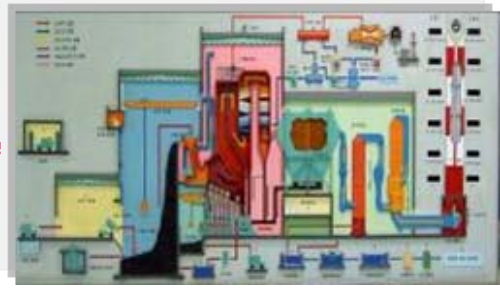
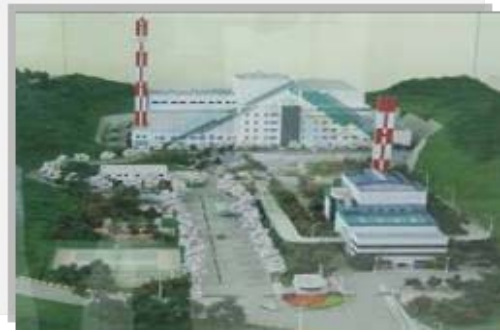


N5000 MV Inverter Case Studies



CONTENTS

- ▶ Case 1
 - SA Fan for Generator Boiler System
- ▶ Case 2
 - M-G Set Test Facility
- ▶ Case 3, 4
 - ID Fan

N5000 Case 1

1. Inverter

- Place : Korea East West Power Co., Ltd.
- Voltage & Capacity : 6600V, 1000KVA
- Q'ty : 2 sets
- Date : 2006. 02(1set), 2006. 06(1set)

2. Motor

- Voltage & Output : 6600V, 750KW

3. Application

- SA Fan



Application
1.SAF(SECONDARY AIR FAN)

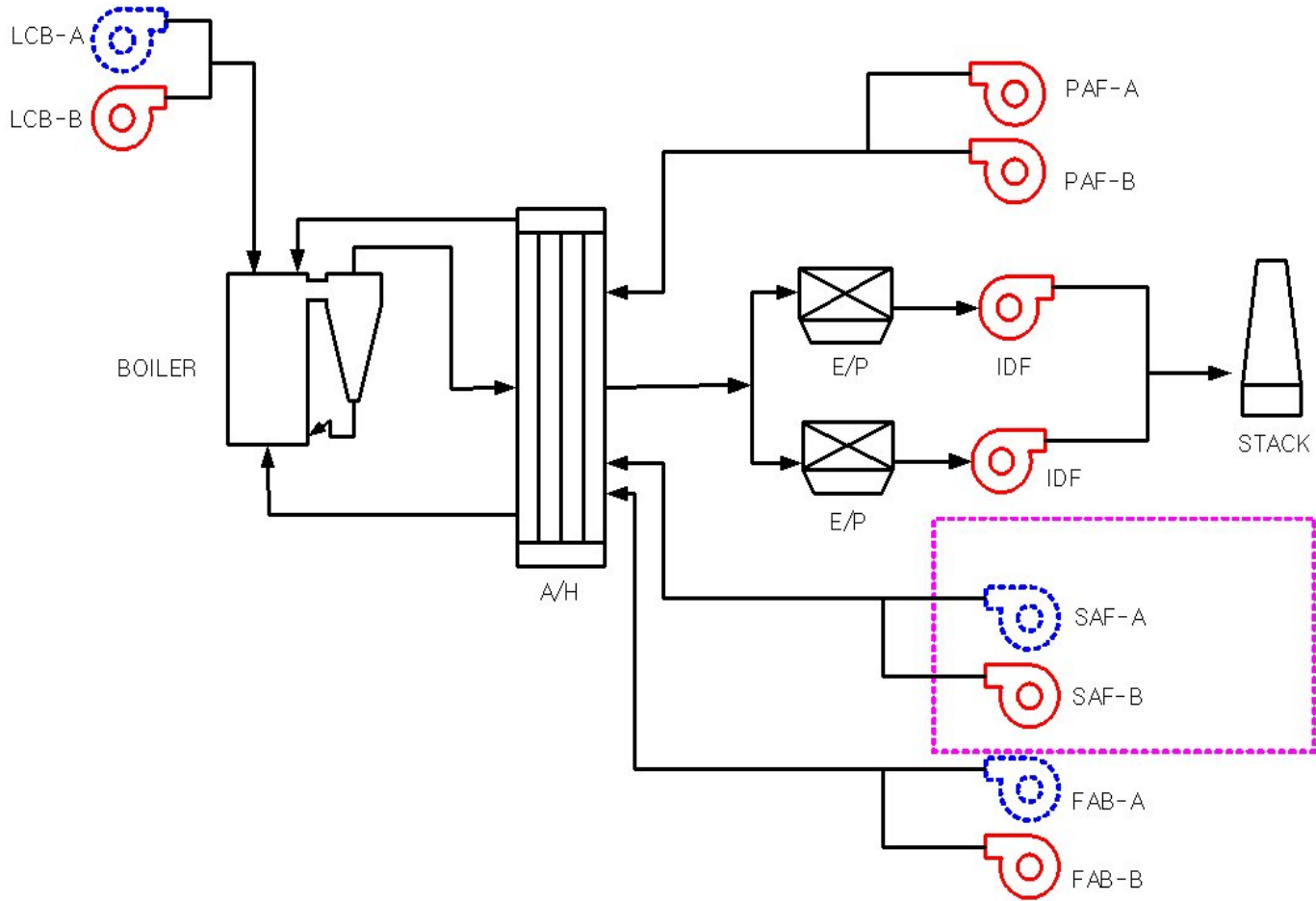


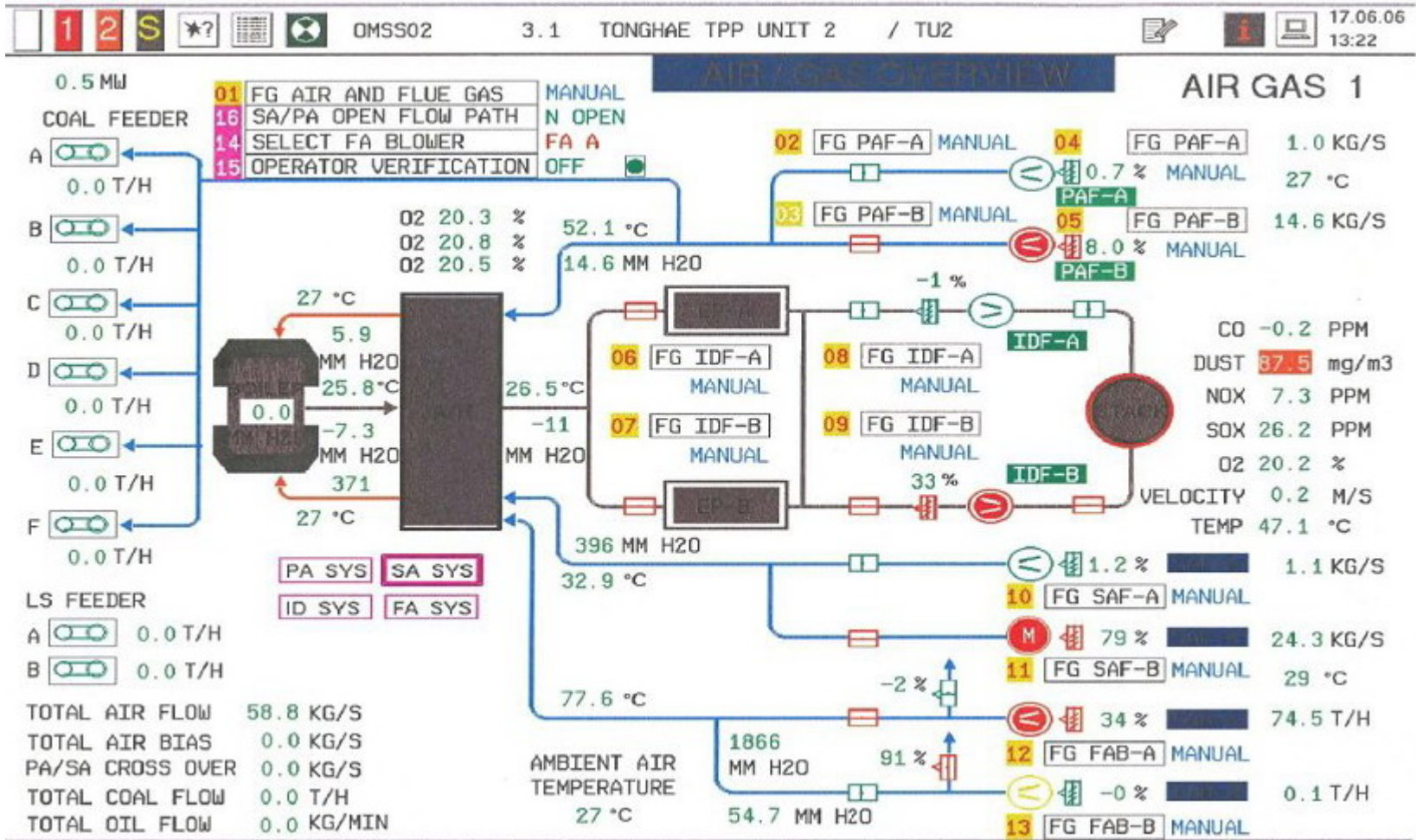
2. Motor

- Voltage : 6600V
- Capacity : 750KW
- Current : 79.4A / 4pole



SAF(Secondary Air Fan)







3. Inverter

- Voltage : 6.6KV
- Capacity : 1000KVA





Inverter Input VCB



Inverter / Bypass & Output VCS





CTPT감시반 *HiRUN-N5000*

3상 입력전압		3상 출력전압		3상 출력전류	
U_R	6964 U	U_U	5169 U	I_U	31 A
U_S	7893 U	U_U	5169 U	I_U	31 A
U_T	7828 U	U_W	5169 U	I_W	38 A

CELL감시반 *HiRUN-N5000*

U_U1	826 U	U_U1	829 U	U_W1	829 U
U_U2	844 U	U_U2	843 U	U_W2	851 U
U_U3	837 U	U_U3	837 U	U_W3	844 U
U_U4	847 U	U_U4	847 U	U_W4	849 U
U_U5	838 U	U_U5	838 U	U_W5	824 U
U_U6	839 U	U_U6	839 U	U_W6	838 U

