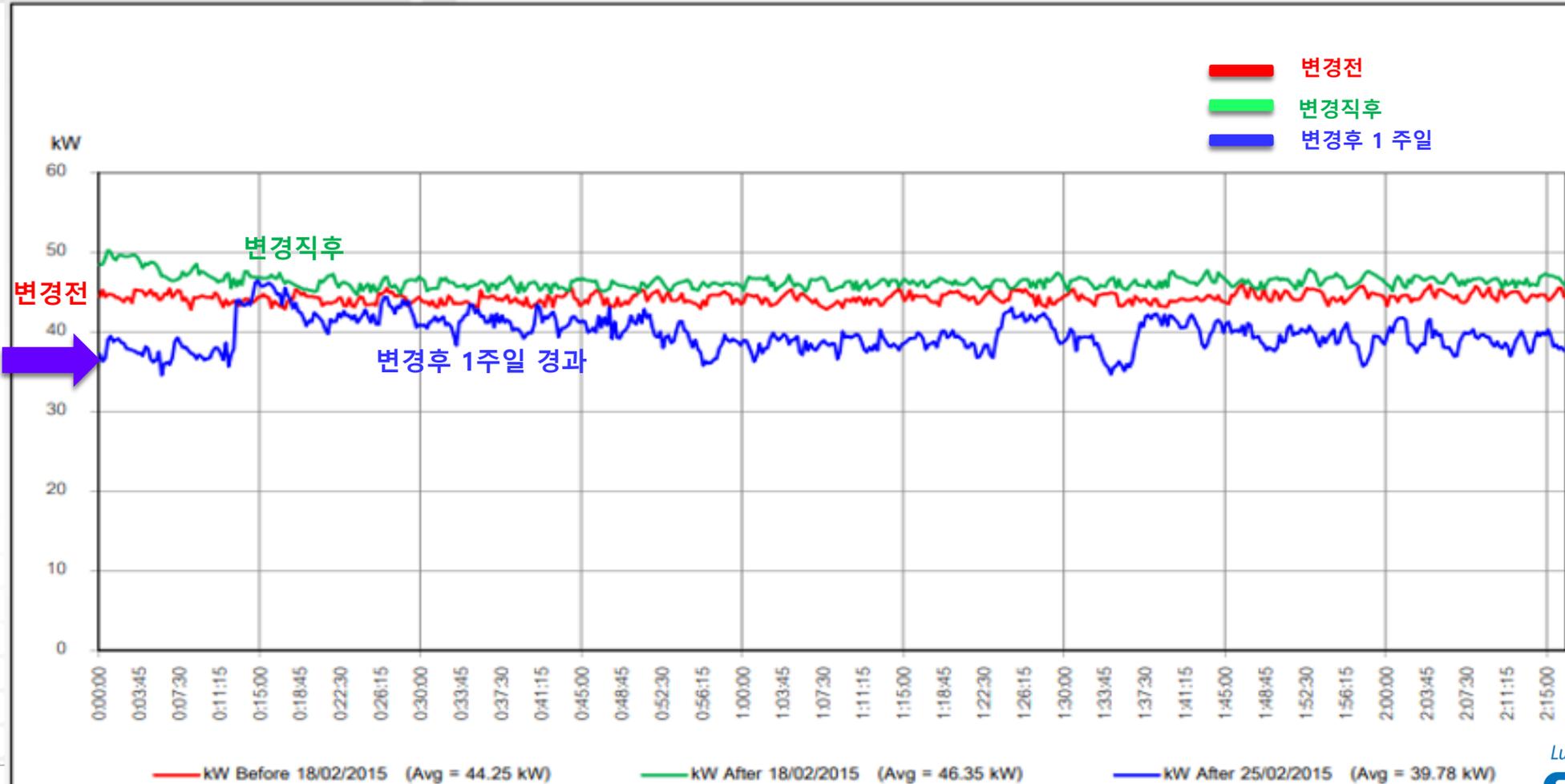


전력비 비교 테스트 자료 / 콤프레서, 감속기  
SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology



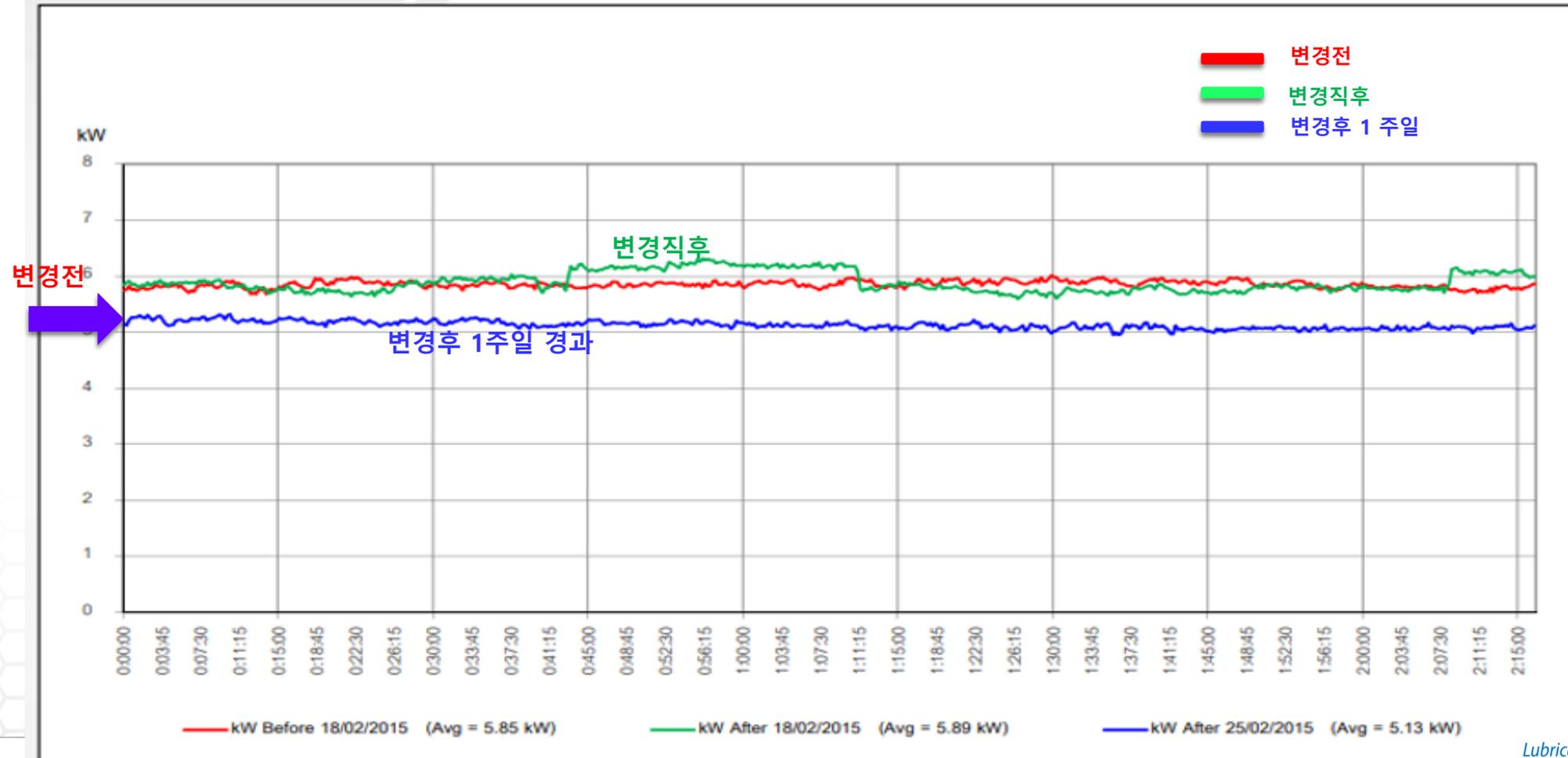
# 급유식 스크류 콤프레서의 전력 테스트

## SULLAIR LS-12, 50 HP



# SINGLE EXTRUDER GEAR BOX

## 37 KW, 2 POLES





Royal Purple SYNFILM GT 220

VS

Mobil SHC 630 (합성유)  
(롯데케미칼, 동두천드림파워)

국내 전력비 절감 사례 (냉각탑 감속기)

SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology

Note : 전력비 절감액 경우 현재 국내 전력비 단가가 많이 상승 하였으므로  
절감율 (%) 기준 현재 단가로 계산을 요함.

# 1. 냉각탑 감속기, 롯데케미칼

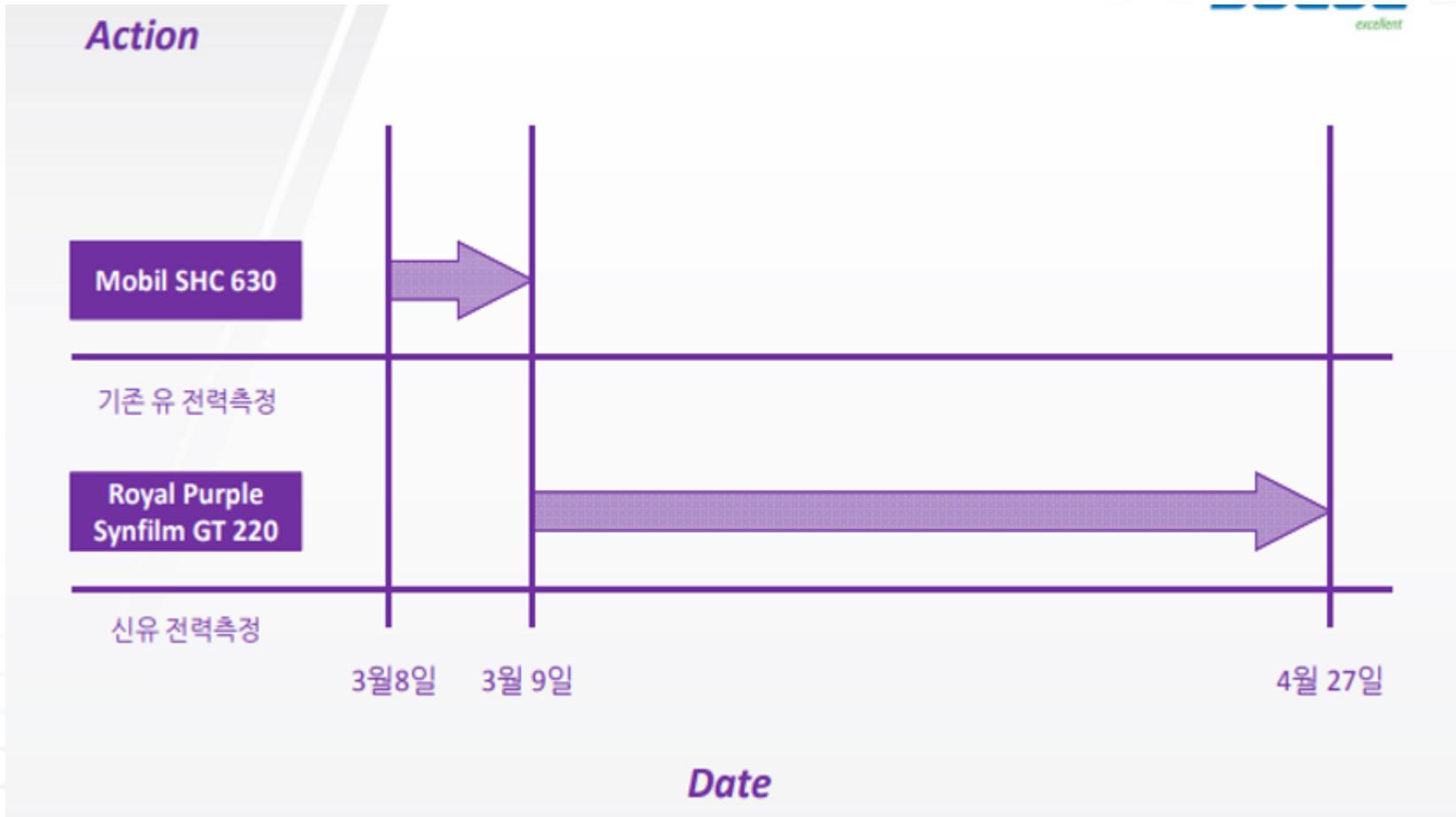
- 냉각탑 감속기 / 모터 정보: SM 공정 #5 Cooling Tower