운전조작반 *HiRUN-N5000*

출력주파수 47.1 Hz MASTER 경고 해제 고장 해제

운전 상태 FWD

전동기속도 1412 RPM

지령주파수 F01 47.1 Hz 방향 설정 F04 1 FWD

가속 시간 F02 88 Sec 감속 시간 F03 88 Sec

1) Output coupling test in DCS

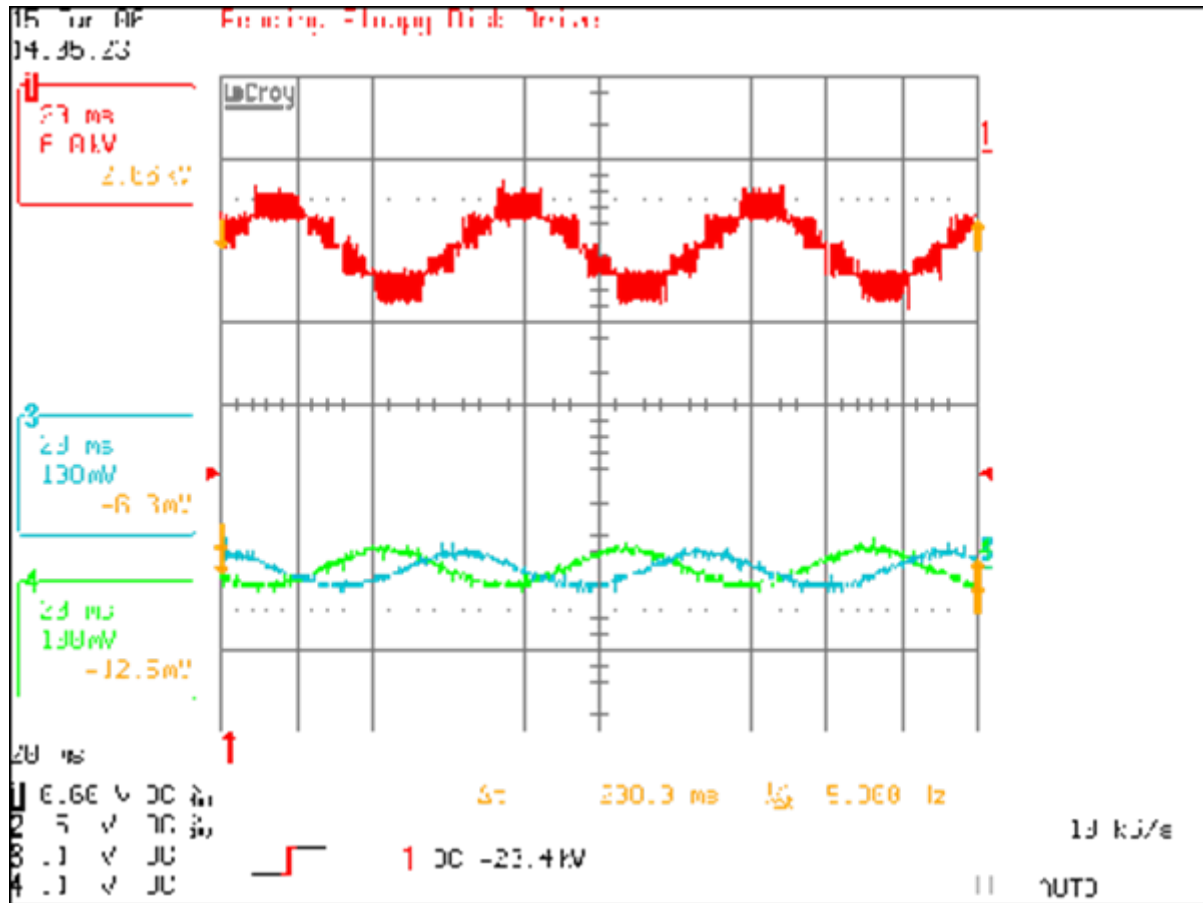


Fig 1. Vane 80% open, 10% setting

2) Output coupling test in DCS

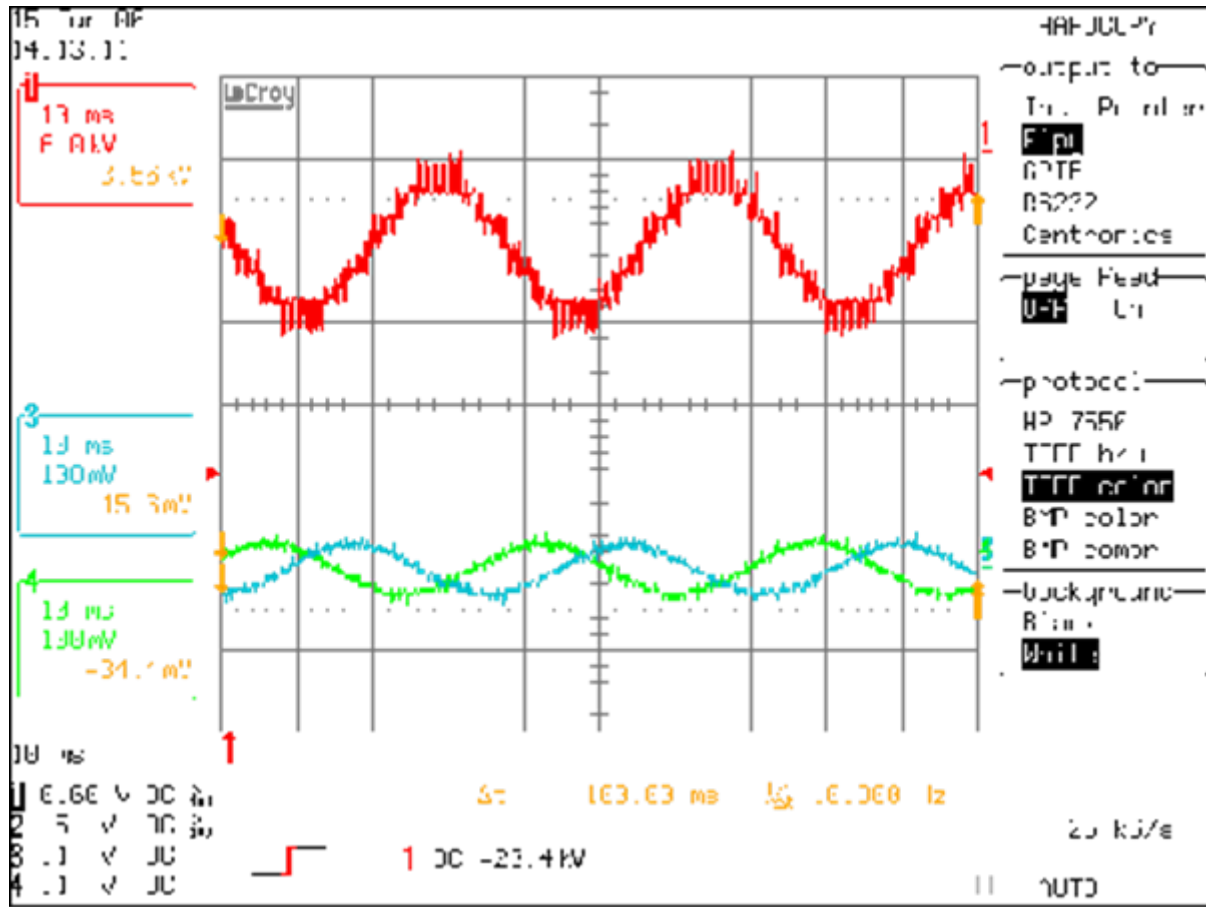


Fig 2. Vane 80% open, 20% setting

3) Output coupling test in DCS

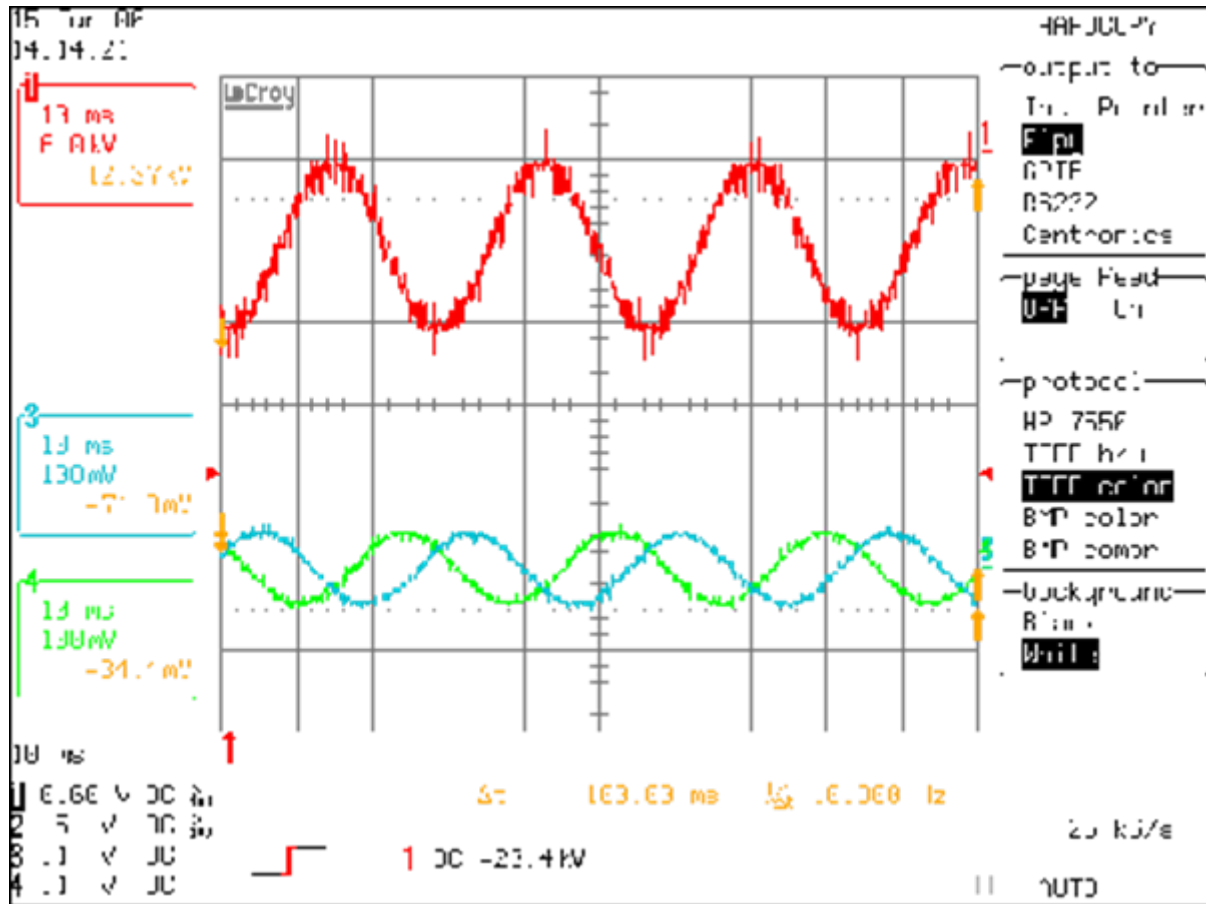


Fig 3. Vane 80% open, 30% setting

4) Output coupling test in DCS

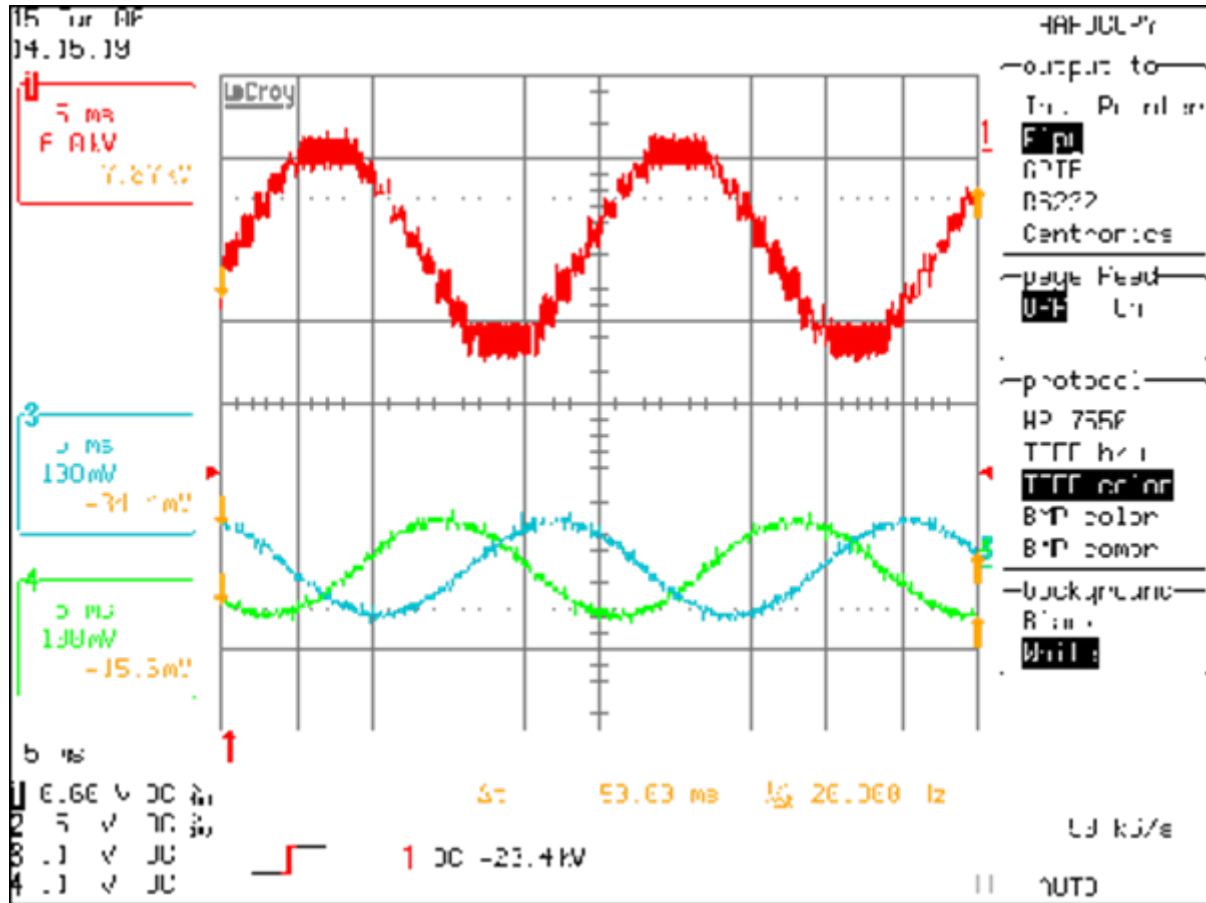


Fig 4. Vane 80% open, 40% setting

5) Output coupling test in DCS

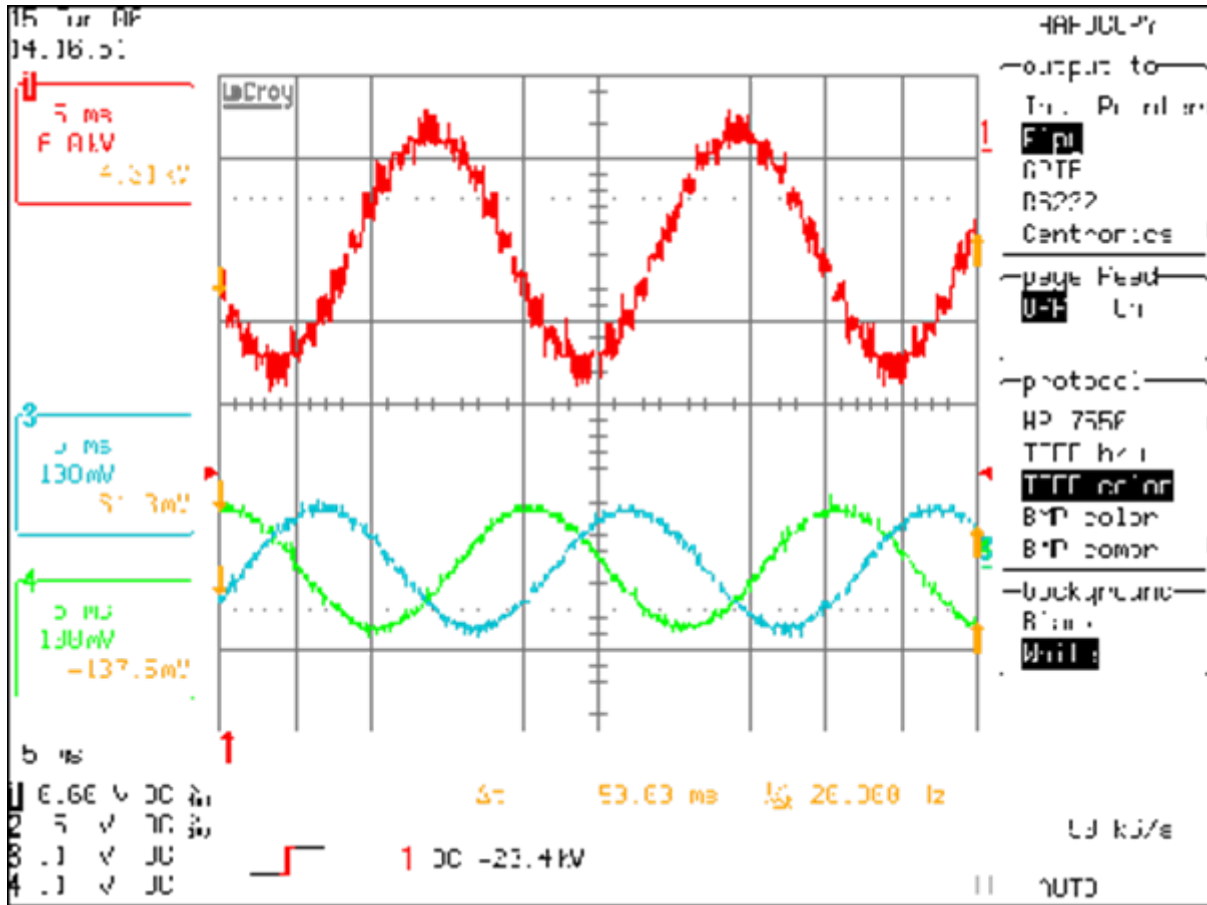


Fig 5. Vane 80% open, 50% setting

6) Output coupling test in DCS

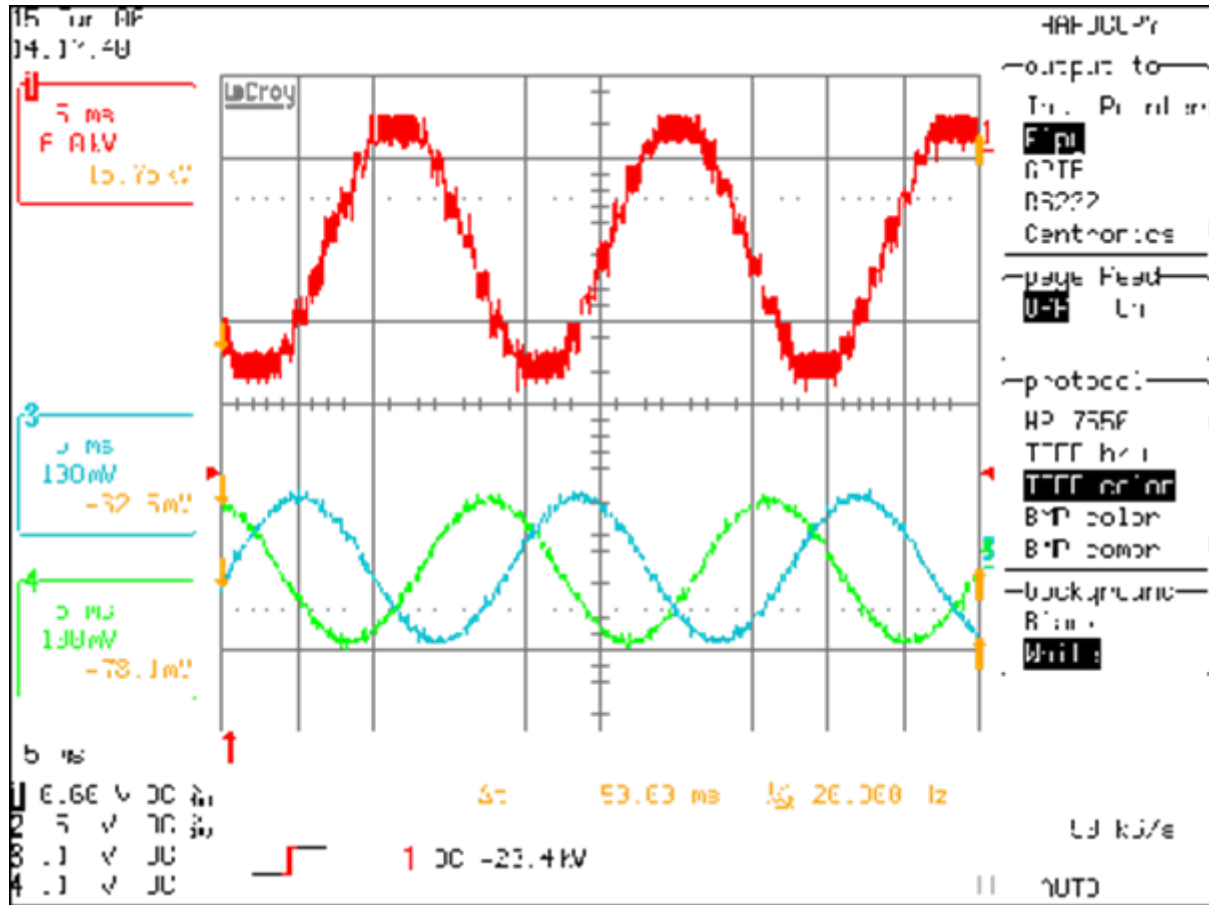


Fig 6. Vane 80% open, 60% setting

7) Output coupling test in DCS

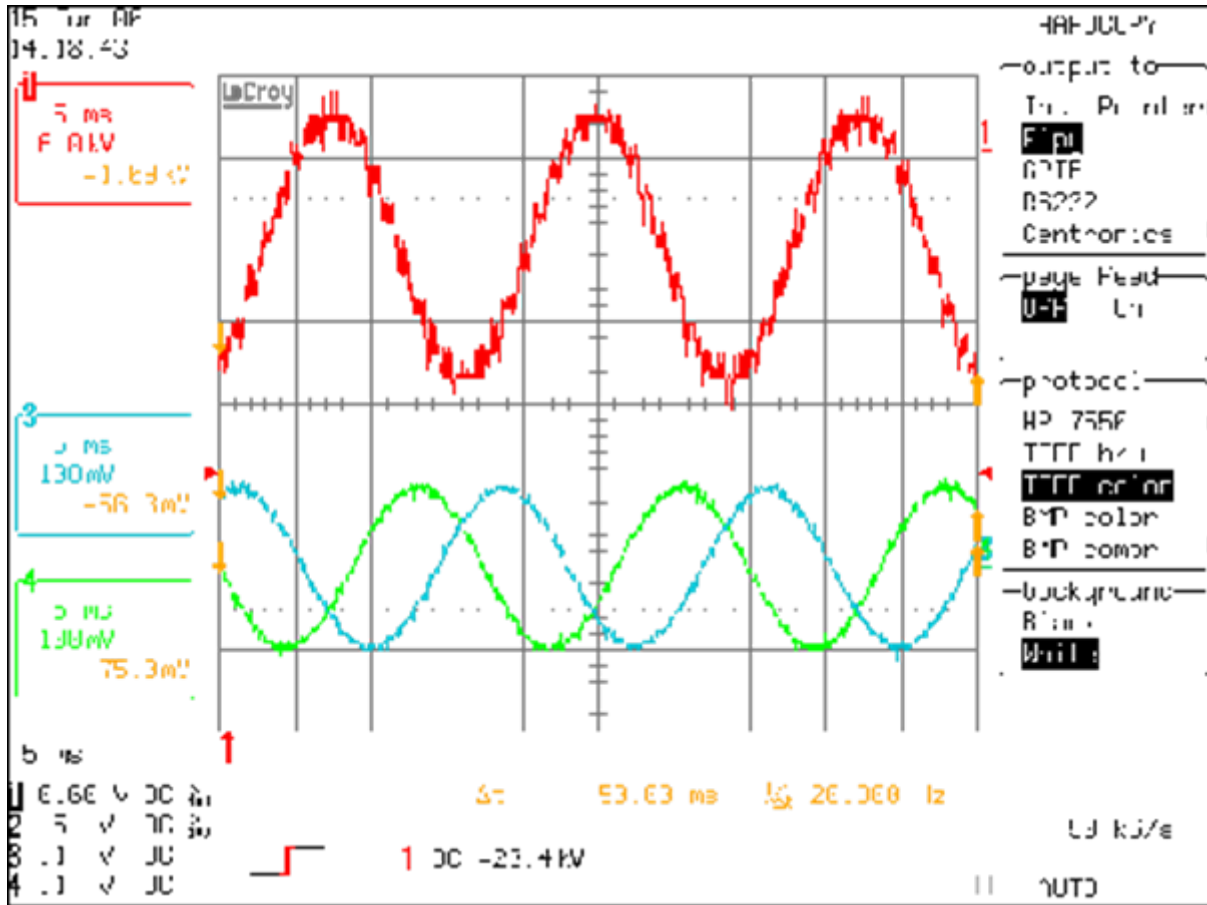


Fig 7. Vane 80% open, 70% setting

8) Output coupling test in DCS

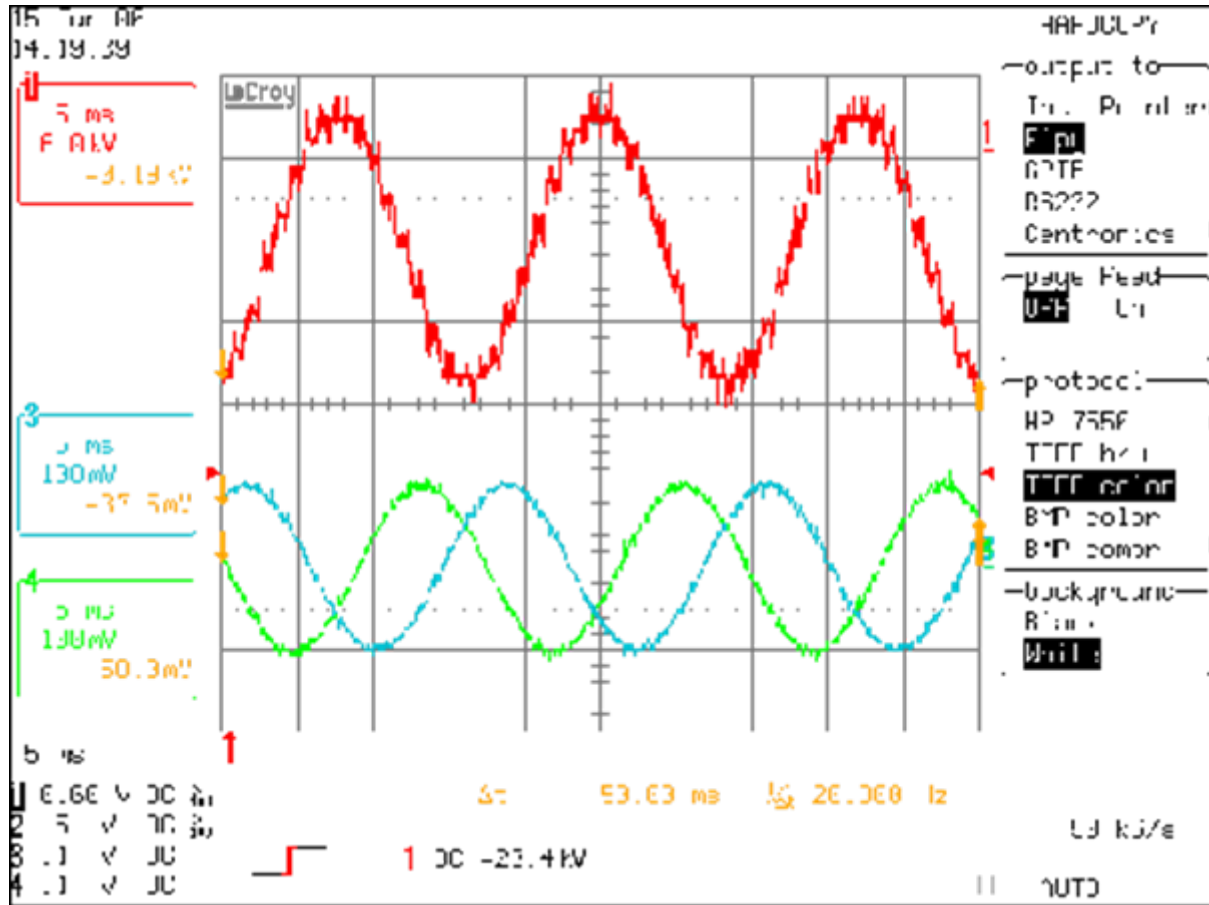


Fig 8. Vane 80% open, 80% setting

9) Output coupling test in DCS

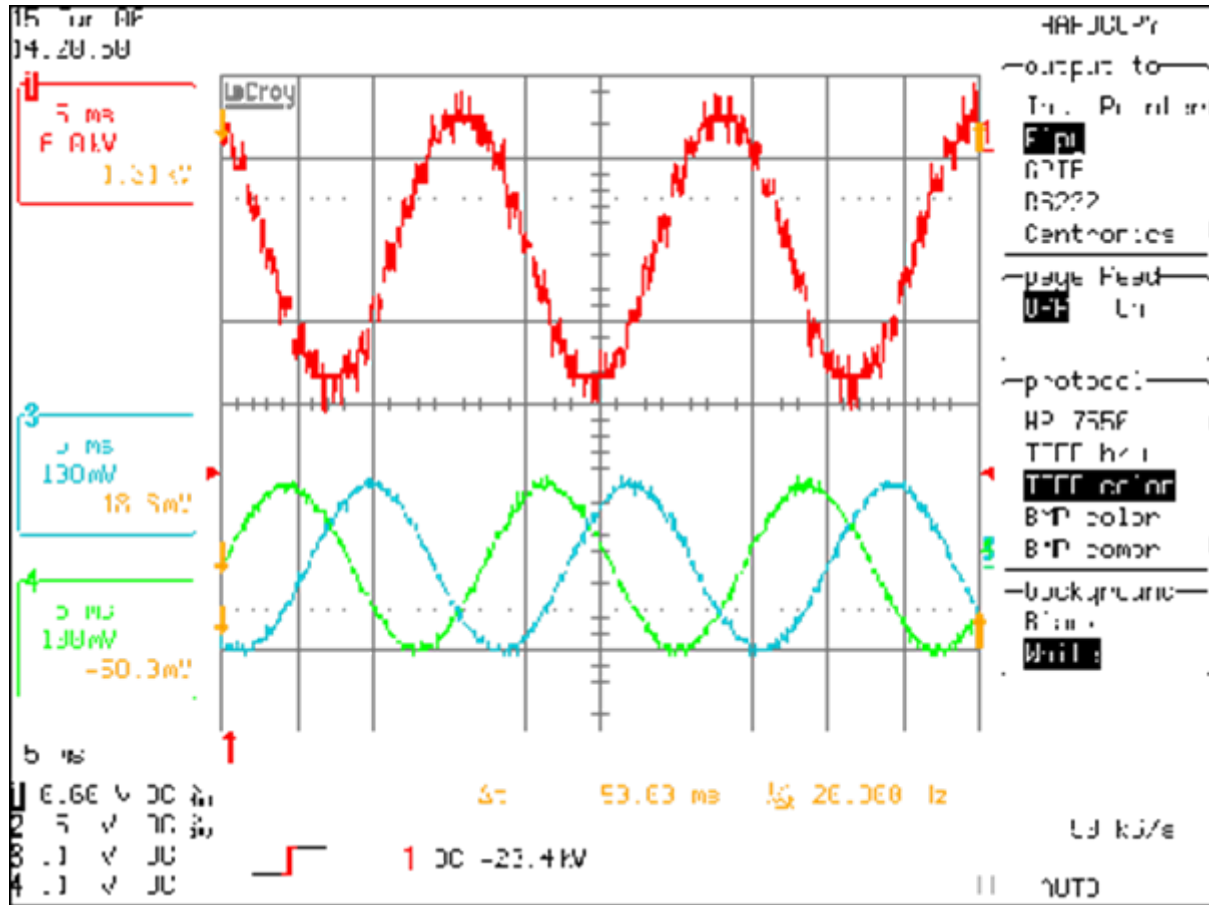


Fig 9. Vane 80% open, 90% setting

10) Output coupling test in DCS

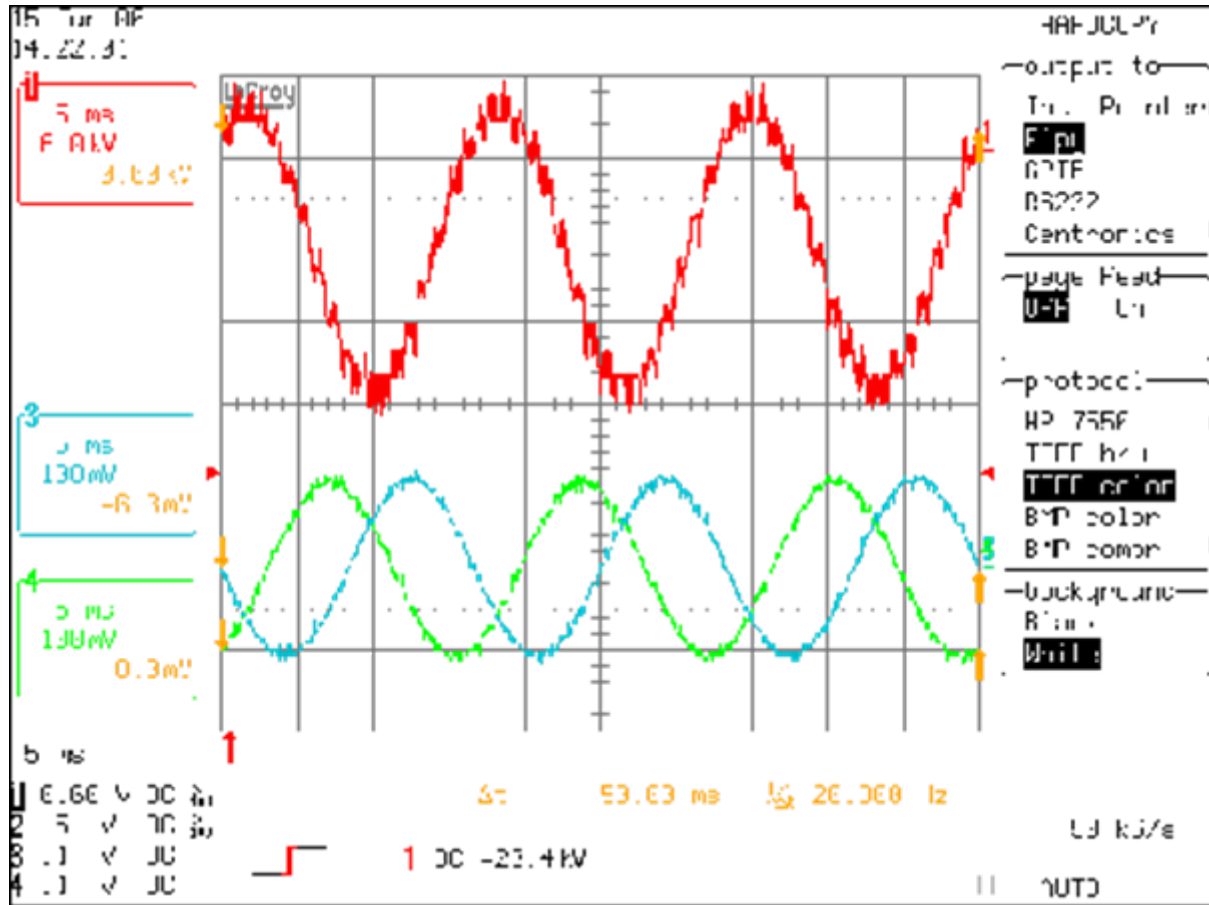


Fig 10. Vane 80% open, 100% setting