제조사	MARLEY	설치 년도	1997년
kW	150kW	Volts	460
Input	1770 rpm	Output	136 rpm



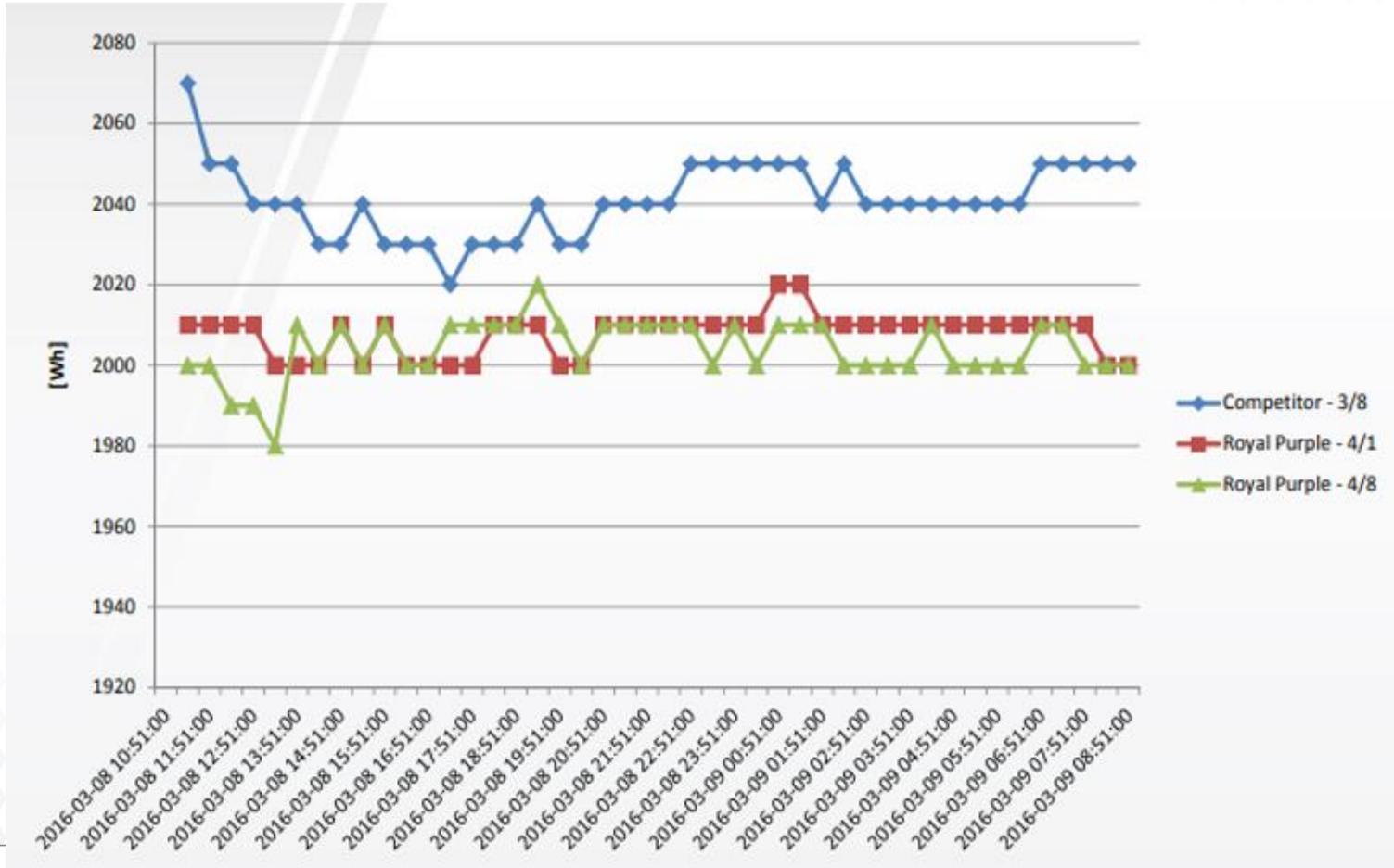
# 1. 냉각탑 감속기, 롯데케미칼

## 전력 테스트 일정



# 1. 냉각탑 감속기, 롯데케미칼

## 전력 부하 측정 결과 (Royal Purple vs Mobil)



SHC 630

SYNFILM GT 220 (교체직후)

SYNFILM GT 220 (교체 1주일후)

# 1. 냉각탑 감속기, 롯데케미칼

## 전력비 분석 (Royal Purple SYNFILM GT 220 vs Mobil SHC 630)

테스트 설비명: 냉각탑 감속기

테스트 시작 일자: 2016년 3월 8일

테스트 종료 일자: 2016년 4월 27일

윤활유 (기존): Mobil SHC630    윤활유(New): Royal Purple Synfilm GT 220

테스트 결과	SHC 630 Original Oil	Royal Purple Synfilm GT 220
KILOWATT HOURS / 21HOURS	2,685.01 kWh	2,631.3 kWh (약2.0% 감소. Max. 2.9% 감소)
KILOWATT HOURS / 24HOURS	3,068.58 kWh	3,007.2 kWh
KILOWATT HOURS / MONTH	92,057.49 kWh	90,216.00 kWh
월 전력비 @ 100원/KWH	9,205,749원	9,021,600원
연간 전력비 (365일 기준)	112,003,274원	109,762,800원
절감액 (with Energy Efficient Premium Lubricants)		2,240,474원/년



# 1. 냉각탑 감속기, 롯데케미칼

## 테스트 기간 중 기온 변화

요소		03월 8일	03월 9일	04월 01일	04월 02일	04월 08일	04월 09일
평균기온	관측	3.2	0.6	12.3	12.1	9.2	10.7
(℃)	평년	2.8	3.1	7.3	7.6	9.8	10.1
최고기온	관측	6.2	3.6	22.6	20.9	16.8	16.4
(℃)	평년	8.2	8.6	13.4	14	16.6	16.9
최저기온	관측	-0.1	-1.1	2.1	3.8	6.4	7
(℃)	평년	-2.1	-1.9	1.6	1.7	4	4.3

## 2. 동두천 드림파워 사례

### 냉각탑 감속기 이력

#### [동두천 드림파워]

- 냉각팬 총 32 Cells : 16 Cells/Block (2 Blocks)
- **Royal Purple SYNFILM GT 220 적용 이력**
  - 2015년도 9월 첫 적용 ~
  - 2025년 현재까지 전 냉각탑 감속기에 적용중
- **감속기**
  - 감속기 : 미국 Amarillo 사 (1917년 설립)
  - 설치년도: 2008년
  - 모터 사양 : 150HP, 480V, Input 1785 rpm, Output 138.05 rpm



## 2. 동두천 드림파워 사례

### 냉각탑 감속기유 로얄퍼플 선정 이유

#### 심각한 수분오염 사례 (300 ppm 주의, 600 ppm 경고)

Date	Sample No.	Water (ppm)	Date	Sample No.	Water (ppm)
2022.08.05.	No.1	2,170	2019.04.17.	10-B	593
	No.3	415		10-G	225
	No.4	10,911		10-P	499
	No.5	2,492		20-B	3,646
	No.6	636		20-G	10,636
				20-P	252
2018.01.18	10-C	259			
	10-G	350			
	10-P	762			
	20-C	382			
	20-G	209			
	20-P	351			



과거 B사 광유를 사용 하였으나 수분, 입자등의 극심한 오염으로 오일이 열화되고 바니쉬가 생성 되었음. 즉, 냉각탑 감속기의 가혹한 운전조건을 광유가 견디지 못하여 유막이 파손되고 금속간 접촉 (Metal to Contact)으로 기어박스가 파손되는 사례가 다수 발생 → 2015년 SYNFILM GT 220 으로 교체후 현재까지 관리중.



승인서 및 추천서 (냉각탑 팬 감속기)  
Approval & Recommendation Letter

# 승인서 Approval Letter from Amarillo (미국 팬 감속기 제조사)

OCT 23, 2002 8:57AM AMARILLO GEAR 806-622-3258

NO. 6322 P. 1/1



Post Office Box 1769  
Amarillo, Texas 79105  
2401 Sandown Lane (79110)  
Ph. 806 622 1273  
Fax 806 622 3258

October 23, 2002

David Canitz  
Technical Services Manager  
Royal Purple Lane  
Porter, TX 77365

To Whom It May Concern:

Royal Purple Synfilm GT 220 is approved for use in Amarillo Cooling Tower Fan Drives.

Regards,

Randy Walser  
Engineer

## SYNFILM<sup>®</sup>GT 220

### Approval Letter

### Cooling Tower Fan Drives



A member of The Marmion Group of companies



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# 추천서 (동두천드림파워)

## SYNFILM<sup>®</sup>GT 220

### Recommendation Letter

### Cooling Tower Fan Drives

#### 감속기 온도 감소

■ 동절기 : 95°C → 73 - 76°C (19-22°C 감소)

■ 하절기 : 95°C → 80 - 85°C (10-15°C 감소)

※ 온도 10°C 감소: 유수명 2배 증대



DREAM POWER Co., Ltd.  
110, Soemok-gil, Dongducheon-si  
Gyeonggi-do, 483-040, Korea

Solge Corporation  
11, Secheonbuk-ro 8Gil, Dasa-eup  
Dalseong-gun, Daegu, 42922, Korea

Royal Purple, Inc.  
One Royal Purple Lane  
Porter, Texas 77365, U.S.A

December 21, 2016

Dear Solge and Royal Purple Team,

The purpose of this letter is to share with your team the performance of Synfilm GT 220 of Royal Purple, which has been used for the application of cooling tower gearbox.

Our company, Dongducheon Dream Power Co., Ltd. is a Combined Cycle Power Plant with a capacity of 1,716MW and we had switched over your synthetic oil, Synfilm GT 220 from a mineral oil in September, 2015. Before a switch-over we had a tremendously high oil temperature around over 95 deg. C but now an oil temperature of gearbox of cooling tower has been keeping around 73 to 76 deg. C and in summer season typical oil temperature was around 80 to 85 deg. C and we have had 10 to 22 deg. C of a temperature reduction compared to previous mineral oil. Consequently the oil temperature reduction leads an oil life extension, a low coefficient of friction, an energy savings and a machinery reliability improvement.

Finally we hope to maintain a business relationship with Solge and Royal Purple and strongly recommend Royal Purple synthetic oils to other customers.

Best regards,

Kim, Guen-mok  
Manager  
Mechanical Engineering Team  
Steam Turbine

김근목



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Royal Purple SYNFILM GT 150

VS

Mobil SHC 629 (합성유)  
(Dow Chemical, USA)

미국 전력비 절감 사례 (냉각탑 감속기)

SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology

Note : 전력비 절감액 경우 미국과 국내 전력비 단가가 다르므로  
절감율 (%)을 기준 국내 단가로 계산을 요함.

# MF-960H 냉각탑, DOW CHEMICAL FREEPORT TEXAS, USA

## Royal Purple SYNFILM GT 150 vs Mobil SHC 629

### *Dow Chemical Freeport Texas Operations*

Unit 2123

Cooling Towers

MF-960H



# MF-960H 냉각탑, DOW CHEMICAL FREEPORT TEXAS, USA

테스트 시스템: Dow Chemical Unit 2321 **MF-960H** Cooling Tower MCC2321G-Cube 3E Marley 32.2 12.93:1  
Driven by: Electric Motor, 150hp, 480 volt, 1785 rpm input, 138.05 rpm output  
Installed: April 15, 2008, 6 years service Capacity: **10 gallon fill**



초기 테스트 날짜: February 10, 2014      **DATE OF FINAL TESTING:** April 15, 2014

## RESULTS:

Mobil SHC 629

KILOWATT HOURS/20 MINUTE	39.95399 kwh
KILOWATT HOURS/Month	87,559.2 kwh
Cost Elapsed @ \$.10/KWH	\$4.00
Cost per Month @ \$.10/KWH	\$8,755.82
Annual Cost (330 days)	\$96,315.12

## SAVINGS with ENERGY EFFICIENT LUBRICANTS

Royal Purple Synfilm GT 150

37.55095 kwh	
82,292.9 kwh	<b>(6.0% Reduction)</b>
\$3.76	
\$8,229.29	
\$90,522.19	
<b>\$526.62 per month</b>	<b>\$5,792.82 per year</b>

이 시스템은 기계적 혹은 전기적 고장이 없는 표준 쿨링 타워 시스템을 대표할수 있다. 이 시스템의 연간 전기 절감 예산은 \$5,792.82 이다.