11) Acc/Dec Time Test

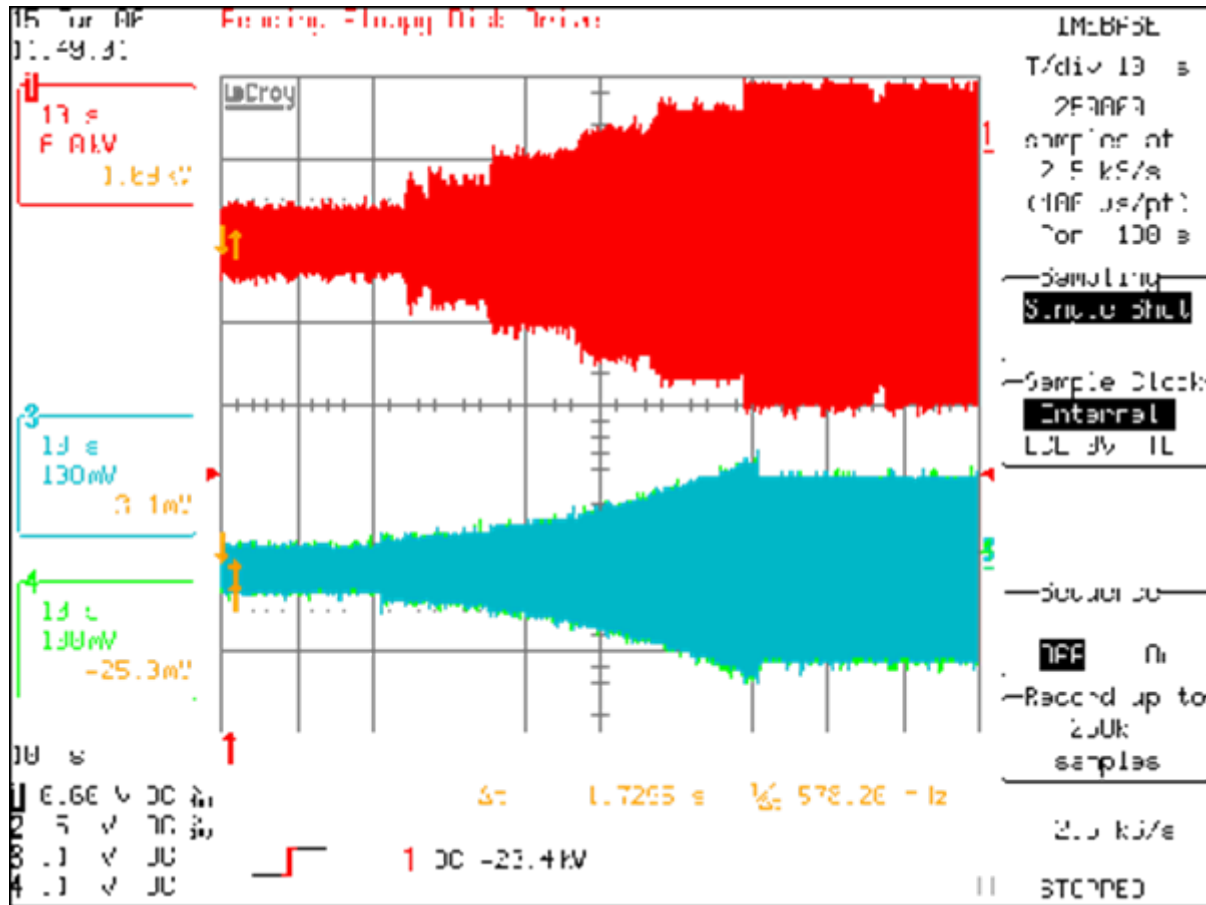


Fig 11. 60[sec] Acc.(from 20[Hz] to 60[Hz], Fan is connecting)

12) Acc/Dec Time Test

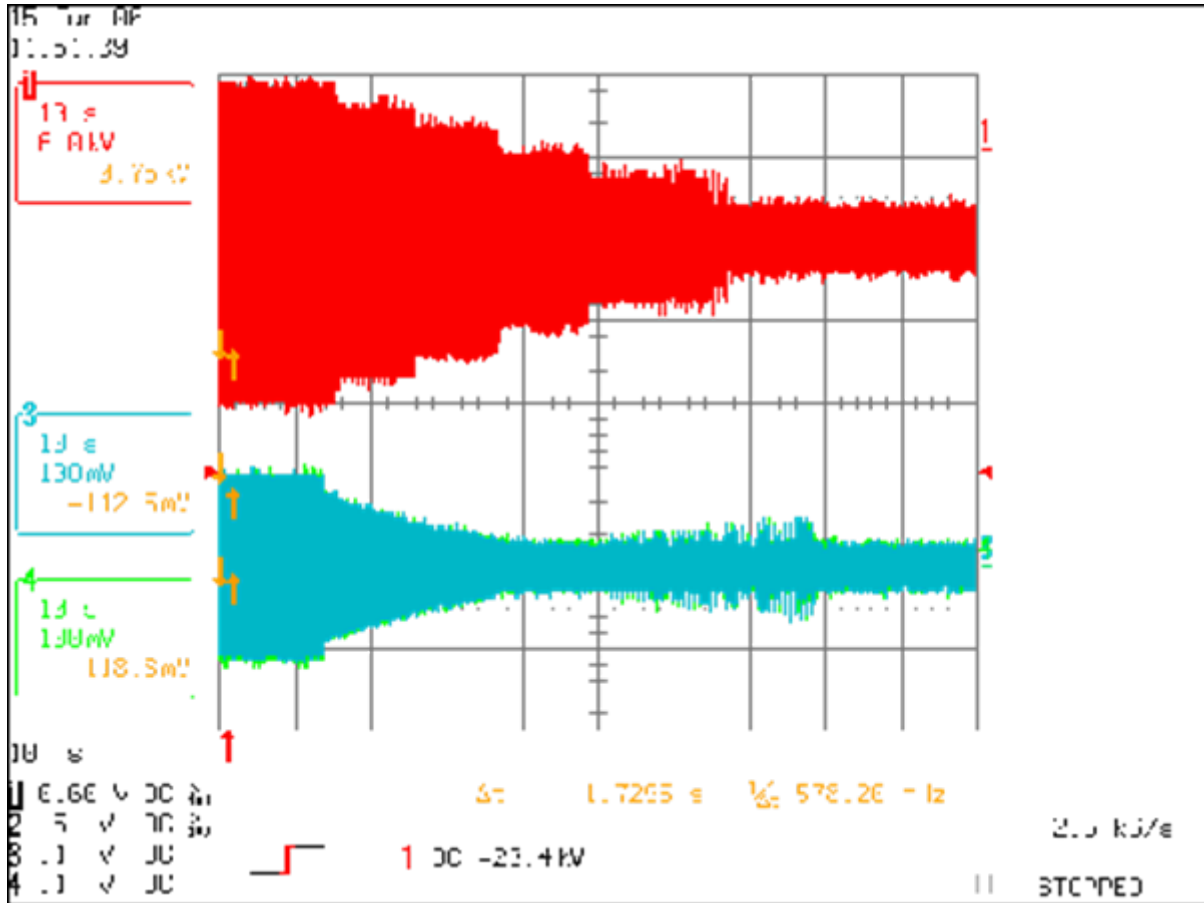
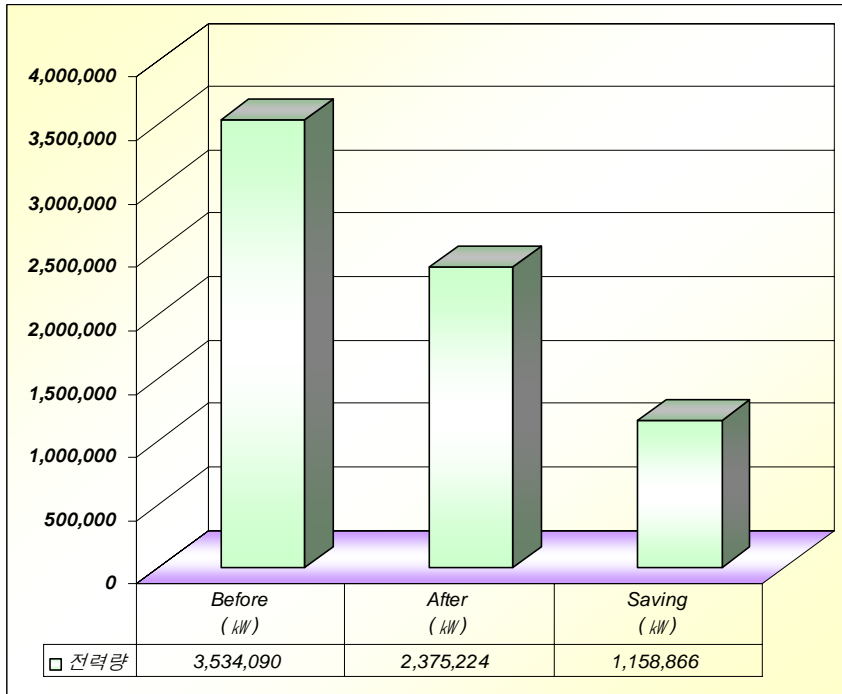
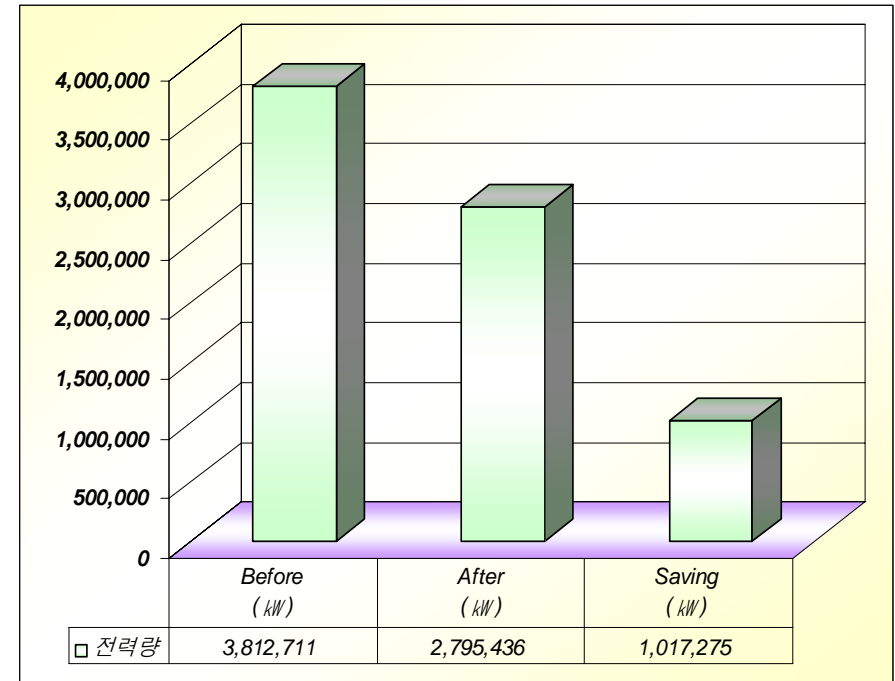


Fig 12. 60[sec] Dec.(from 60[Hz] to 20[Hz], Fan is connecting)



1st SAF Saving Money / year :

54,652,000 KRW



2nd SAF Saving Money / year :

47,975,000 KRW

N5000 Case 2

1. Inverter

- Place : HHI Transformer Factory
- Voltage & Capacity : 6600V, 4500KVA
- 부하 : M-G SET
- Q'ty : 3 sets
- Date : 2006. 09(1set), 2007. 03(2sets)