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# MF-960H 냉각탑, DOW CHEMICAL FREEPORT TEXAS, USA

## 전력비 절감액 (미국 단가 기준)

Estimated Saving per Year in Dollars

960H Cooling Tower	Original Oil	New Oil	2 week oil	Royal Purple New	Royal Purple 2 week	Royal Purple 5 Week
VS						
Original Oil	X	-\$2,521.97	-\$4,364.14	-\$4,122.58	-\$6,747.95	-\$5,792.82
New Oil	-\$2,521.97	X	-\$1,842.28	-\$1,600.72	-\$4,226.09	-\$0.39
New 2 Week Oil	-\$4,364.14	-\$1,842.28	X	\$241.56	-\$2,383.81	-\$0.18
Royal Purple New	-\$4,122.58	-\$1,600.72		X	-\$2,625.37	-\$1,670.24
Royal Purple 2 week	-\$6,747.95	-\$4,226.09	-\$2,383.81	-\$2,625.37	X	\$955.13
Royal Purple 5 week	-\$5,792.82	-\$0.39	-\$0.18	-\$1,670.24	\$955.46	X

모든 조사가 비교되었다. 각각의 변화는 에너지 절감효과를 보였다. Royal Purple SYNFILM GT 150 은 다른 ISO 150 제품들 보다 \$5,792.82 의 연간 에너지 절감을 예측할 수 있었다. 또한 마찰을 줄이고 적은 마모와 전력부하로 우수한 성능을 실행하였다.

# MF-960H 냉각탑, DOW CHEMICAL FREEPORT TEXAS, USA

## 점도 변화 비교

Oil Sample Data	960H Cooling Tower			Notes
		ISO		
	VISCOSITY	VISCOSITY cSt	DR	
OLD SHC-629 2-10-14 10:15 A.M. (Original Oil)	787 SUS	169.94	34/6	Very high Ferrous particle count. Viscosity is high for an ISO Viscosity 150 oil.
NEW SHC-629 2-10-14 2:20 P.M. (New Oil)	757 SUS	163.45	10/4	Decrease in ferrous particle count from first.
2 WEEKS LATER SHC-629 2-24-14 10:00 A.M. (New 2Week Oil)	777 SUS	167.78	18/6	Increase in ferrous particle count. Viscosity is high for an ISO Viscosity 150 oil.
NEW ROYAL PURPLE 2-24-14 3:00 P.M.	694 SUS	149.82	8/0	Reduced ferrous particle count from SHC-629 2-week later
ROYAL PURPLE 2 WEEKS LATER 3-10-14 10:25 A.M.	699 SUS	150.9	5/0	Larger reduction in ferrous particle count.

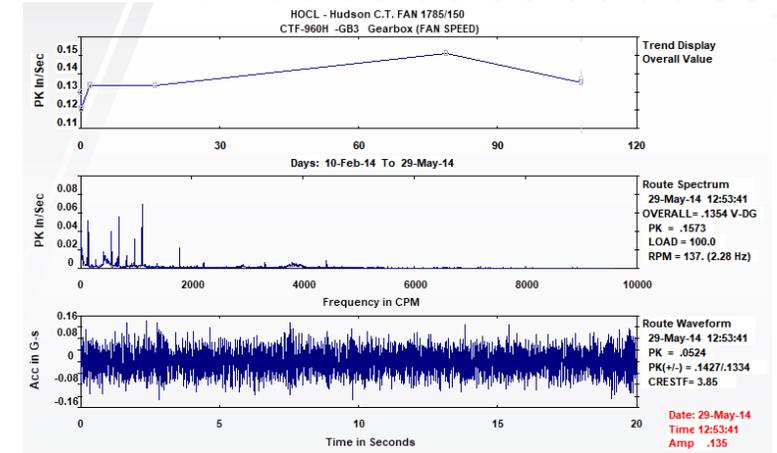
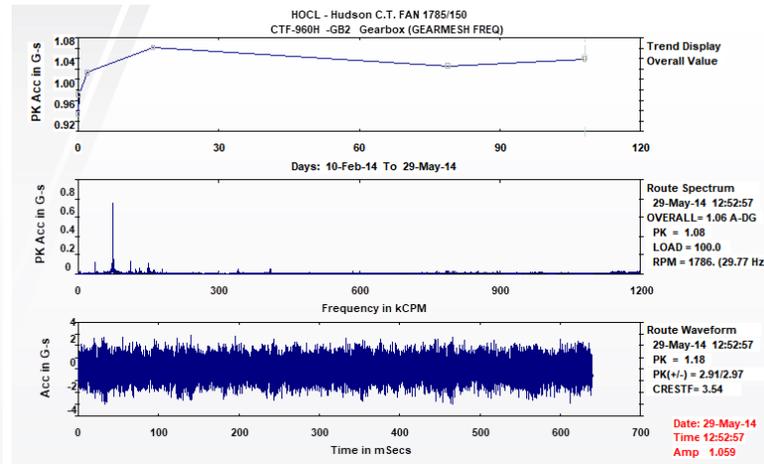
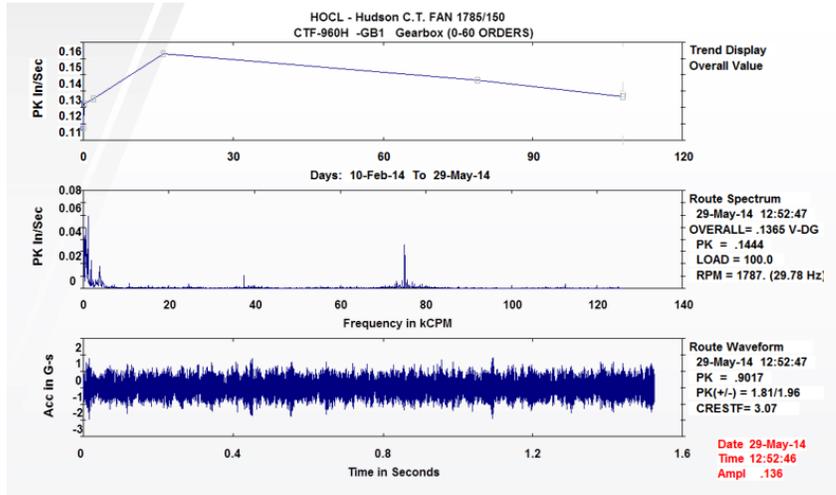
ISO Viscosity Grade Numbers	Viscosity Grade Ranges (centistokes at 40 °C)	
	Minimum	Maximum
150	135	165

오일샘플 데이터를 보면 Mobil 기존오일과 New 2 Week Oil은 ISO 점도 150등급의 스펙에서 벗어난 걸 볼 수 있다.



# MF-960H 냉각탑, DOW CHEMICAL FREEPORT TEXAS, USA

## Vibration Data 960H



- MF-960H Cooling Tower 는 기계적이거나 전기적 문제를 갖고 있지 않는 것으로 알려져 있다.
- 많은양의 금속입자들이 오일샘플에 존재하고 있었다. Royal Purple 2 Week 샘플에 존재하는 금속입자들은 경쟁사의 오일 샘플양에 비해 절반 정도였다.



Royal Purple SYNFILM GT 220

VS

Mobil 600 XP 220 (광유)  
(INNOVEK, Thailand)

태국 전력비 절감 사례 (냉각탑 감속기)

SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology

Note : 전력비 절감액 경우 태국과 국내 전력비 단가가 다르므로  
절감율 (%) 기준 국내 단가로 계산을 요함.

# INNOVEK, THAILAND (AMARILLO 175 FAN DRIVE)



## ENERGY SAVING THROUGH THE USE OF ROYAL PURPLE SYNTHETIC OIL



COOLING TOWER GEARBOX

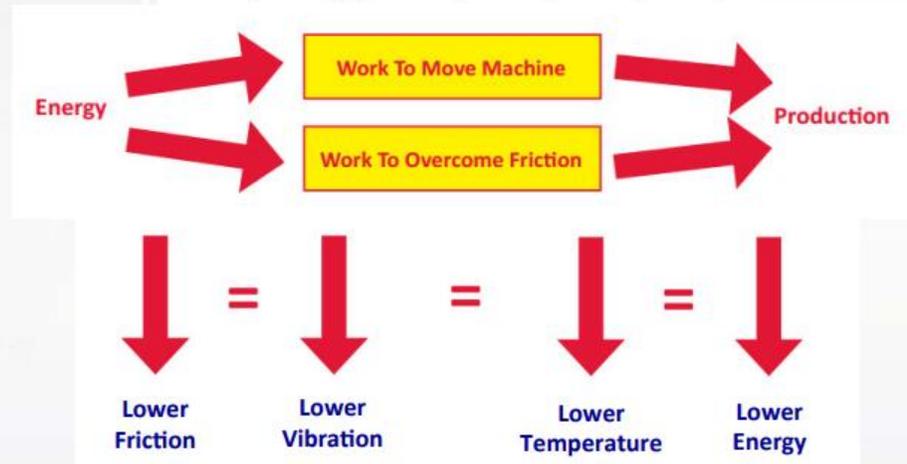
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## FRICTIONAL ENERGY

$$E \text{ (energy)} = W \text{ (work)} + Q \text{ (heat)}$$



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# INNOVEK, THAILAND (AMARILLO 175 FAN DRIVE)

## 냉각탑 운전조건

### LUBRICATION AND LUBRICANT

#### Lubrication Requirement:

- Clean Target: 17/15/12
- Dry Target:  $\leq 400$  ppm
- Cool Target: 70-80 C
- Non-EP Gear Oil
- ISO VG 150 or 220



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### EQUIPMENT SURVEY

#### Amarillo Series Model 175 Fan Drive

##### Ratings:

Input (RPM)	Service Horsepower Ratings (HP) at (Service Factor = 2.0)							
	Nominal Ratio							
1750	126	112	105	100	80	60	60	50
1450	104	92	87	83	66	50	50	41
1160	84	74	70	66	53	40	40	33

##### Thrust:

Vertical Shaft Down Thrust Capacity: 5150 lbs.

##### Oil Capacity:

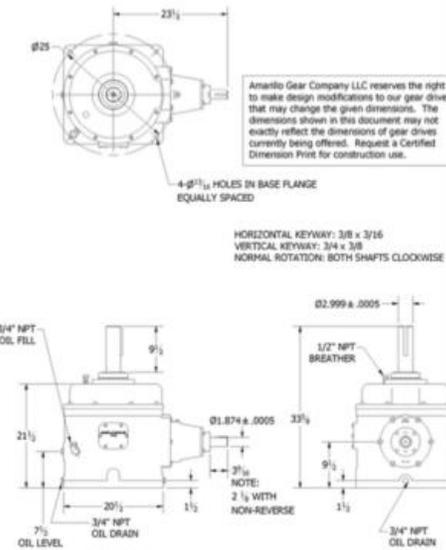
ISO Grade 220/ AGMA Lubricant Number 5 or 5S. Extreme Pressure additives are not recommended.  
Capacity: 5.5 Gallons/21 Liters

##### Weight:

Domestic Shipping Weight: 855 lbs.  
Weight with Export Boxing: 940 lbs.

##### Shipping Info:

Export Box Dimensions (L x W x H): 40in x 27in x 41in.