2. Motor

- Voltage & Output : 6600V, 60HZ, 3000KW, 6P

3. Application

- M-G set for Transformer Test

1. Synchronous Generator
1) 6600V , 23 MVA



1. Synchronous Generator
- 2) 6600V , 23 MVA



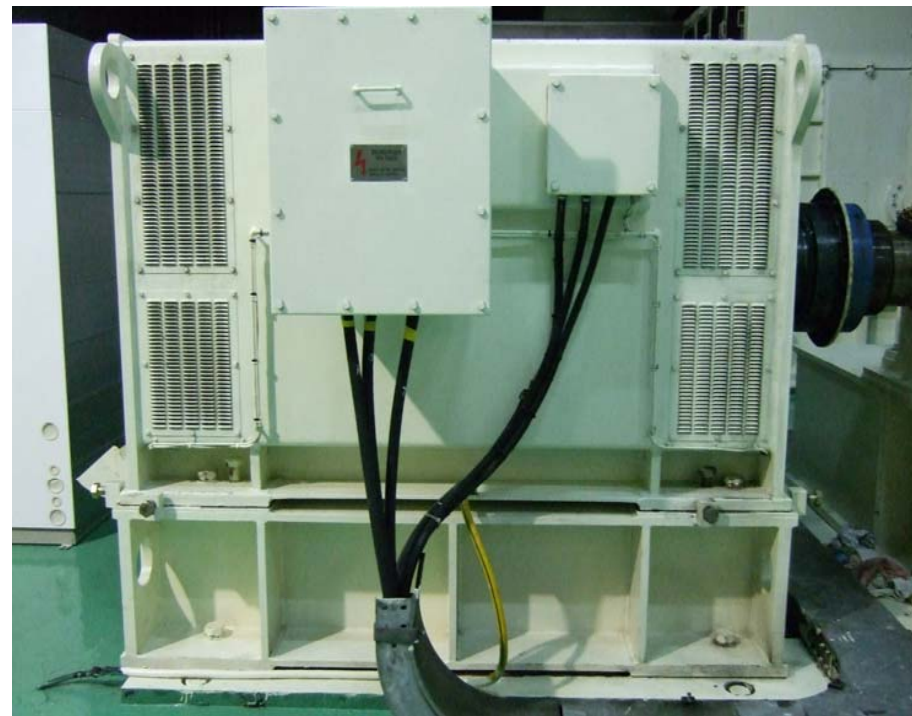
2. Motor

1) 6600V, 60HZ, 6P, 3000KW

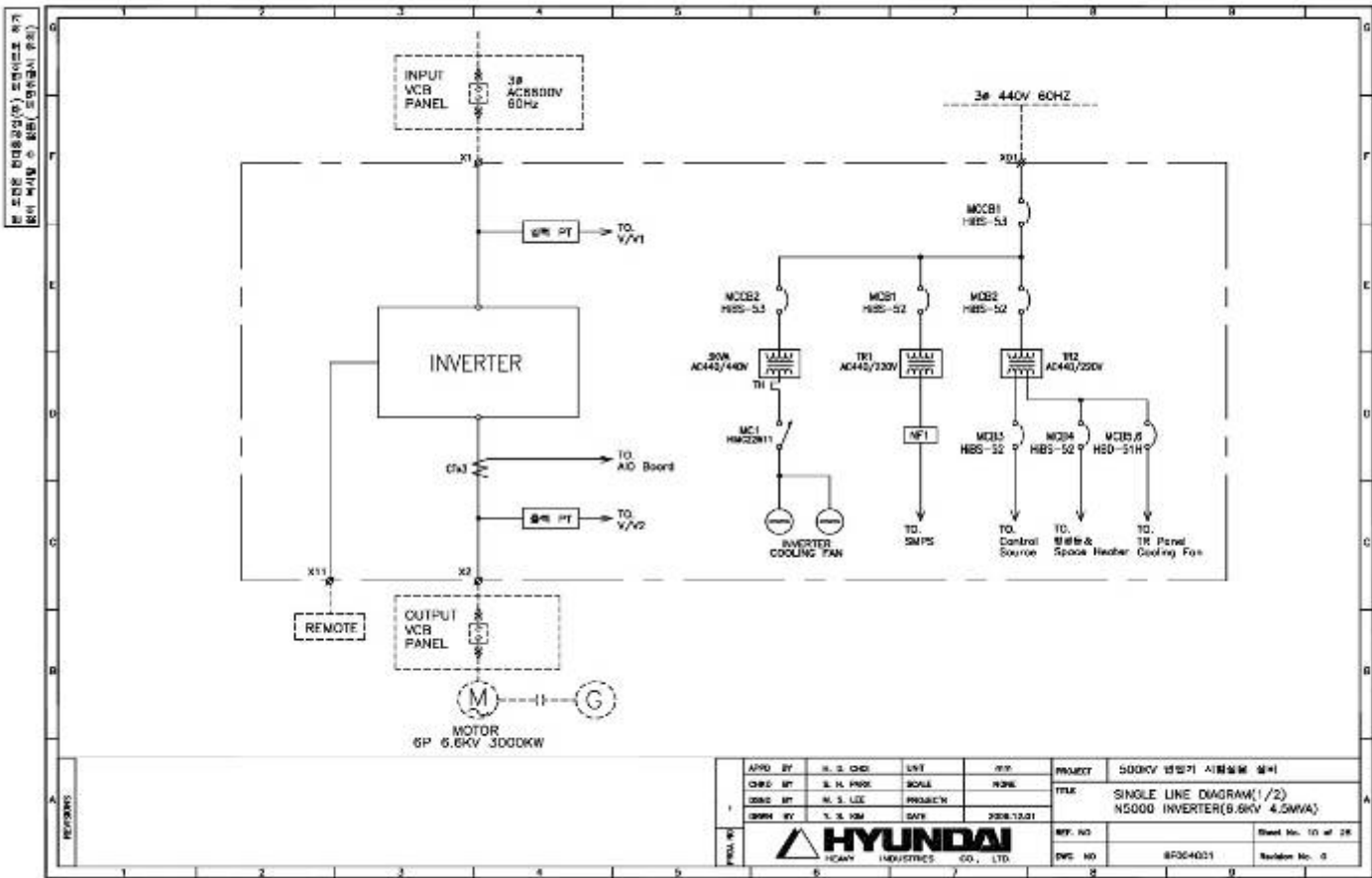


2. Motor

2) 6600V, 60HZ, 6P, 3000KW



Single Line Diagram



3. Inverter

- 6.6KV, 4500KVA
- Multi Level Inverter, 36 pulse input







Outline Dimension





Inverter Operating Curve

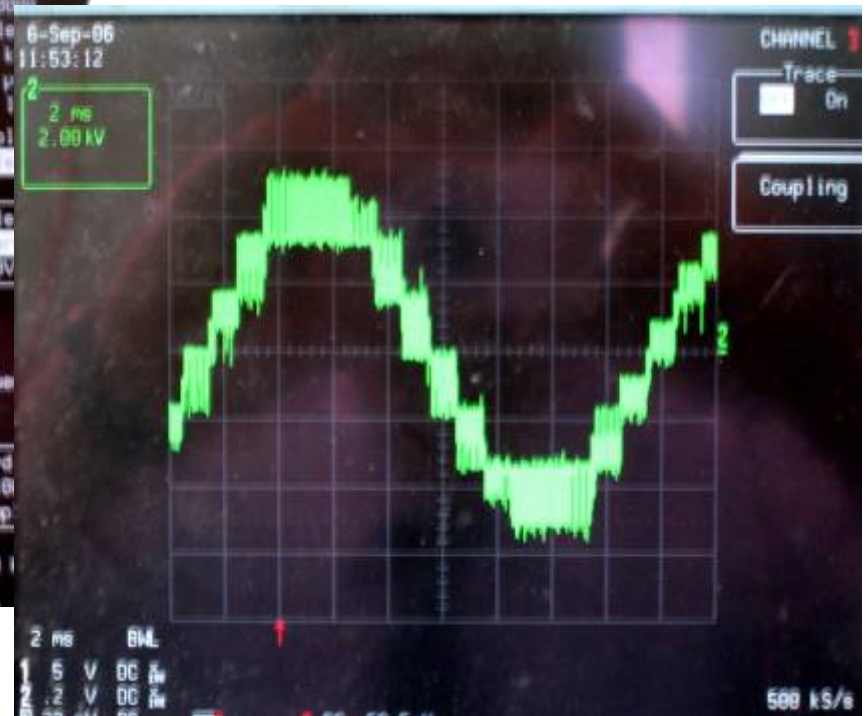
Output Frequency (Blue)
Output Voltage (Red)

Output Current
50A/div.

Motor rpm



Output Voltage & Current



N5000 Case 3

1. Inverter

- Place : Sung-Nam Refuse Incineration Plant
- Voltage & Capacity : 6600V, 800KVA
- Q'ty : 2 sets
- Date : 2006. 12 (2sets)

2. Motor

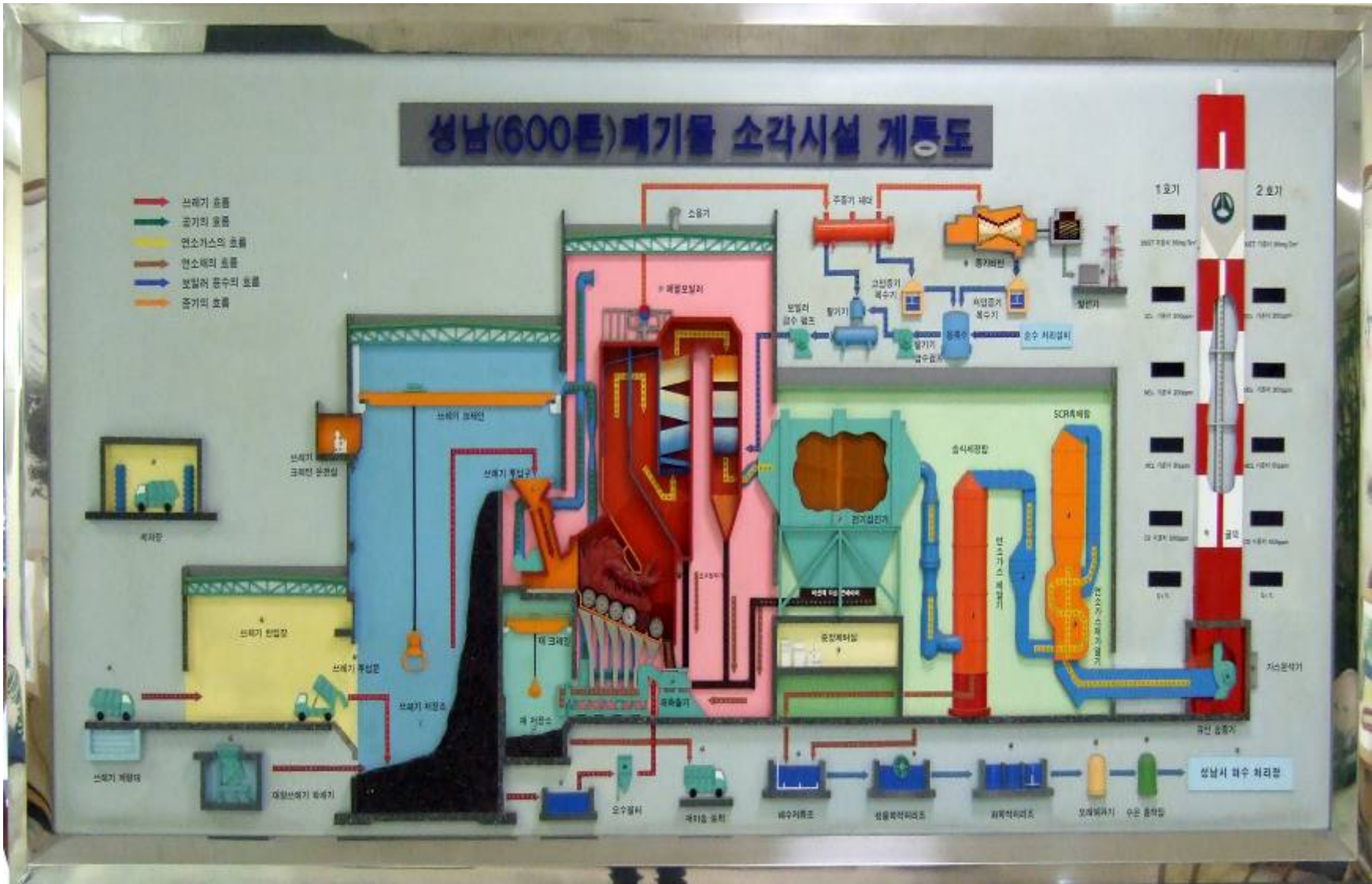
- Voltage & Output : 6600V, 1000KW ,4/8P