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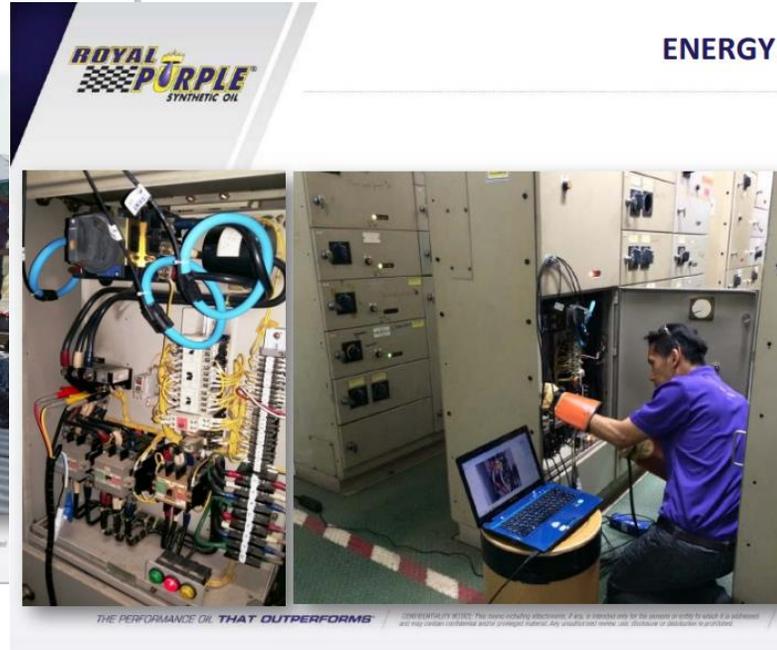
# INNOVEK, THAILAND (AMARILLO 175 FAN DRIVE)

## 냉각탑 운전조건 SURVEY 및 전력 측정

### MECHANICAL CONDITIONS



### ENERGY AUDIT



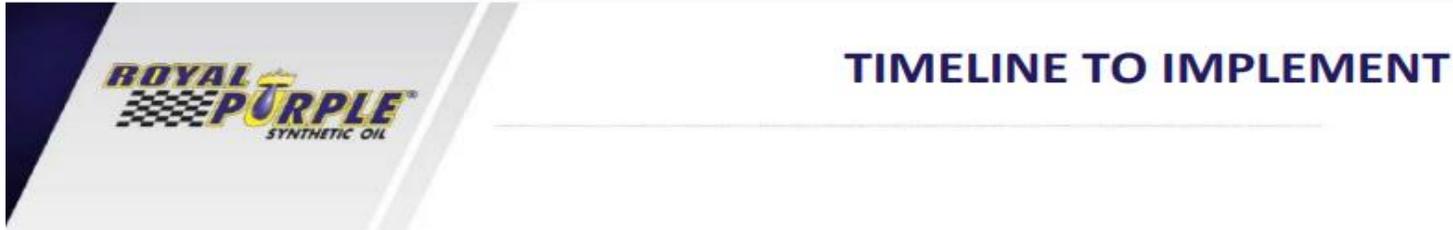
### ENERGY AUDIT

DATA LOGGER EQUIPMENT AT ELECTRIC CONTROL ROOM



# INNOVEK, THAILAND (AMARILLO 175 FAN DRIVE)

## 전력 측정 일정



Timeline to Implement Royal Purple at CTW Fan Area

No.	Topics	by	Apr-15				May-15				Jun-15				Jul-15				Aug-15				
			W1	W2	W3	W4																	
1	Approach / Issue	CTT	7																				
2	Before Change Lubricant - Unit B by Collect: 2.1. Amp / Volt / PF	CTT			27																		
3	Change Oil & After01 - Unit B by Collect: 2.1. Amp / Volt / PF				28	9																	
4	After02 - Unit B by Collect: Amp/Volt/PF	CTT				4	22																
5	After03 - Unit B by Collect: Amp/Volt/PF	CTT											9	17									
6	Conclusion / Re-Approach	CTT												17									
8	Before Change Lubricant - Unit H by Collect Amp	CTT														24	7						
9	Change Oil & After01 - Unit H by Collect Amp	CTT																			18	25	
10	After02 - Unit H by Collect Amp	CTT																					
11	After03 - Unit H by Collect Amp	CTT																					
12	After04 - Unit H by Collect Amp	CTT																					
13	After05 - Unit H by Collect Amp	CTT																					
14	Used Oil Sampling for Analysis	CTT																					
15	After06 - Unit H by Collect Amp	CTT																					
16	After07 - Unit H by Collect Amp	CTT																					
17	Conclusion																						



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THE PERFORMANCE OIL THAT OUTPERFORMS™

# INNOVEK, THAILAND (AMARILLO 175 FAN DRIVE)

## 전력측정 결과 (Mobil 600 XP 220 vs Royal Purple SYNFILM GT 220)



### INNOVEK COOLING TOWERS SYSTEM B, CELL H

**Purpose of Trial:** Achieve operating costs reduction through energy saving using Royal Purple's Premium Synthetic Lubricant

**Trial Equipment:** Amarillo FD175 (Unit H), Driven by: Electric Motor, 45 kW, Input 1,750 rpm  
 380V 3Phase Served: N/A hrs    Energy Cost: 3.50 THB/Unit  
 Oil Capacity: 21 Liters    Oil Served: 3,600 hrs

**Before Change:** Aug 08, 2015    **After Change:** Sep 28 2015 to 11 Apr 2016

**Existing Oil:** Mobilgear 600 XP 220 (Mineral)    **New Oil:** Royal Purple Synfilm GT 220

Trial Result:	Existing Oil	RP Synfilm GT 220
kW (Amps)	32.10 (48.78)	31.19 (47.39) (2.85 % Reduction)
kWh/Month	23,112 kwh	22,456.8 kwh
Cost/Month	80,892 THB	78,598.8 THB
Annual Cost (330 Days)	889,812 THB	864,586.8 THB
<b>SAVINGS with Energy Efficient Lubricant</b>		<b>2,293.2 THB/Month.    25,225.2 THB/Year</b>

Remark: CTW Motor of Unit H run at 68-70% of full Rated Load

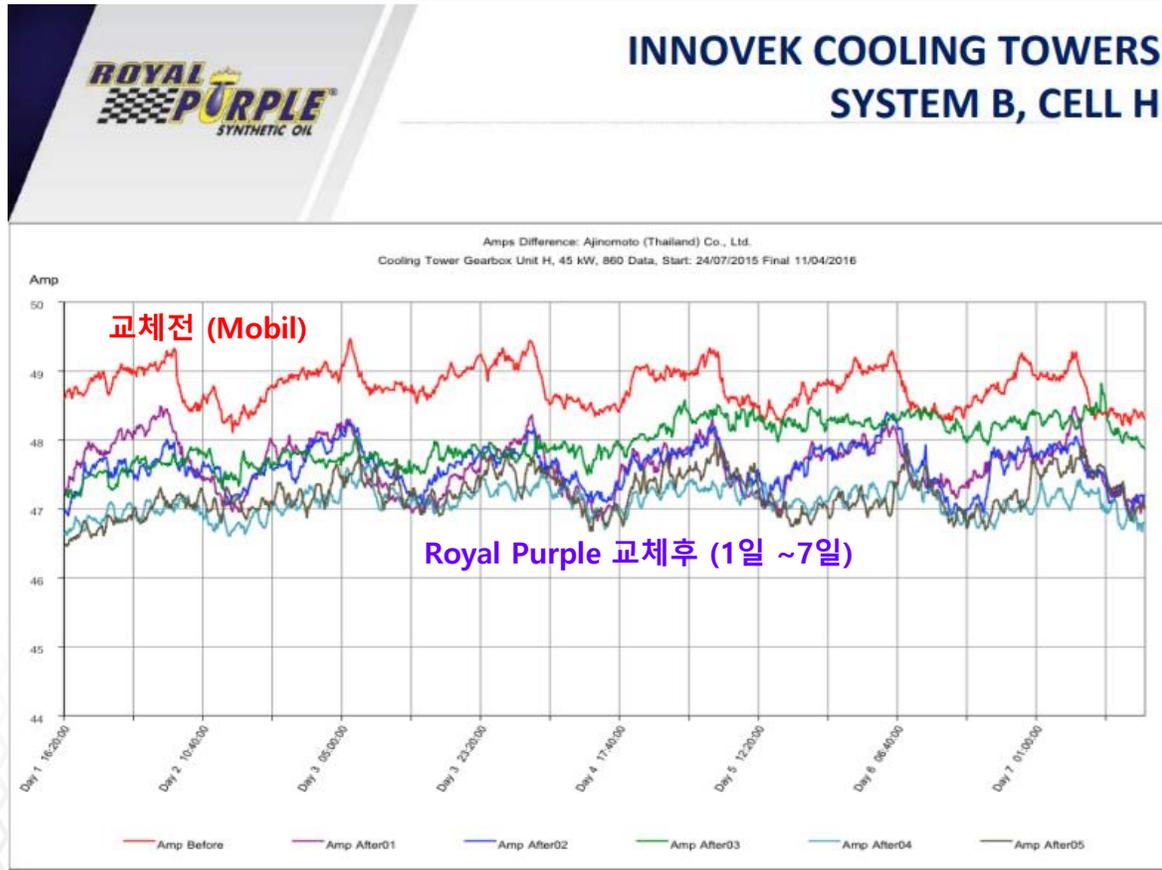
THE PERFORMANCE OIL THAT OUTPERFORMS™    CONFIDENTIALITY NOTICE: This memo including attachments, if any, is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. Any unauthorized review, use, disclosure or distribution is prohibited.

Mobil 600 XP 220 (광유)  
대비 2.85% 전력비 절감

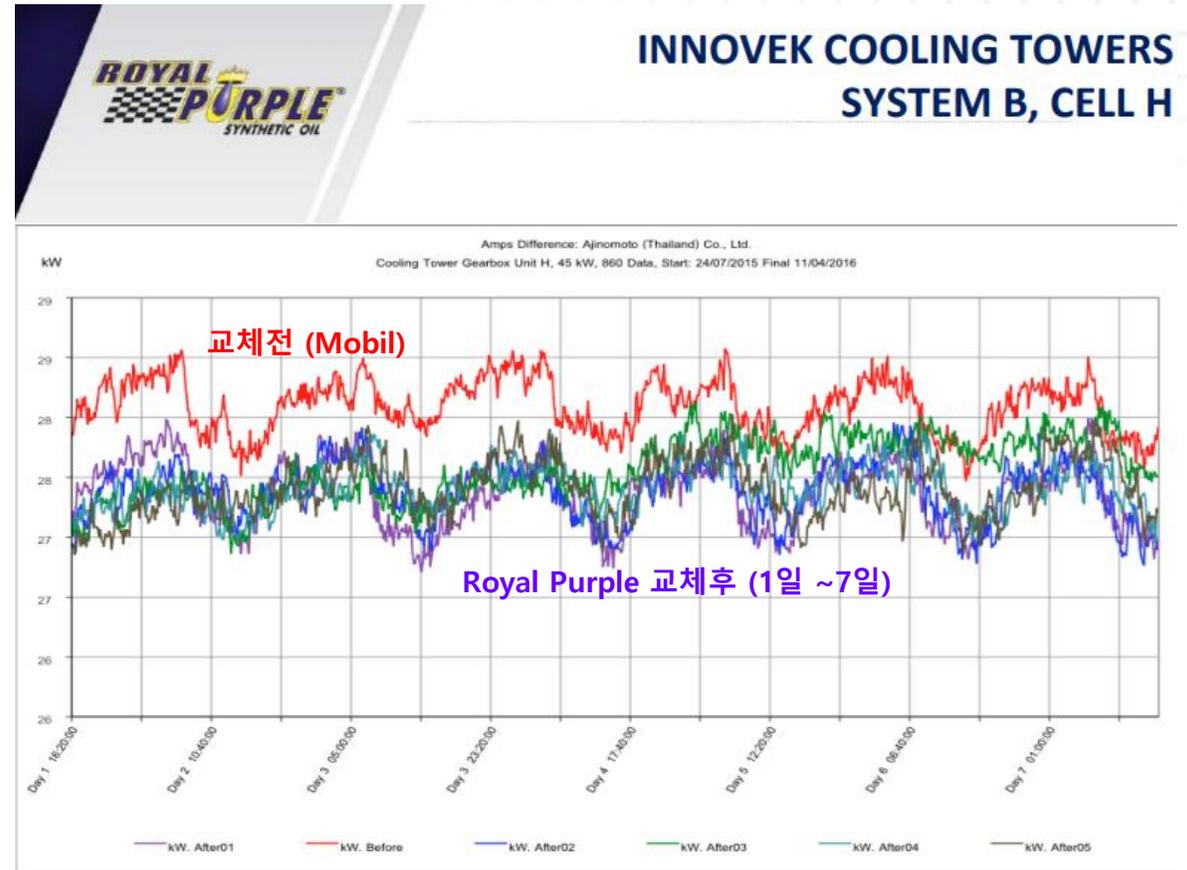


# INNOVEK, THAILAND (AMARILLO 175 FAN DRIVE)

## 전류 및 전력 측정치 비교 (Mobil 600 XP 220 vs Royal Purple SYNFILM GT 220)



Amp 측정치



KW 측정치





Royal Purple SYNFILM GT 220

VS

Shell Morlina 220(광유)  
(Rayong Steel, Thailand)

태국 전력비 절감 사례 (냉각탑 감속기)

SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology

Note : 전력비 절감액 경우 태국과 국내 전력비 단가가 다르므로  
절감율 (%)을 기준 국내 단가로 계산을 요함.