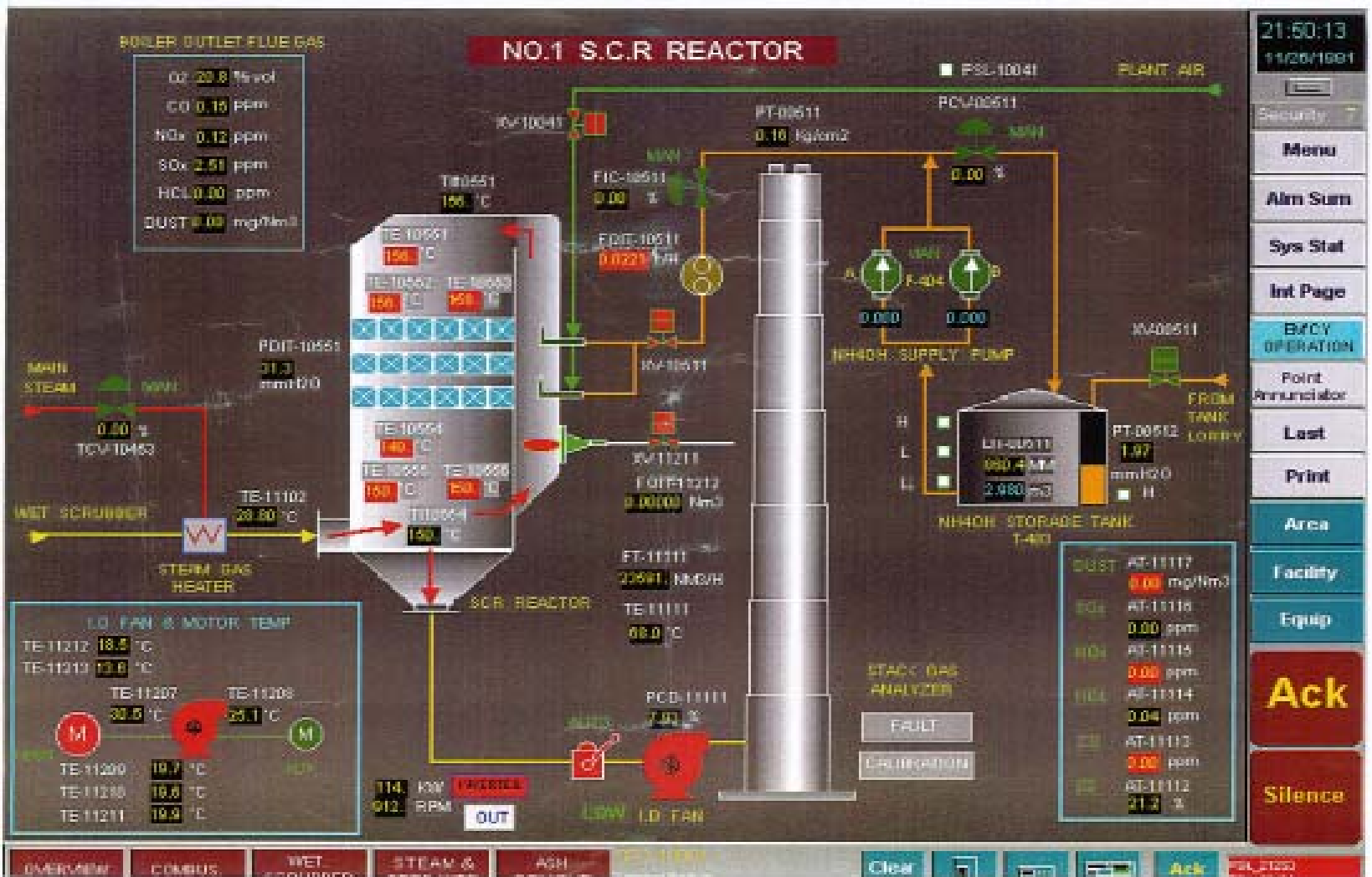
3. Application

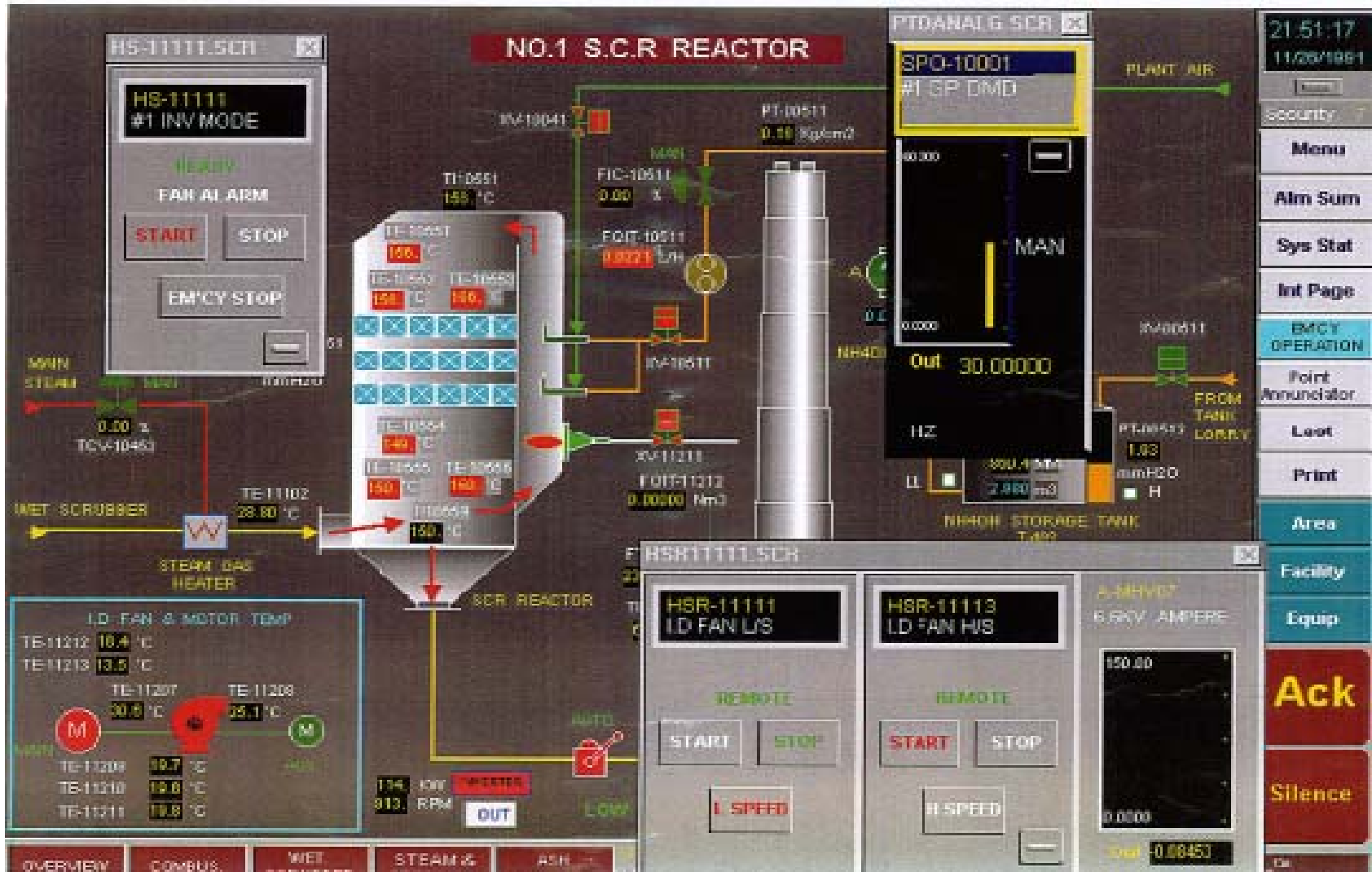
- ID FAN

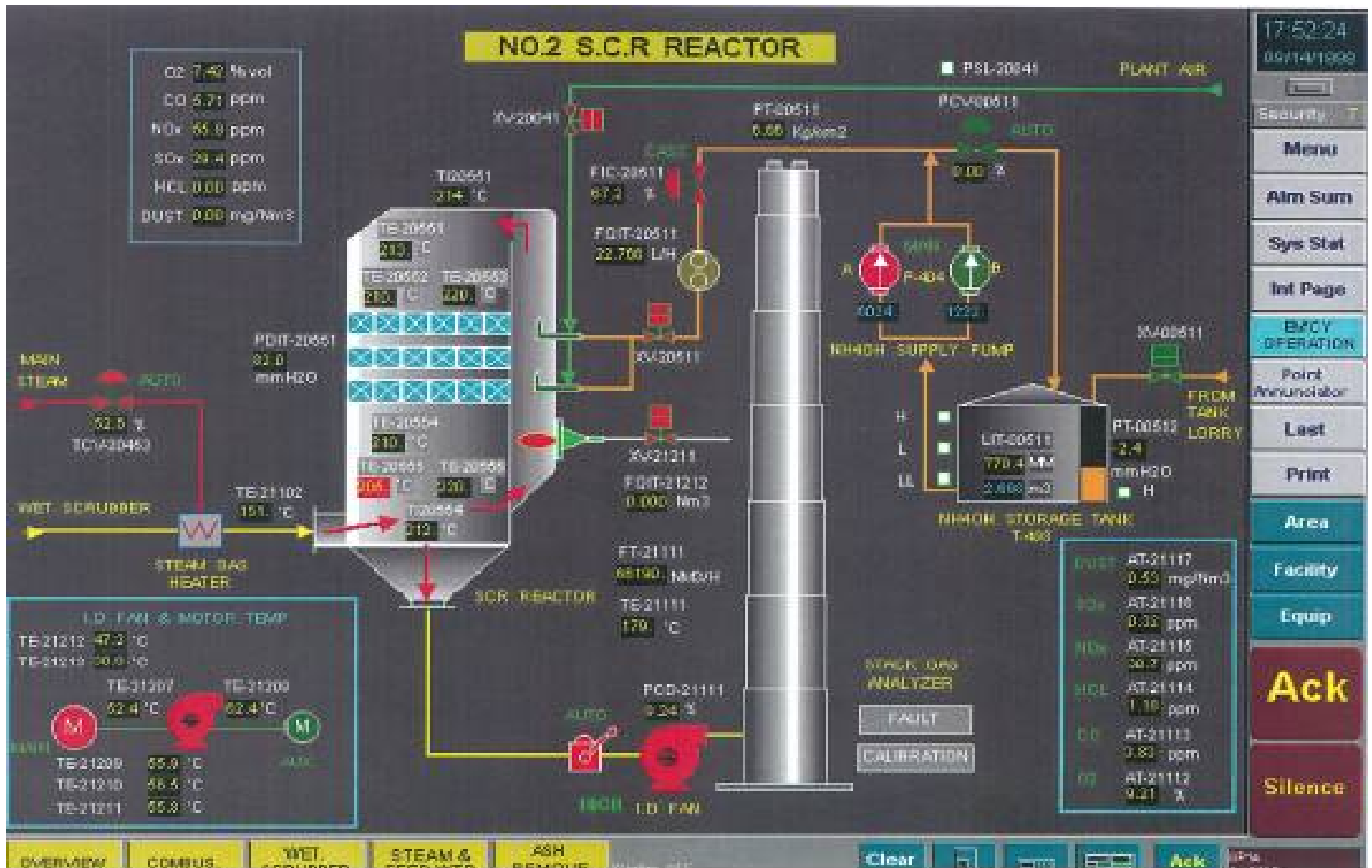


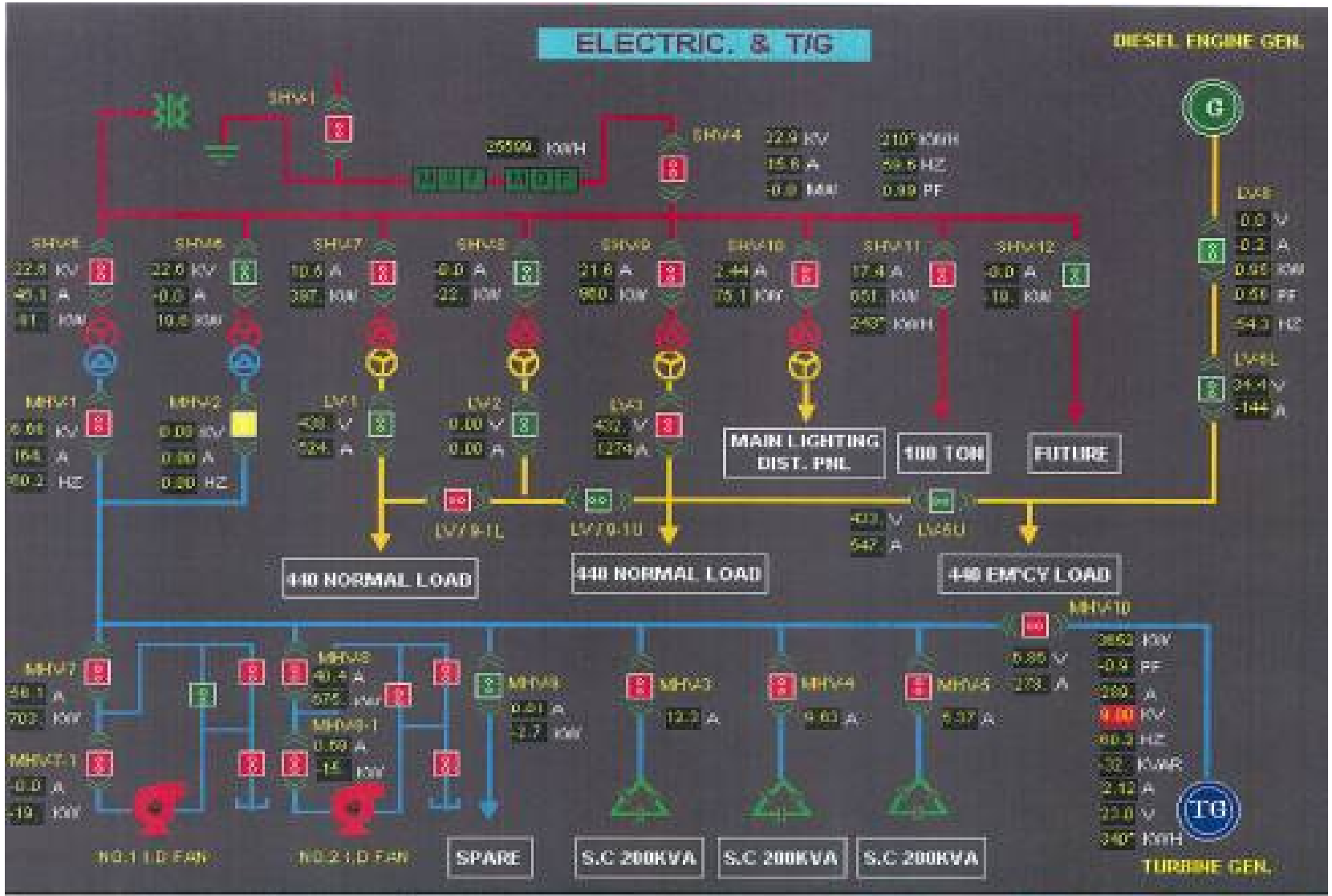










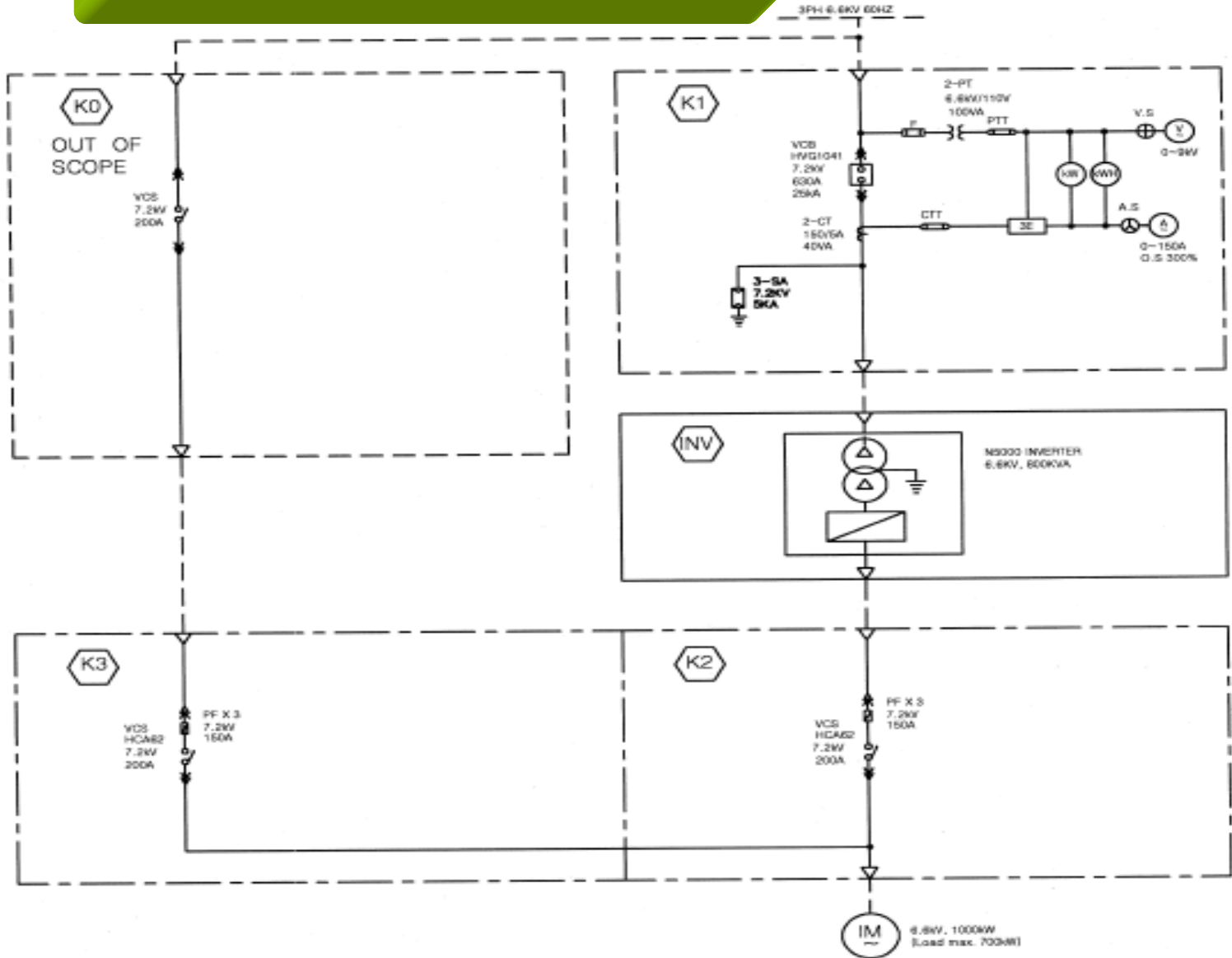




1. Motor / Application

- Voltage : 6600V,60HZ
- Output : 1000KW
- Current : 97.8A
- Pole : 4/8 pole
- ID Fan