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

## 냉각탑 감속기 현황

### The Equipment Information : **Mechanical**



Application	: Cooling Tower – Single Reduction Fan Drive
Machine No.	: Cooling Tower No.2
Manufacturer	: Amarillo Gear Company (Texas, USA)
Model	: F155 (Serial No. 328215)
Impellers	: 6 pcs

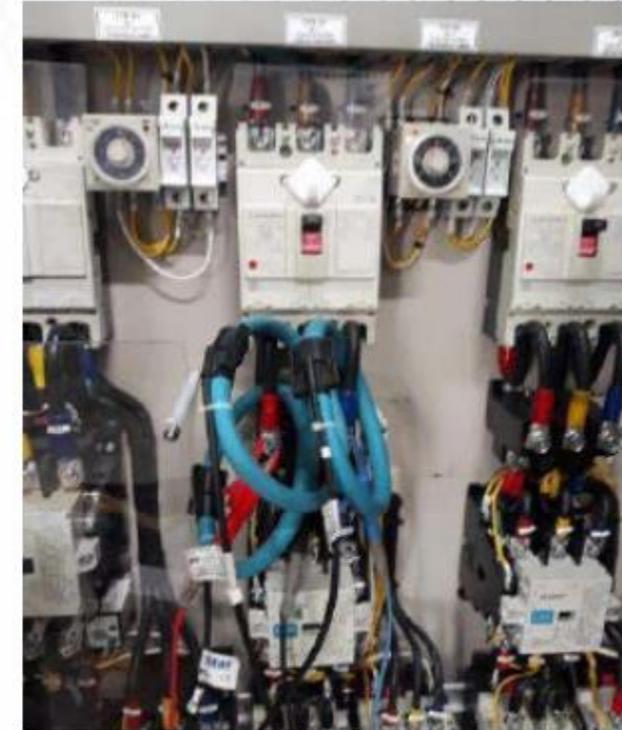
# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

## 냉각탑 감속기 모터 사양

### The Equipment Information : **Electrical**



SIEMENS		IE1						
Made in Czech Rep.								
1LG4 223-4AA60	225M	UC 1109/092363003 IMB3 Tr.C. 155						
V	Hz	A	kW	cos φ	1/min	1/W	T <sub>e</sub> s	Certif.No.
400 Δ	50	IE1-91,7%	82	45	0,86	1475		
590 Y			47,5					
460 Δ	60	IE1-93,0%	81	52	0,87	1775		
IEC/EN 60034		G <sub>10</sub> /M 3000						
2JC5TombS47C								



Driven by	: Siemens Motor, 45 kW (82 Amp)
Volt	: 400V / 3Phase3Wire
Breaker Position	: NFB-05, M-3-2 Cooling Tower Circuit Breaker
Energy Cost	: <b>3.5</b> THB/Unit (Approx.)

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

기존 윤활유 사양 Shell Morlina 220 (광유)

## The Equipment Information : **Lubrication**



**Amarillo Gear Company LLC**

### Amarillo Series Fan Drive Model 155

SERVICE HORSEPOWER RATINGS  
(2.0 SERVICE FACTOR)

Input (RPM)	Nominal Ratio								
	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
1750	110	100	90	85	75	65	55	50	45
1450	91	83	75	70	62	54	46	41	37
1160	73	66	60	56	50	43	36	33	30

THRUST CAPACITY: 4700 lbs.  
OIL TYPE: ISO 220 / AGMA 5 or 5S / No EP additives  
OIL CAPACITY: 5.5 gallons (21 L)  
WEIGHT, DOMESTIC SHIPPING: 705 lbs.  
WEIGHT, EXPORT SHIPPING w/EXPORT BOX: 855 lbs.  
EXPORT BOX DIMENSIONS (L x W x H): 40 x 27 x 41 (inches)

REV.-

Oil Capacity : 21 Liters (Not include piping)  
OEM Oil Spec : ISO 220 / AGMA 5 or 5S / No EP additives  
Oil Serviced : 816 hrs. (on 18 May 2018)  
Oil Change Interval : 6 Months (Last Change 14 Apr 2018)  
Existing Oil Type : **Shell Morlina 220 (Mineral Oil)**  
Oil Analysis : **No**

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

## 전력 측정 일정표

Timeline to Implement Royal Purple at Cooling Tower Gear Box No.2

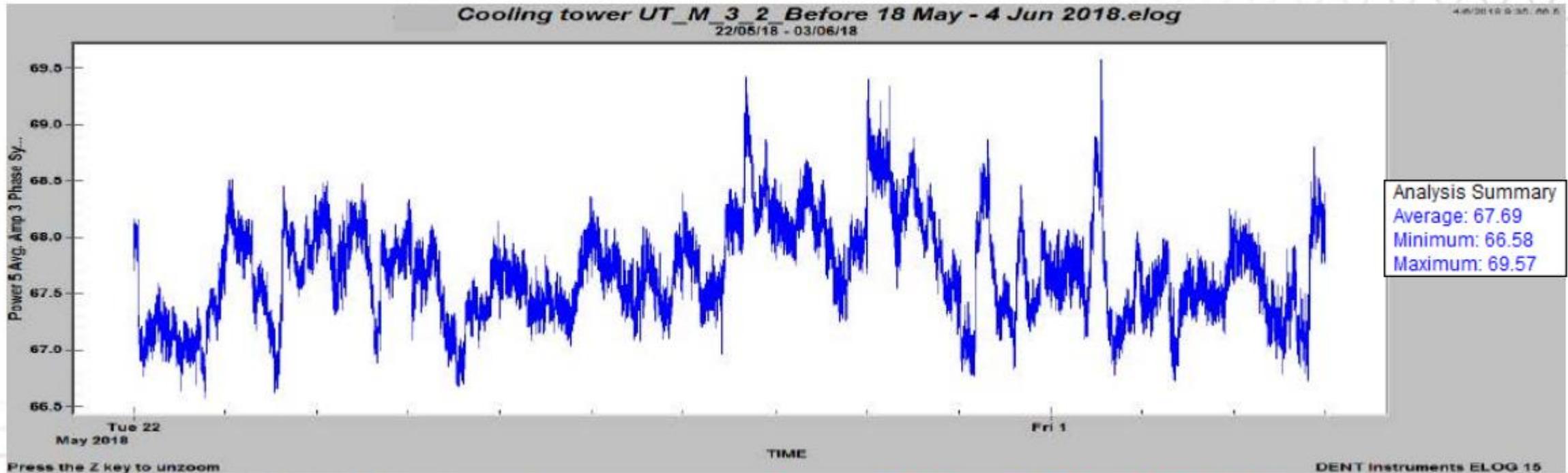
No.	Topic	By	Time																															
			Mar-18				Apr-18				May-18				Jun-18				Jul-18				Aug-18				Sep-18							
			W1	W2	W3	W4	W1	W2	W3	W4																								
1	Approach / Issue	CTT			16																													
2	Change PTT Gear Oil EP320 New Oil							14																										
3	Before Collect Data									27						4																		
	3.1 Amp / Volt / PF / kW ( Service Oil 816 hrs)	CTT											18		4																			
	3.2 Thermal Image	CTT							27		14			4																				
4	Change Royal Purple Oil																																	
5	Test Peak Load Start - Stop	CTT																																
6	After Collect Data																																	
	6.1 Amp / Volt / PF / kW (Service Oil 840 hrs)	CTT																									10							
	6.2 Thermal Image	CTT																									24		9					
7	1st Conclusion	CTT																																
8	Thermal Image Monitoring	CTT																										Every 3 Month						
9	Used Oil Analysis	CTT																										On May 2019						
10	Final Conclusion	CTT																										On June 2019						



# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Shell Morlina 220 전력 측정 자료 (Amp)

Data **Amp Before** OP Day 22 May – 3 Jun 2018



Actual Motor Operating

: **Average 67.69 A or 82.55%** (100% @ 82A)

Min 66.58 A , Max 69.57 A

Amp Fluctuate from Average

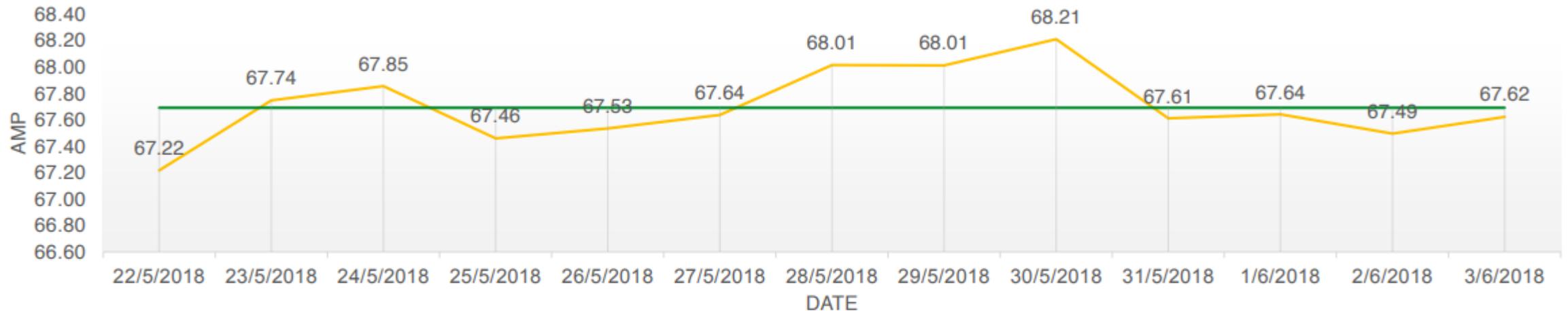
: **4.42%**

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

## Shell Morlina 220 전력 측정 자료 (Amp)

### Data Avg. Amp Before Analysis

CTW#2 Operating Avg Amp 22 May 2018 - 3 Jun 2018 (13 Day)



— Avg Amp — Avg 67.69 Amp

**Average Amp used**

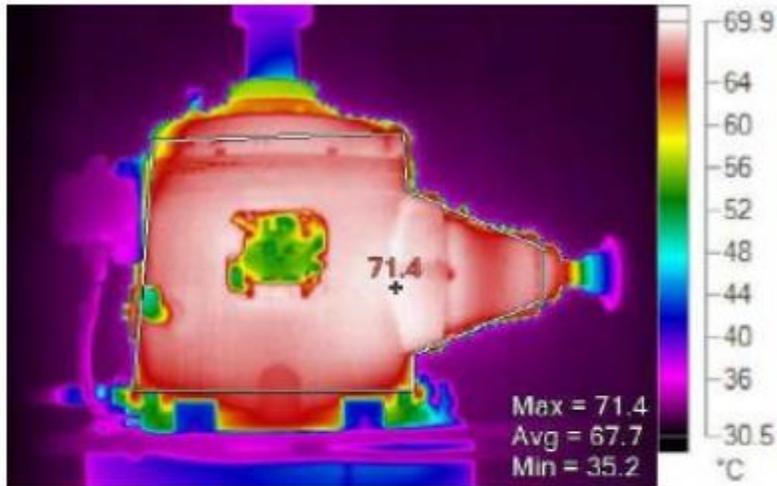
**= 67.69 A**

**Average Power Energy Used (P)**

$= (1.732 \times \text{Amp.} \times \text{Volt} \times \text{Cos } \emptyset) / 1000$   
 $= (1.732 \times \mathbf{67.69 A} \times 400 \text{ V} \times 0.86) / 1000$   
**= 40.33 kW/hr**

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Shell Morlina 220 열화상 카메라

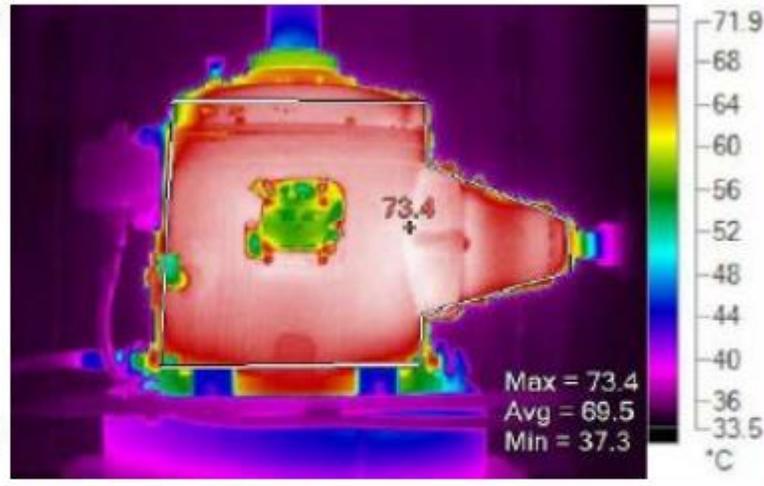


IR\_03896.IS2

4/27/2018 3:22:19 PM

Max. = 71.40°C

Avg. = 67.70°C

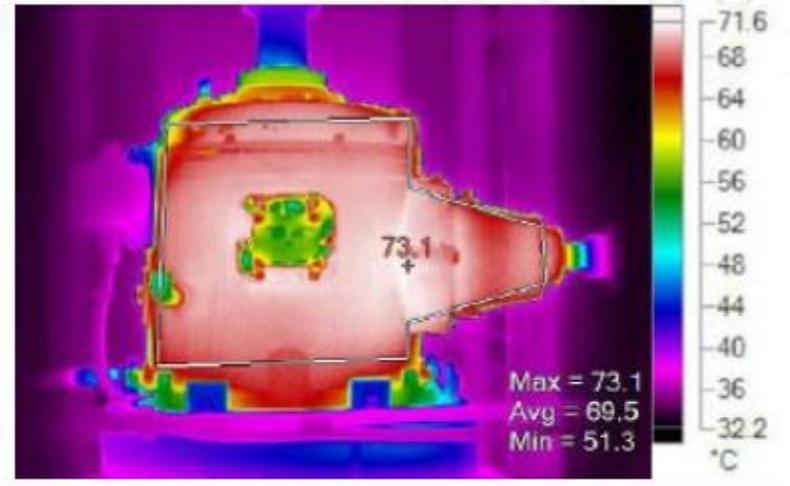


IR\_03998.IS2

5/14/2018 12:16:46 PM

Max. = 73.40°C

Avg. = 69.50°C



IR\_04146.IS2

6/4/2018 9:42:08 AM

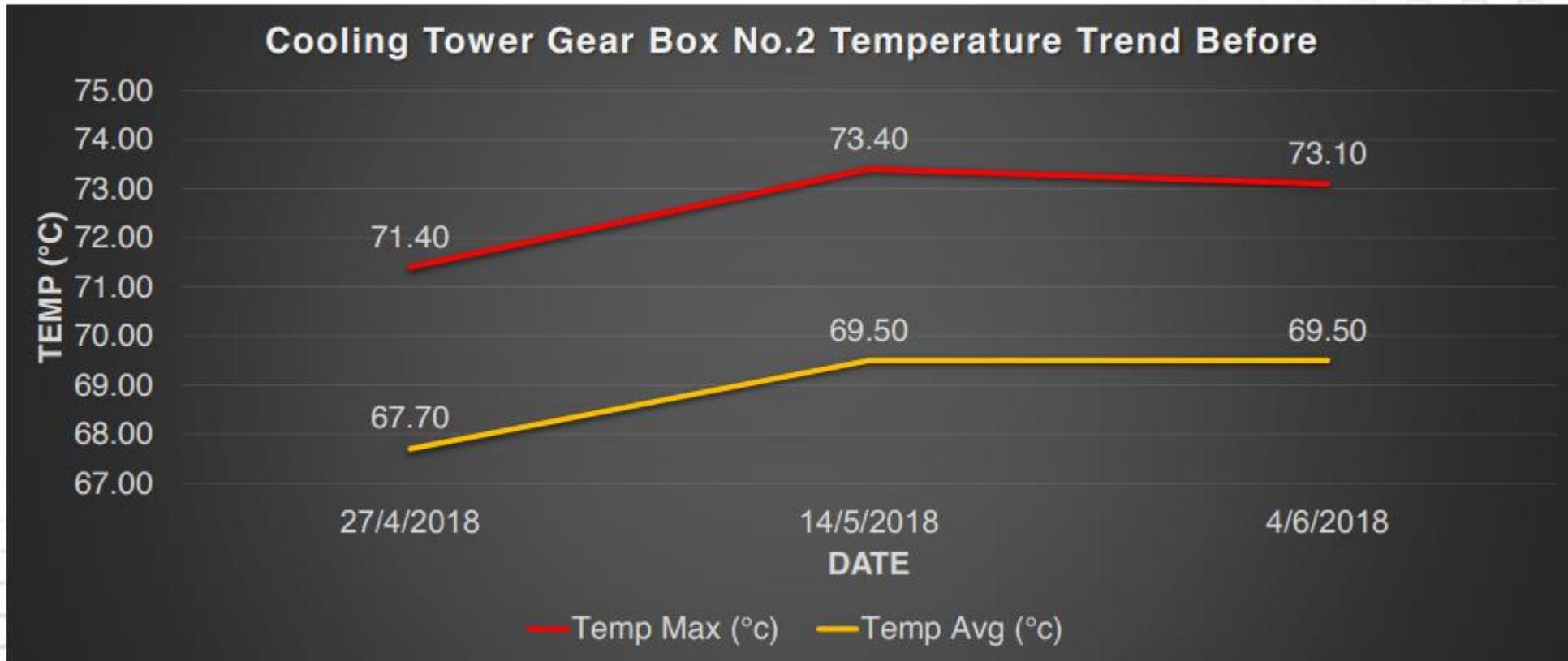
Max. = 73.10°C

Avg. = 69.50°C

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Shell Morlina 220 온도 트렌드 모니터링

**Before** Thermal Image Monitoring



# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

오일 교체 (Shell Morlina 220 → Royal Purple SYNFILM GT 220)

## OILS CHANGEOVER

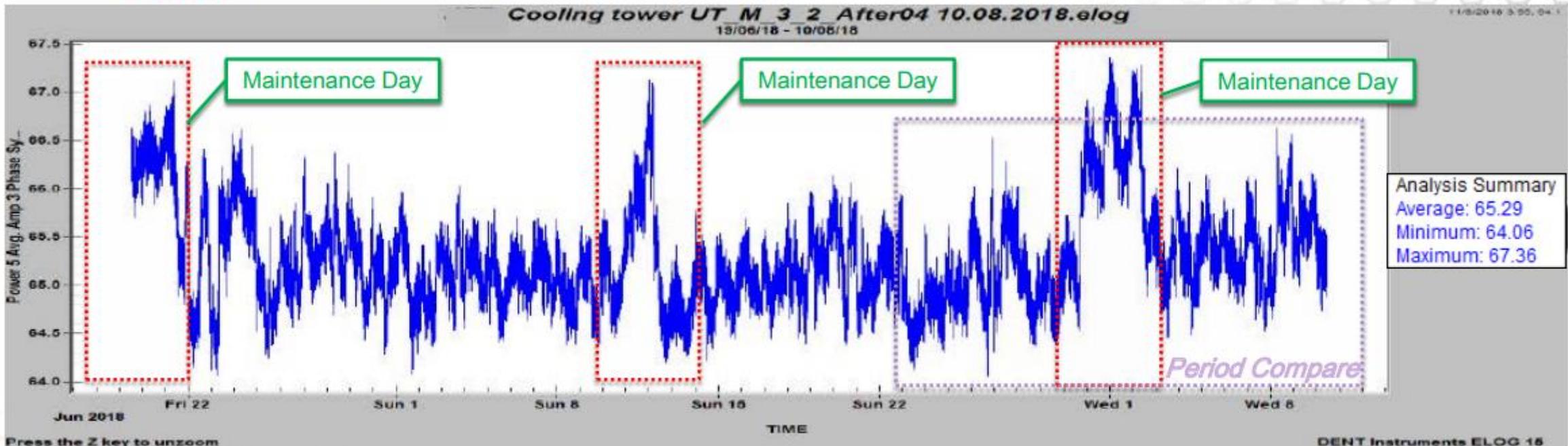
Date **19 June 2018**



# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Royal Purple SYNFILM GT 220 전력 측정값 (Amp)

Data **After** Record Condition



Record Interval	: 1 Minute
Service Oil	: 1 - 1,248 hrs. (1 - 52 day)
Data After Record Since	: 19 Jun 2018 – 10 Aug 2018 (52 Day – 74,794 Data)
Data After Analysis	: <b>24 July 2018</b> – 00.00.00 am to <b>9 Aug 2018</b> – 23.59.59 am (14 Operating Day – 20,159 Data)



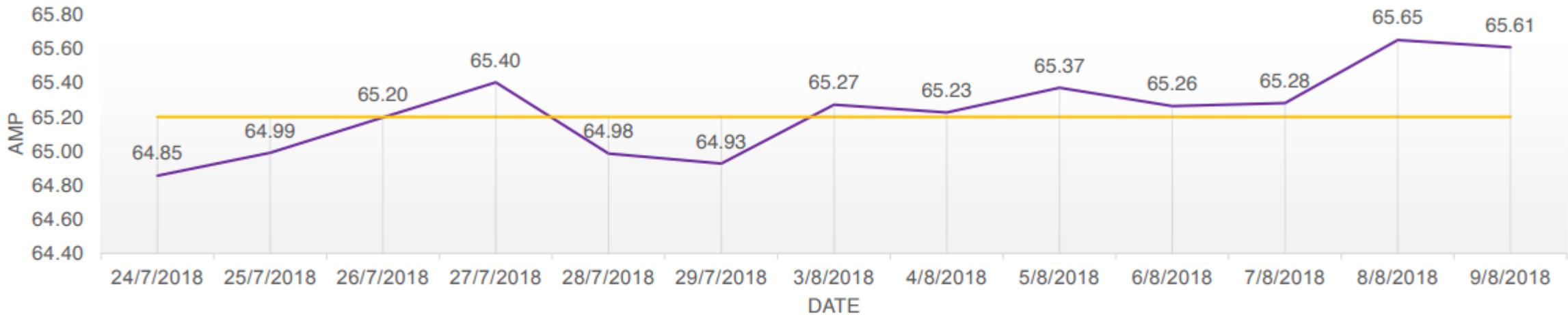
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# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Royal Purple SYNFILM GT 220 전력 측정값

## Data Avg. Amp Before Analysis

CTW#2 Operating Day Avg Amp 23 Jul 2018 - 9 Aug 2018 (14 Day)



— Avg Amp — Avg 65.20 Amp

**Average Amp used**

**= 65.20 A**

**Average Power Energy Used (P)**

$= (1.732 \times \text{Amp.} \times \text{Volt} \times \text{Cos } \emptyset) / 1000$   
 $= (1.732 \times 65.20 \text{ A} \times 400 \text{ V} \times 0.86) / 1000$   
**= 38.85 kW/hr**

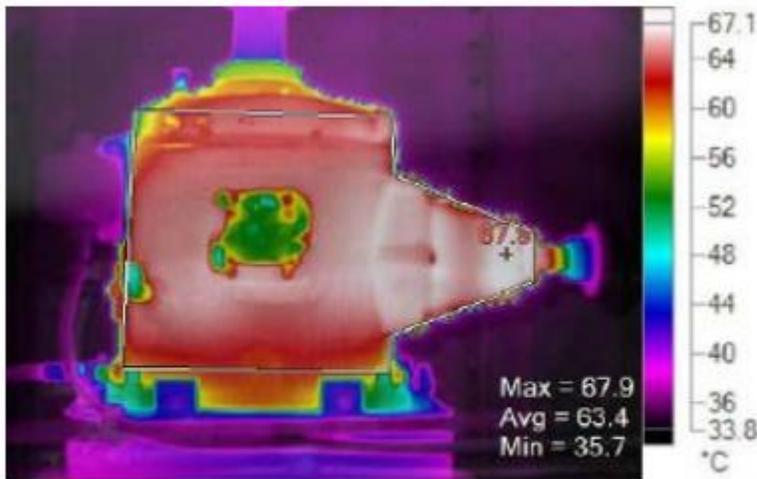


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# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Royal Purple SYNFILM GT 220 열화상 카메라