Single Line Diagram



2. Inverter

– 6.6KV, 800KVA, 70A









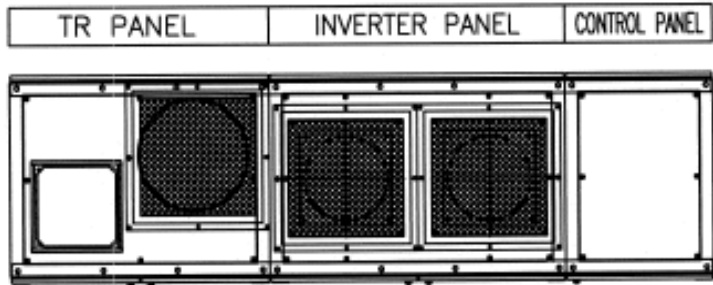
Inverter Input VCB



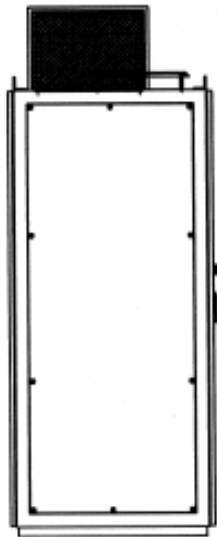
Inverter / Bypass & Output VCS



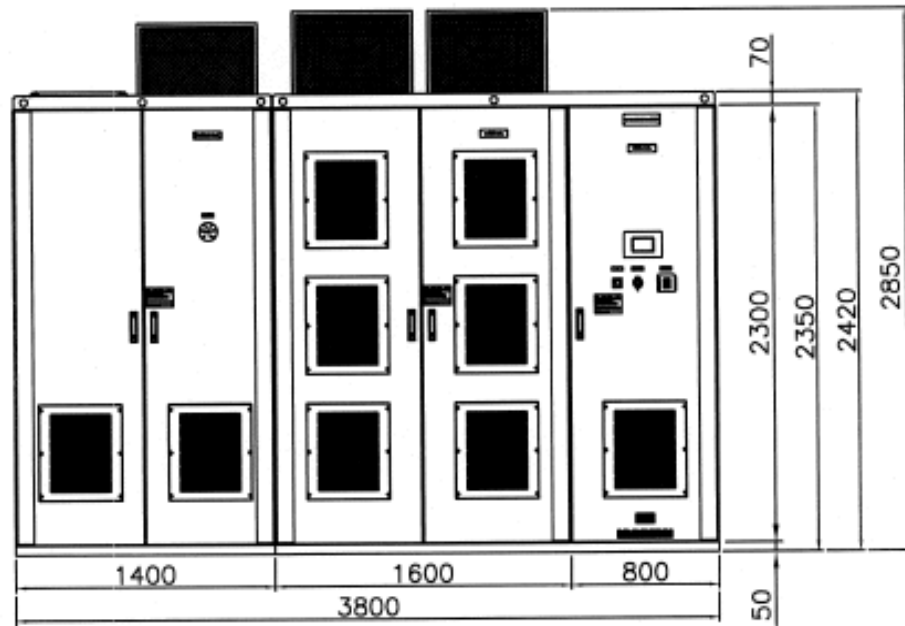
Outline Dimension



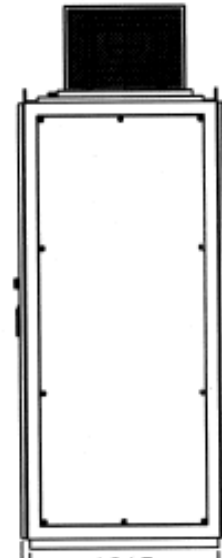
TOP VIEW



SIDE VIEW (LEFT)

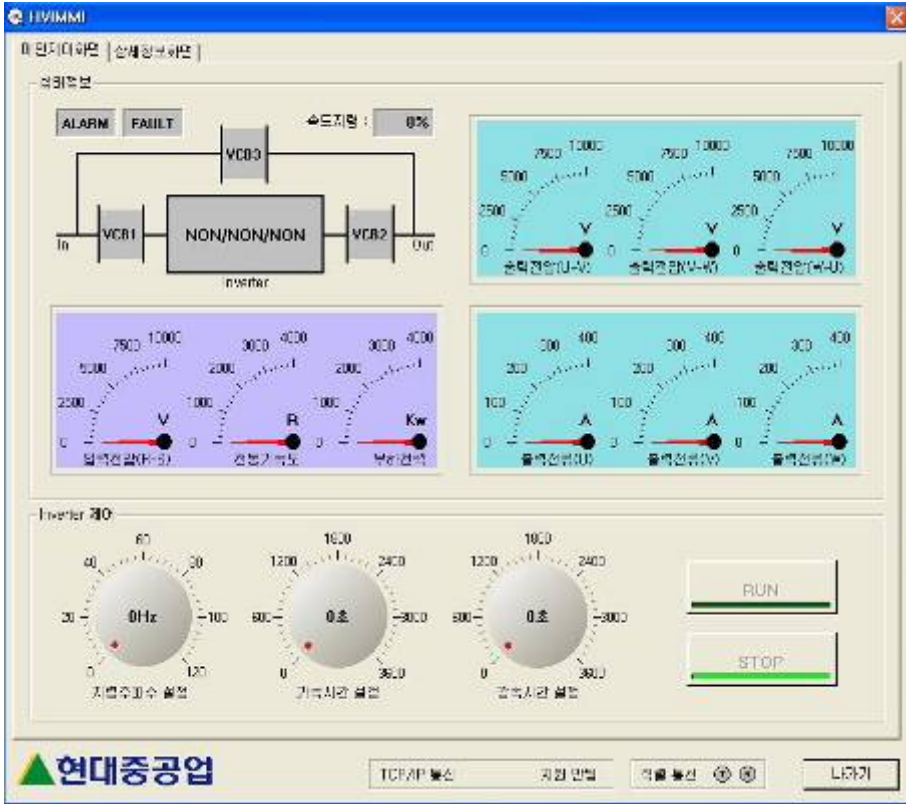


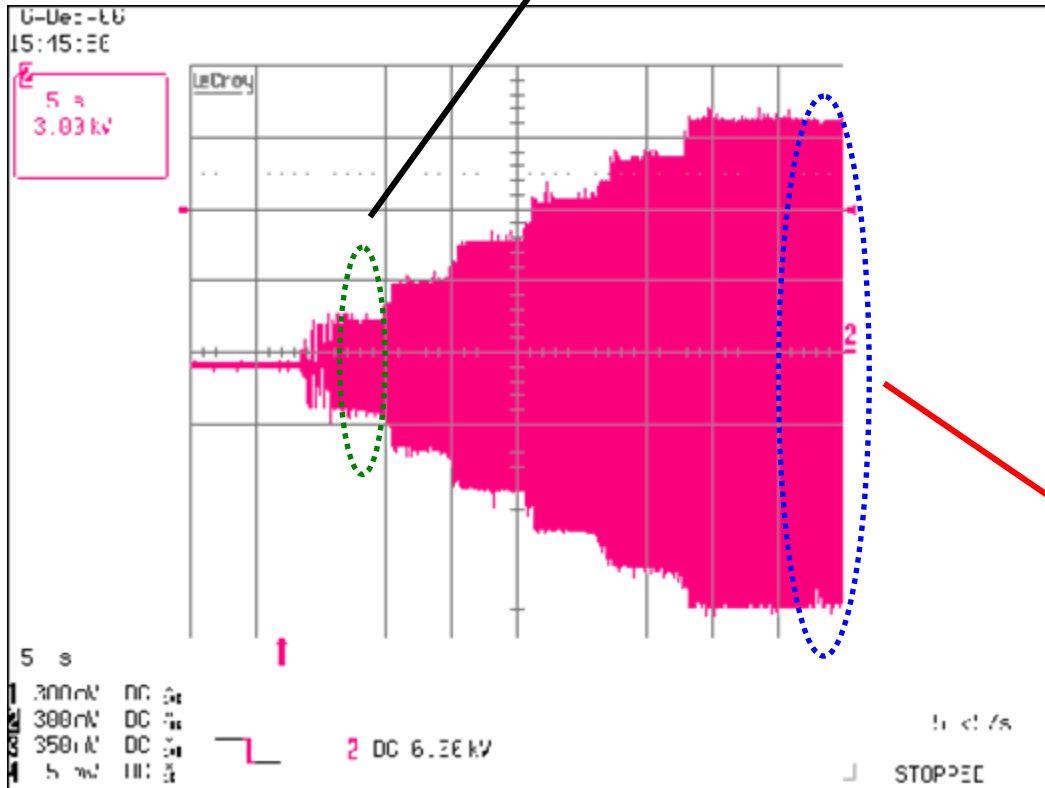
FRONT VIEW



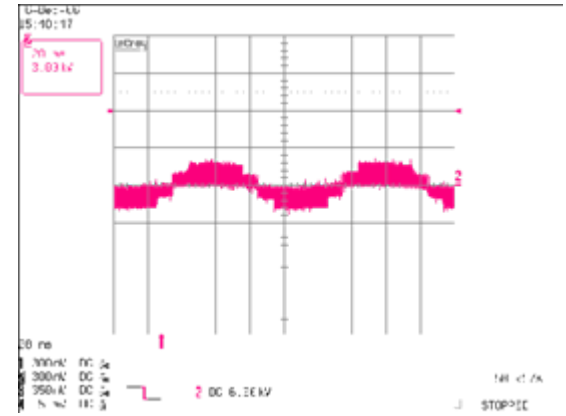
SIDE VIEW (RIGHT)

MMI Display

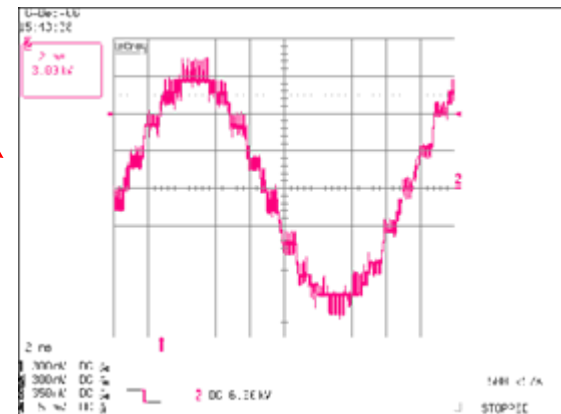




Inverter Output 0V → 6600V

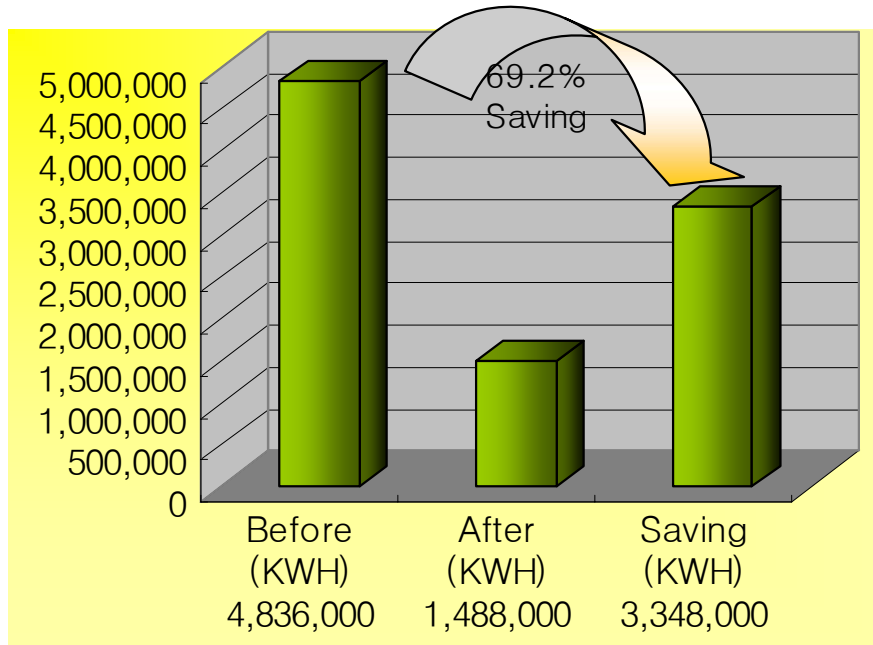


Inverter Output 1100V



Inverter Output 6600V

Power Saving Graph per Year



1. Saving Amount per Year
 (1 & 2 ID Fan)
 $= 3,348,000 \text{KWH} \times 70 \text{KRW} \times 2$
 Sets
 $= 468,720,000 \text{KRW}$

2. Investment Breakdown
 - Inverter : 2 Sets
 - VCB/VCS Panel : 3 Sets
 - DCS Connection

Additional Effect 부가 효과

1. Reduce Motor Noise and Vibration
2. Reduce Starting Current → Extend Motor life span

N5000 Case 4

1. Inverter

- Place : Tancheon Sewage Treatment Center In Seoul
- Voltage & Capacity: 3300V, 750KVA(6sets), 1000KVA(3sets)
- Q'ty : 9 sets
- Date : 2007. 11

2. Motor

- 3300V, 60HZ, 500KW(1) , 550KW(5), 650KW(3), 2P

3. Application

- ID Fan





SERVER NO.1 - H - C

주식회사한천환경

HiMAX 2000
Distributed Control System

2007-11-23 14:47:41

경 보

표 시 경 보

네 트 워 크

입 출 력 상 태

포 인 트 제 어

이 전 화 면

화 면 인 쇄

화 면 방 기

공 정 도 구 설

추 이 곡 선

포 인 트 정 보

보 고 서

시 스템 환 경

USER ID pes

Log In

Log Out

초 기 화 면

사 용 자 등 록

Sound All Ack

1ST 송풍기설비

송 풍 기

송 풍 량 E-27-3: 639 m3/h

최초점선지

DO: 0.2 PPM		DO: 1.0 PPM		PHI-601: 7.0 PH		TI-601: 9.2 temp	
1차-601	3차-603	5차-605	7차-607	9차-609	11차-611	13차-613	15차-615
1.2 PPM	1.0 PPM	1.1 PPM	1.0 PPM	1.1 PPM	1.1 PPM	1.3 PPM	0.9 PPM
778 PPM	2184 PPM	3703 PPM	5000 PPM	1266 PPM	1172 PPM	1203 PPM	697 PPM
26 %	39 %	24 %	75 %	82 %	83 %	82 %	25 %

Airation Tank 포기조 1개월

DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM	
17차-617	19차-619	21차-621	23차-623	25차-625	27차-627	29차-629	31차-631						
0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM						
0 PPM	0 PPM	0 PPM	0 PPM	0 PPM	0 PPM	0 PPM	0 PPM						
0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %						