## After Thermal Image Monitoring

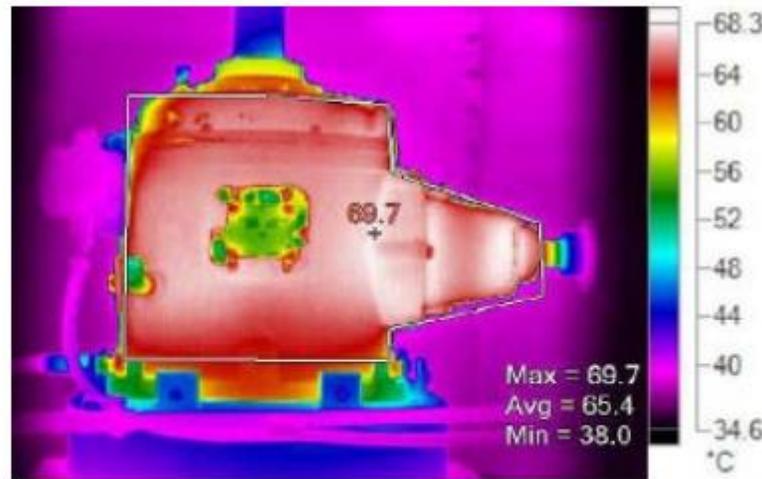


IR\_04554.IS2

6/7/2018 2:45:59 PM

Max. = 67.90°C

Avg. = 63.40°C

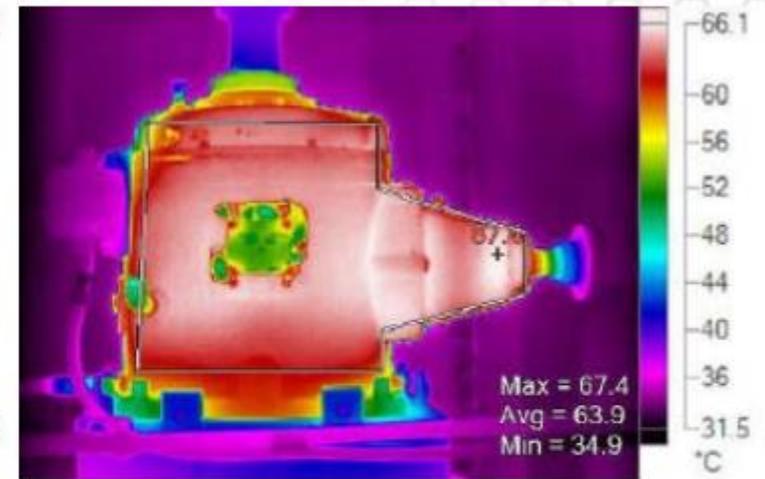


IR\_04657.IS2

23/7/2018 3:02:11 PM

Max. = 69.70°C

Avg. = 65.40°C



IR\_00157.IS2

10/8/2018 10:59:29 AM

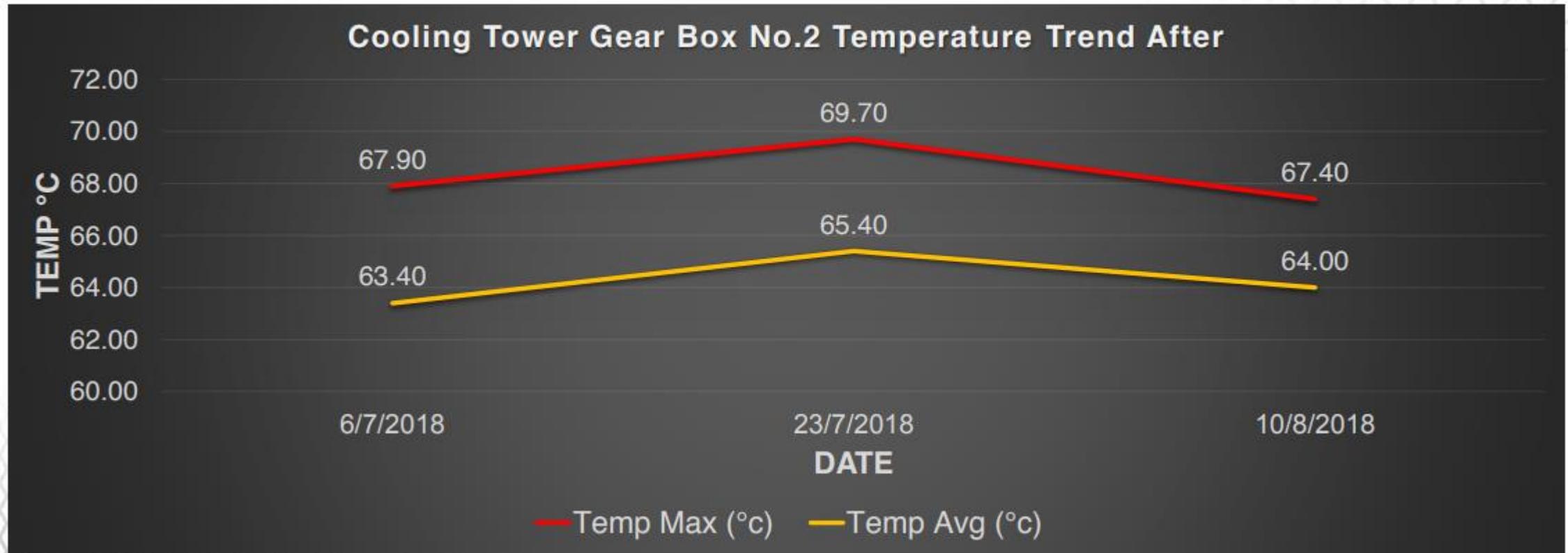
Max. = 67.40°C

Avg. = 64.00°C

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

Royal Purple SYNFILM GT 220 온도 트렌드 모니터링

## After Thermal Image Monitoring



# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

## 전력 측정값 비교 (Shell vs Royal Purple)

### COMPARISONS ANALYSIS

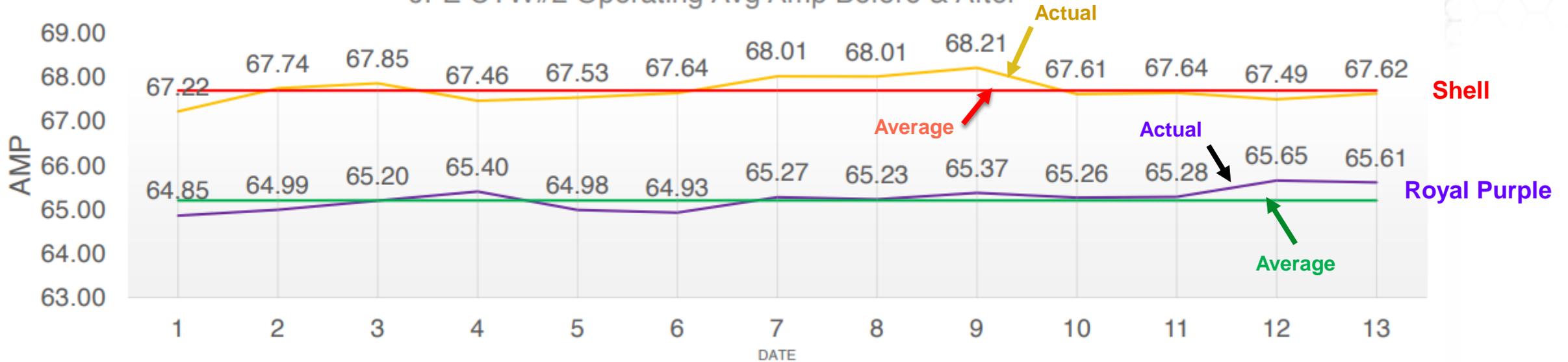
Topic	Before	After	Difference (%)
Time Record	22 May – 3 Jun 2018	24 Jul - 9 Aug 2018	-
Data Quantity	18,719	18,719	-
Oil	Shell Morlina 220	RP Synfilm GT 220	-
Avg. Amp	67.69	65.20	2.49 (- 3.68%)
Avg. Cal. kWh	40.33	38.85	1.48 (- 3.68%)
Avg. Max Operating Temp (°C)	72.63	68.33	4.30 (- 5.92%)
Operating Cost : Cal @ 3.5 THB/Unit			
Hr	141.15	135.97	5.18
Day	3,387.72	3,263.40	124.32
Month	101,631.60	97,902.00	3,729.60
Year	1,219,579.20	1,174,824.00	44,755.20

# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

전력 (Amp) 측정값 비교 (Shell vs Royal Purple)

## COMPARISONS ANALYSIS

JFE CTW#2 Operating Avg Amp Before & After



— Avg Actual Amp Before      — Avg Amp Before 67.69 Amp  
— Avg Actual Amp After        — Avg Amp After 65.20 Amp

**Amp. Reduction 3.68% !!!**



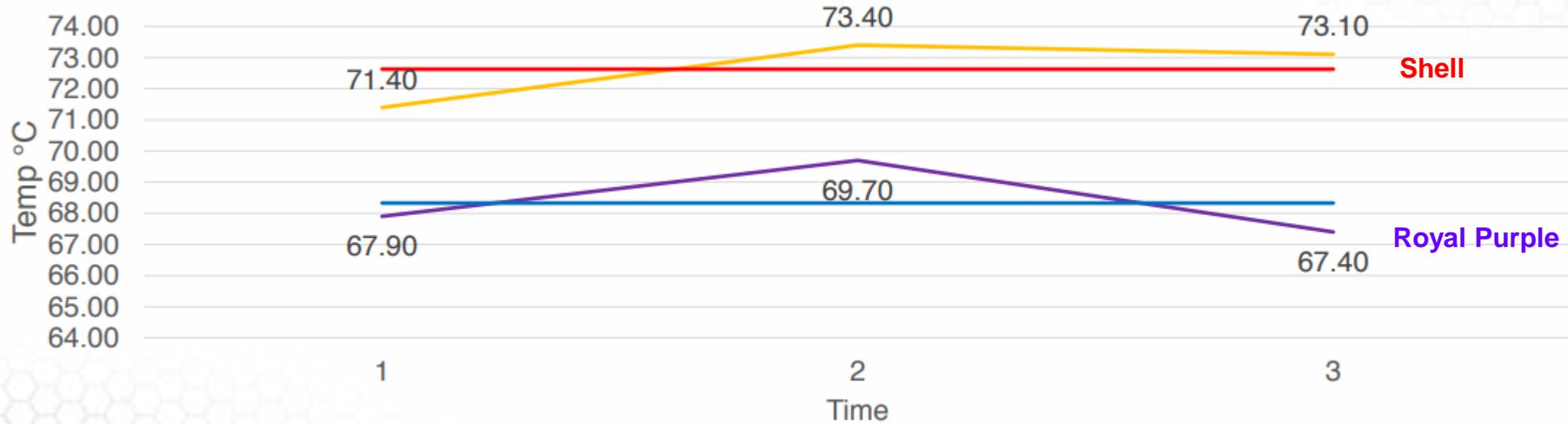
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# RAYONG STEEL, THAILAND (AMARILLO 155 FAN DRIVE)

운전온도 비교

## COMPARISONS ANALYSIS

JFE CTW#2 Operating Avg Temp Max Before & After



— Temp Max Before (°C)      — Temp Max Before Avg (72.63°C)  
— Temp Max After (°C)      — Temp Max After Avg (68.33°C)

**Temp. Reduction 5.92% !!!**



THE PERFORMANCE OIL THAT OUTPERFORMS™



## 미국 전력비 절감 사례 (콤프레서)

**SYNFILM<sup>®</sup> GT with Synerlec<sup>®</sup> Additive Technology**

Note : 전력비 절감액 경우 미국과 국내 전력비 단가가 다르므로 절감율 (%)을 기준으로 계산을 요함.

# 1. Lauter Tun- Anheuser-Busch, USA (맥주공장 설비 감속기)

- 기존 사용유 테스트 일자            2017년 9월 13일
- SYNFILM GT 320 테스트 일자 : 2018년 1월 11일
- 테스트 설비: Lauter Tun #3. 480V 연결 (전류 및 전압을 측정)

LUBRICANT: **Mobil 600 XP 220 (광유)**    LUBRICANT: **Royal Purple Synfilm GT 320**

APPLIED: Reservoir

RESULTS:

Mobil 600Xp 220

Royal Purple Synfilm GT

KILOWATT HOURS

18.74 kwh

17.29 kwh (**8.4% Reduction**)

KILOWATT HOURS/Month

305.6 kwh

282 kwh

COST Elapsed @ \$0.07/KWH

\$0.03

\$0.01

COST PER MONTH@ \$0.07/KWH

\$21.56

\$19.74

ANNUAL COST

\$258.72

\$236.88

**SAVINGS with SYNFILM GT 320**

**\$1.82 per month**  
**\$21.84 per year**

ANHEUSER-BUSCH  
ST. LOUIS, MISSOURI  
LAUTER TUN #3



1 Busch Place  
St. Louis, Missouri 63118



THE PERFORMANCE OIL THAT OUTPERFORMS™

## 2. SULLAIR 3700 COMPRESSOR- AGCO CORP. USA (농기계 제조사)

- 기존 사용유 테스트 일자            2018년 7월 18일
- SYNFILM GT 32 테스트 일자 :    2018년 8월 29일
- 테스트 설비: Sullair 3700 Compressor / Set as Primary Compressor (Base Load)  
480V 연결 (전류 및 전압을 측정)

LUBRICANT: **Sull-lub PAG 32(합성유)**    LUBRICANT: **Royal Purple SYNFILM GT 32**

APPLIED:        Reservoir

RESULTS:

Sull-lub PAG 32

Royal Purple Synfilm GT

KILOWATT HOURS	54.4 kwh	52.9 kwh <b>(2.5% Reduction)</b>
KILOWATT HOURS/Month	24,783.2 kwh	24,170.5 kwh
COST Elapsed @ \$0.05/KWH	\$1.27	\$0.97
COST PER MONTH@ \$0.05/KWH	\$1,734.83	\$1,691.93
ANNUAL COST	\$20,817.96	\$20,303.16
<b>SAVINGS with ENERGY EFFICIENT LUBRICANTS</b>		<b>\$42.90 per month</b> <b>\$514.80 per year</b>

ENERGY AUDIT  
SULLAIR 3700 COMPRESSOR



**AGCO CORP**  
420 w. Lincoln Blvd  
Hesston, KS 67062



THE PERFORMANCE OIL THAT OUTPERFORMS™

### 3. SULLAIR LS-25 COMPRESSOR- CNH, USA (건설기계 제조사)

- 기존 사용유 테스트 일자 2020년 2월 24일
- SYNFILM GT 32 테스트 일자 2020년 10월 14일
- 테스트 설비: Sullair LS-25 Compressor No.3 / 480V 연결 (전류 및 전압을 측정)



Case New Holland  
3301 S. Hoover Road  
Wichita, KS 67215

LUBRICANT: **Sullube Oil 32 (합성유)**  
APPLIED: Compressor  
RESULTS:

LUBRICANT: **Royal Purple Synfilm GT 32**

KILOWATT HOURS

**81.58 kwh**

Royal Purple SYNFILM GT 32

**71.79 kwh (12.0% Reduction)**

KILOWATT HOURS/Month

59,550 kwh

52,404 kwh

COST Elapsed @ \$0.05/KWH

\$1.74

\$1.53

COST PER MONTH @ \$0.05/KWH

\$2,978.00

\$2,620.64

ANNUAL COST

\$35,736.00 \$31,447.68

**SAVINGS with ENERGY EFFICIENT LUBRICANTS**

**\$357.36 per month**

**\$4,288.32 per year**



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# 4. KAESER DS 201 COMPRESSOR- J.B.SIMS (ATLAS). USA (발전소)

- 기존 사용유 테스트 일자: 2016년 7월 11일
- SYNFILM GT 46 테스트 일자: 2016년 8월 29일
- 테스트 설비: Kaeser DS 201 Compressor / 480V 연결 (전류 및 전압을 측정)

LUBRICANT: **Chemlube 228 (합성유)**

LUBRICANT: **Royal Purple SYNFILM GT 46**

APPLIED: Reservoir

RESULTS:

Chemlube 228

Royal Purple SYNFILM GT 46

KILOWATT HOURS

130.9 kwh

108.7 kwh (16.3% Reduction)

KILOWATT HOURS/Month

95,775.9 kwh

80,164.1 kwh

COST Elapsed @ \$0.0525/KWH

\$4.24

\$4.03

COST PER MONTH @ \$0.0525/KWH

\$4,788.79

\$4,008.20

ANNUAL COST

\$57,465.48

\$48,098.40

**SAVINGS with ENERGY EFFICIENT LUBRICANTS**

**\$780.59 per month**

**\$9,367.08 per year**

SULLAIR 7500  
COMPRESSOR AUDIT



The Atlas Group  
Wichita, KS



THE PERFORMANCE OIL THAT OUTPERFORMS™

# 5. KAESER CSD 100 COMPRESSOR- LACKS, USA (자동차부품 도금회사)

- 기존 사용유 테스트 일자 2018년 3월 22일
- SYNFILM GT 46 테스트 일자 2018년 8월 16일
- 테스트 설비: Kaeser CSD 100 Compressor / 480V 연결 (전류 및 전압을 측정)

LUBRICANT: **Chemlube 228 (합성유)**  
 APPLIED: Compressor  
 RESULTS:

LUBRICANT: **Royal Purple SYNFILM GT 46**

Chemlube 228

Royal Purple SYNFILM GT 46

KILOWATT HOURS	15.132 kwh
KILOWATT HOURS/Month	55,783.4 kwh
COST Elapsed @ \$0.07/KWH	\$1.06
COST PER MONTH@ \$0.07/KWH	\$4,137.43
ANNUAL COST	\$49,649.16

12.062 kwh <b>(21% Reduction)</b>
46,102.6 kwh
\$1.03
\$3,264.67
\$39,176.04

**SAVINGS with ENERGY EFFICIENT LUBRICANTS**

**\$872.76 per month**  
**\$10,473.12 per year**

## ENERGY SAVINGS ON A KAESER COMPRESSOR



LACKS-Barden Facility  
 4090 Barden S.E.  
 Kentwood, MI 49512



THE PERFORMANCE OIL THAT OUTPERFORMS™



승인서 및 추천서 (콤프레서)

Approval & Recommendation Letter

# OEM 승인서 (OEM APPROVAL)

Atlas Copco, RENOX, CORKEN, ....

**Atlas Copco**  
 August 18, 1998

Mr. John Williams  
 Royal Purple Inc  
 2006 Wilson Road  
 Humble, TX 77396

Subject: Atlas Copco Compressor Warranty

Dear Mr. Williams:

Please be advised that the Atlas Copco Compressor warranty will not be voided if Royal Purple Poly-Guard and Royal Purple Synfilm each meet the required ISO VG viscosity specification and are in full conformance with ISO Standard 3448.

This letter is not to be used to authorize Royal Purple to advertise the above-mentioned oils as "Approved by Atlas Copco"

Very truly yours,  
*Neshan Dagilan*  
 Neshan Dagilan

cc: D. Prator  
 P. Rowlands  
 W. Lytle  
 P. Callow

Atlas Copco Compressors Inc.  
 Atlas Copco Compressors Inc. Via della Industria 12  
 P.O. Box 431 181 Lower Westfield Rd.  
 Holyoke, MA 01041-0431 Holyoke, MA 01040-2220  
 Telephone: 413/536-0600  
 Telex: 410350-0091

**RENOX**  
 RENOX di Prati A. & C. snc  
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**FAX**

Di: Royal Purple  
 AIT: DAVID CANITZ/FRED KNEIPP Da: Alexander Priori  
 Tel.: 001/281 4461000 Tel.: 071/7926418  
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 Data: 12/11/99 Page:

**OGGETTO: OEM APPROVED OIL FOR SIAD GAS COMPRESSORS**

David & Fred,

I just received today the approval for the use of Royal Purple Synfilm Recept. 100 in Siad Gas Compressors. They in fact sent me the updated compressor manual with the Synfilm on their list of approved oils. You will see a Note that states that Siad has tested the Synfilm Oil and has found that by using this oil you can have a energy reduction of 3%, you will also see that Synfilm is the only synthetic oil listed. I am very pleased with this result and will use this to get into other companies and Siad Compressor end users. You may show this to companies such as union carbide or Praxair since Siad is part of that group of companies.

ALEX PRIORI  
*Alex Priori*

Part. IVA 01947800403 - C.C.I.A.A. AN n. 125202 - ISO T&D AN n. 22026

## CORKEN

CORKEN, INC.  
 A Unit of IDEX Corporation  
 3805 NW 36th Street  
 Oklahoma City, OK, 73112  
 www.corken.com

**Corken Crankcase Oil Recommendations (except ammonia service)**

Normal Service							
Ambient Temperature <sup>1</sup>		Oil Product	Oil Type <sup>2</sup>	Viscosity <sup>3</sup> ISO	Viscosity Index <sup>3</sup>	Pour Point <sup>4</sup>	
Degrees F°	Degrees C°					Degrees F°	Degrees C°
40 to 100 F	4 to 38 C	Mobil DTE 10 Excel 100	C	100	127	-27 F	-33 C
		Mobil Rarus 427	C	100	100	16 F	-9 C
		Phillips 66 Gas Compressor Oil	C	100	102	-20 F	-29 C
		Chevron Regal R&O	C	100	97	5 F	-15 C
		Sunoco Sunvis 900	C	100	95	-15 F	-26 C
10 to 65 F	-12 to 18 C	Mobil DTE 10 Excel 68	C	68	156	-38 F	-39 C
		Mobil DTE Heavy Medium	C	68	95	5 F	-15 C
		Phillips 66 Premium Gas Compressor Oil	B	68	133	-27 F	-33 C
		Chevron Regal R&O	C	68	99	-11 F	-24 C
		Sunoco Sunvis 900	C	68	104	-21 F	-29 C
Heavy Service							
10 to 100 F	-12 to 38 C	Mobil SHC 627 <sup>4</sup>	S	100	162	-49 F	-45 C
		Royal Purple Synfilm NGL 100	S	100	130	-44 F	-42 C
		Dyna-Plex 21C Synzol CO ISO 100	S	100	132	-49 F	-45 C
-20 to 90 F	-29 to 32 C	Mobil SHC 626 <sup>4</sup>	S	68	165	-59 F	-51 C
		Royal Purple Synfilm NGL 68	S	68	132	-60 C	-76 F

**Corken Crankcase Oil Recommendations - Ammonia Service Only**

Normal Service							
Ambient Temperature <sup>1</sup>		Oil Product	Oil Type <sup>2</sup>	Viscosity <sup>3</sup> ISO	Viscosity Index <sup>3</sup>	Pour Point <sup>4</sup>	
Degrees F°	Degrees C°					Degrees F°	Degrees C°
40 to 100 F	4 to 38 C	Mobil Rarus 427	C	100	100	16 F	-9 C
		Phillips 66 Ammonia Compressor Oil	C	68	102	-27 F	-33 C
10 to 65 F	-12 to 18 C	Chevron Capella P68	C	68	96	-44 F	-42 C
		Mobil Rarus 426	C	68	105	16 F	-9 C
Heavy Service							
10 to 100 F	-12 to 38 C	Mobil Gargyle Arctic SHC 228 <sup>4</sup>	S	100	147	-43 F	-45 C
		Royal Purple Uni-Temp 100	S	100	124	-53 F	-47 C
		Mobil Gargyle Arctic SHC 226E <sup>4</sup>	S	68	136	-58 F	-50 C
-20 to 90 F	-29 to 32 C	Royal Purple Uni-Temp 68	S	68	118	-51 F	-46 C

NOTES:  
 1 Consult Corken for Oil Recommendations in very hot climates - Ambient temperatures consistently above 100°F (38°C)  
 2 Oil Type: C = Conventional, S = Synthetic, B = Conventional/Synthetic Blend  
 3 Information available from oil manufacturers at the time of publication  
 4 Mobil SHC oils are synthetic oils which require that the crankcase be flushed of residual mineral oil



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## 로얄퍼플 고객사 Reference List

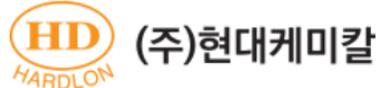
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한화솔루션



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감사합니다. Thank you.

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