Airation Tank 포기조 2개월

DO: 0.0 PPM		DO: 0.0 PPM		PHI-602: 0.0 PH		TI-602: 9.0 temp	
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최종점선지

최초점선지

최종점선지

최초점선지

최종점선지

송풍기 고압연버터(제1차리광) CONTROL MENU

1 INV-5-2 #2 송풍기	1 INV-5-3 #4 송풍기	1 INV-5-5 #5 송풍기	1 INV-5-6 #6 송풍기
REMOTE LOCAL	REMOTE LOCAL	REMOTE LOCAL	REMOTE LOCAL
AUTO MANUAL	AUTO MANUAL	AUTO MANUAL	AUTO MANUAL
RUN STOP	RUN STOP	RUN STOP	RUN STOP
Ready Bypass	Ready Bypass	Ready Bypass	Ready Bypass
STOP(Emergency)	STOP(Emergency)	STOP(Emergency)	STOP(Emergency)
RESET	RESET	RESET	RESET
ALARM TRIP	ALARM TRIP	ALARM TRIP	ALARM TRIP
SPEED 54 rpm	SPEED 54 rpm	SPEED 51 rpm	SPEED 0 rpm
전류 55.8 A	전류 55.7 A	전류 40.8 A	전류 0.3 A
전력 168.0 W	전력 168.8 W	전력 114.5 W	전력 0.0 W
회전속도 0 rpm	회전속도 0 rpm	회전속도 0 rpm	회전속도 0 rpm

최초점선지

DO: 0.2 PPM		DO: 1.0 PPM		PHI-601: 6.8 PH		TI-601: 9.2 temp	
1차-601	3차-603	5차-605	7차-607	9차-609	11차-611	13차-613	15차-615
1.1 PPM	1.0 PPM	1.1 PPM	0.9 PPM	1.1 PPM	0.0 PPM	1.3 PPM	0.9 PPM
700 PPM	2584 PPM	3700 PPM	5000 PPM	1266 PPM	1169 PPM	1203 PPM	697 PPM
26 %	39 %	24 %	76 %	74 %	82 %	82 %	25 %

Airation Tank 포기조 1개월

DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM		DO: 0.0 PPM	
17차-617	19차-619	21차-621	23차-623	25차-625	27차-627	29차-629	31차-631						
0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM	0.0 PPM						
0 PPM	0 PPM	0 PPM	0 PPM	0 PPM	0 PPM	0 PPM	0 PPM						
0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %						

Airation Tank 포기조 2개월

DO: 0.0 PPM		DO: 0.0 PPM		PHI-602: 0.0 PH		TI-602: 9.0 temp	
-------------	--	-------------	--	-----------------	--	------------------	--

최종점선지

2007-11-23 14:42:40 #5 송풍량 E U.R.

2007-11-23 14:42:32 #2 송풍량 B U.R.

2007-11-23 14:42:23 잉여슬러지 저류조 수위 B LOW

2007-11-23 15:02:01 농축슬러지 저류조 수위 A LOW

2007-11-23 14:54:12 LOS3 SEC. 네트워크 상태 ERROR

2007-11-23 14:54:08 LOS3 WORKSTATION 상태 ERROR

SERVER NO.1 - M - C

주식회사 탄천환경
hiMAX 2000
Distributed Control System

2007-11-23 15:02:18

경 보

표 시 경 보

네 트 워 크

입 출 력 상 태

포 인 트 제 어

이 전 화 면

화 면 인 쇄

화 면 밝 기

공 절 도 구 성

추 이 곡 선

포 인 트 정 보

보 고 서

시 스템 환 경

USER ID: pes

Log In

Log Out

초 기 화 면

사 용 자 등 록

Sound All Ack

2ND 송풍기설비

2M-5-2 냉각수펌프 1 2

2M-5-3(습식필터) 1 2 3 4 5 6

2M-5-4(건식필터) 1 2 3 4 5 6

2M-5-1

적산량 62355 m3/h

LSM1 여과수조

5233 m3/h	7365 m3/h	7980 m3/h	7480 m3/h	7760 m3/h	7786 m3/h	10381 m3/h	8370 m3/h
75.2 %	74.1 %	65.4 %	72.4 %	71.3 %	74.9 %	67.5 %	69.6 %

1차-301	3차-303	5차-305	7차-307	혼합1-321	혼합2-322	온도
D O 0.5 PPM	1.4 PPM	0.9 PPM	2.0 PPM	1.1 PPM	0.6 PPM	15.3 °C
MLSS 563 PPM	591 PPM	694 PPM	53 PPM	34 PPM	731 PPM	
SV30 86.4 %	78.6 %	85.8 %	22.9 %	16.0 %	86.5 %	
P H 0.0 PH	0.0 PH	0.0 PH	0.0 PH	0.0 PH	0.0 PH	

Airation Tank 포기조 1계열

9차-309	10차-310	11차-311	12차-312	13차-313	14차-314	15차-315	16차-316
D O 1.1 PPM	0.0 PPM	3.6 PPM	0.0 PPM	1.1 PPM	0.9 PPM	2.4 PPM	1.0 PPM
MLSS 532 PPM	0 PPM	632 PPM	0 PPM	624 PPM	699 PPM	256 PPM	717 PPM
TEMP 9.0 °C	7.2 °C	12.4 °C	16.3 °C	10.4 °C	12.5 °C	3.5 °C	13.1 °C
P H 6.6 PH	0.0 PH	6.6 PH	0.0 PH	6.6 PH	6.9 PH	6.5 PH	6.8 PH

Airation Tank 포기조 2계열

FI-401A 2585 m3/h

FI-401B 2390 m3/h

반송오니

최침전지

중침전지

12

송풍기 교역인버터(제2차리공) CONTROL MENU

2.MV-5.1 #1 송풍기	2.MV-5.2 #2 송풍기	2.MV-5.3 #3 송풍기	2.MV-5.4 #4 송풍기	2.MV-5.5 #5 송풍기
REMOTE LOCAL	REMOTE LOCAL	REMOTE LOCAL	REMOTE LOCAL	REMOTE LOCAL
AUTO MANUAL	AUTO MANUAL	AUTO MANUAL	AUTO MANUAL	AUTO MANUAL
RUN STOP	RUN STOP	RUN STOP	RUN STOP	RUN STOP
Ready ByPass	Ready ByPass	Ready ByPass	Ready ByPass	Ready ByPass
STOP(Emergency)	STOP(Emergency)	STOP(Emergency)	STOP(Emergency)	STOP(Emergency)
RESET	RESET	RESET	RESET	RESET
ALARM TRIP	ALARM TRIP	ALARM TRIP	ALARM TRIP	ALARM TRIP
SPEED 0 rpm	SPEED 0 rpm	SPEED 0 rpm	SPEED 0 rpm	SPEED 0 rpm
전류 0.0 A	전류 0.0 A	전류 0.0 A	전류 0.0 A	전류 0.0 A
전력 0.0 kW	전력 0.0 kW	전력 0.0 kW	전력 0.0 kW	전력 0.0 kW
공압 0 rpm	공압 0 rpm	공압 0 rpm	공압 0 rpm	공압 0 rpm

8370 m3/h	69.6 %
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1차-301	3차-303	5차-305	7차-307	혼합1-321	혼합2-322	온도
D O 0.5 PPM	1.4 PPM	0.9 PPM	2.0 PPM	1.1 PPM	0.6 PPM	15.2 °C
MLSS 563 PPM	594 PPM	691 PPM	50 PPM	38 PPM	731 PPM	
SV30 86.3 %	78.6 %	85.8 %	23.1 %	16.1 %	86.6 %	
P H 0.0 PH	0.0 PH	0.0 PH	0.0 PH	0.0 PH	0.0 PH	

Airation Tank 포기조 1계열

9차-309	10차-310	11차-311	12차-312	13차-313	14차-314	15차-315	16차-316
D O 1.1 PPM	0.0 PPM	3.6 PPM	0.0 PPM	1.1 PPM	0.9 PPM	2.4 PPM	1.0 PPM
MLSS 527 PPM	0 PPM	624 PPM	0 PPM	624 PPM	688 PPM	256 PPM	717 PPM
TEMP 9.0 °C	7.2 °C	12.4 °C	16.3 °C	10.4 °C	12.5 °C	3.5 °C	13.1 °C
P H 6.6 PH	0.0 PH	6.6 PH	0.0 PH	6.6 PH	6.9 PH	6.5 PH	6.8 PH

Airation Tank 포기조 2계열

FI-401A 2578 m3/h

FI-401B 2362 m3/h

반송오니

최침전지

중침전지

2007-11-23 15:02:01 능률슬러지 저류조 수위 A LOW

2007-11-23 14:54:12 LOS3 SEC. 네트워크 상태 ERROR

2007-11-23 14:54:08 LOS3 WORKSTATION 상태 ERROR

12

SERVER NO.1 - M - C

주식회사탄천환경

hiMAX 2000
Distributed Control System

2007-11-23 15:05:28

경 보

표 시 경 보

네 트 워 크

입 출 력 상 태

포 인 트 제 이

이 전 화 면

화 면 인 쇄

화 면 방 기

공 점 도 구 성

추 이 곡 선

포 인 트 점 보

보 고 서

시 스템 환 경

USER ID des

Log In

Log Out

조 기 화 면

사 용 자 등 록

Sound All Ack

2ND 주 변 전 실 #2

H1-8 OCR OVGR

353.4 A

3.1 KW

H2-11 92.8 A

TR-3 3.3KV/380KV 300KVA

H1-6

TR-1 3.3KV/380KV 1000KVA

H1-7

TR-2 3.3KV/380KV 1000KVA

H2-4

TR-2 3.3KV/380KV 1000KVA

H2-11

TR-3 3.3KV/380KV 300KVA

H2-4

LV1-1

LV1-1

LV2-1

OCR SGR

H1-9 0.0 A

H1-10 104.3 A

H2-12

H2-13

H2-14

H2-15

송풍기1

송풍기2

송풍기3

송풍기4

송풍기5

송풍기6

송풍기동

최 종 점 전 지

최 종 점 전 지

송 풍 기 VCB(개기차기장) CONTROL MENU

2-VCB-5-1 #1 송풍기	2-VCB-5-2 #2 송풍기	2-VCB-5-3 #3 송풍기	2-VCB-5-4 #4 송풍기	2-VCB-5-5 #5 송풍기
OPEN CLOSE	OPEN CLOSE	OPEN CLOSE	OPEN CLOSE	OPEN CLOSE

송풍기1

송풍기2

송풍기3

송풍기4

송풍기5

송풍기6

최 종 점 전 지

최 종 점 전 지

H1-2

2007-11-23 15:04:38 1차리장 송풍기5 INVERTER ALARM ON

2007-11-23 15:02:01 능축슬러지 저류조 수위 A LOW

2007-11-23 14:54:12 LOS3 SEC. 네트워크 상태 ERROR

13

Sound All Ack

2007-11-23 15:04:38 1차리장 송풍기5 INVERTER ALARM ON

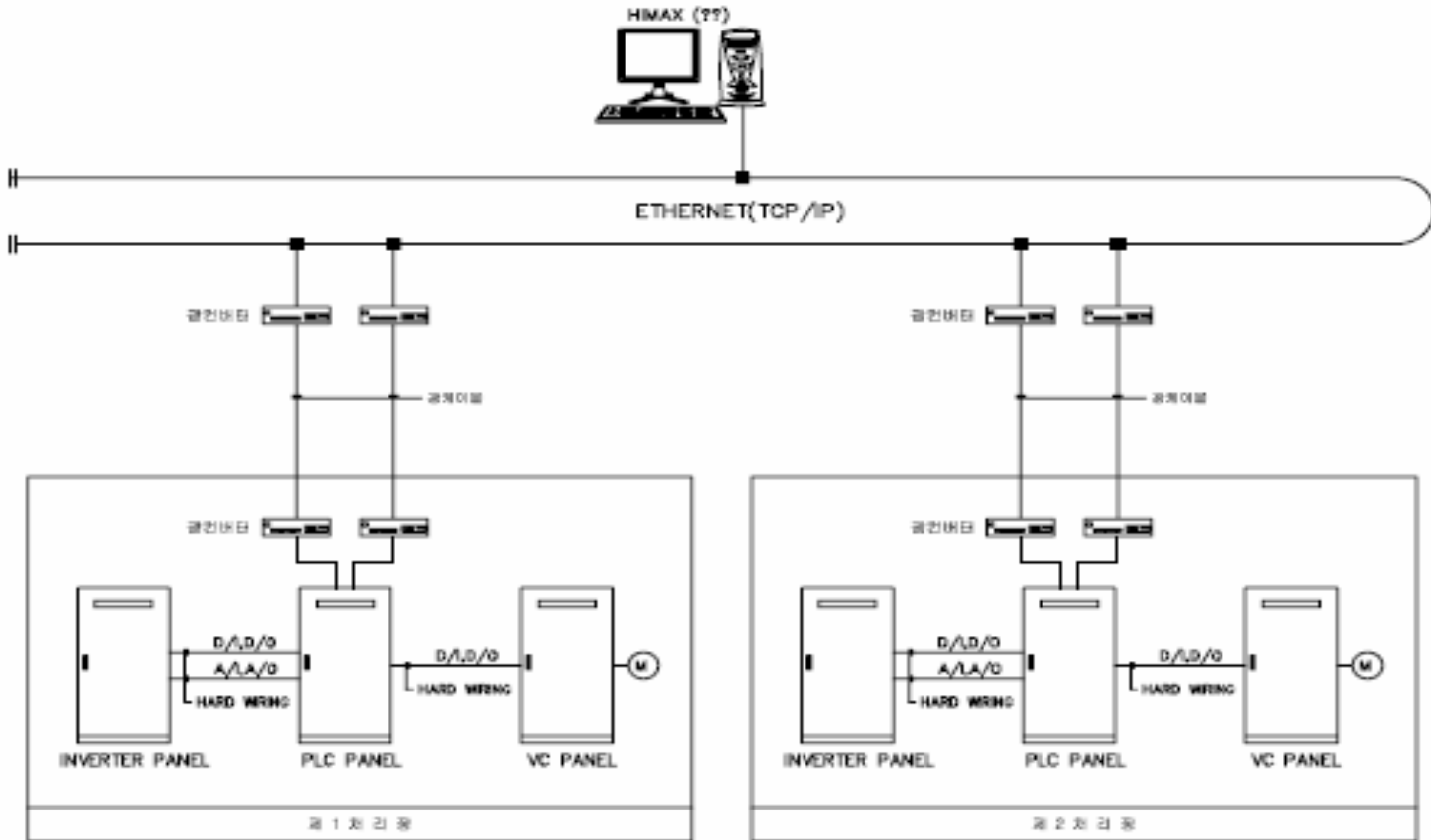
2007-11-23 15:02:01 능축슬러지 저류조 수위 A LOW

2007-11-23 14:54:12 LOS3 SEC. 네트워크 상태 ERROR

13

PLC System Configuration

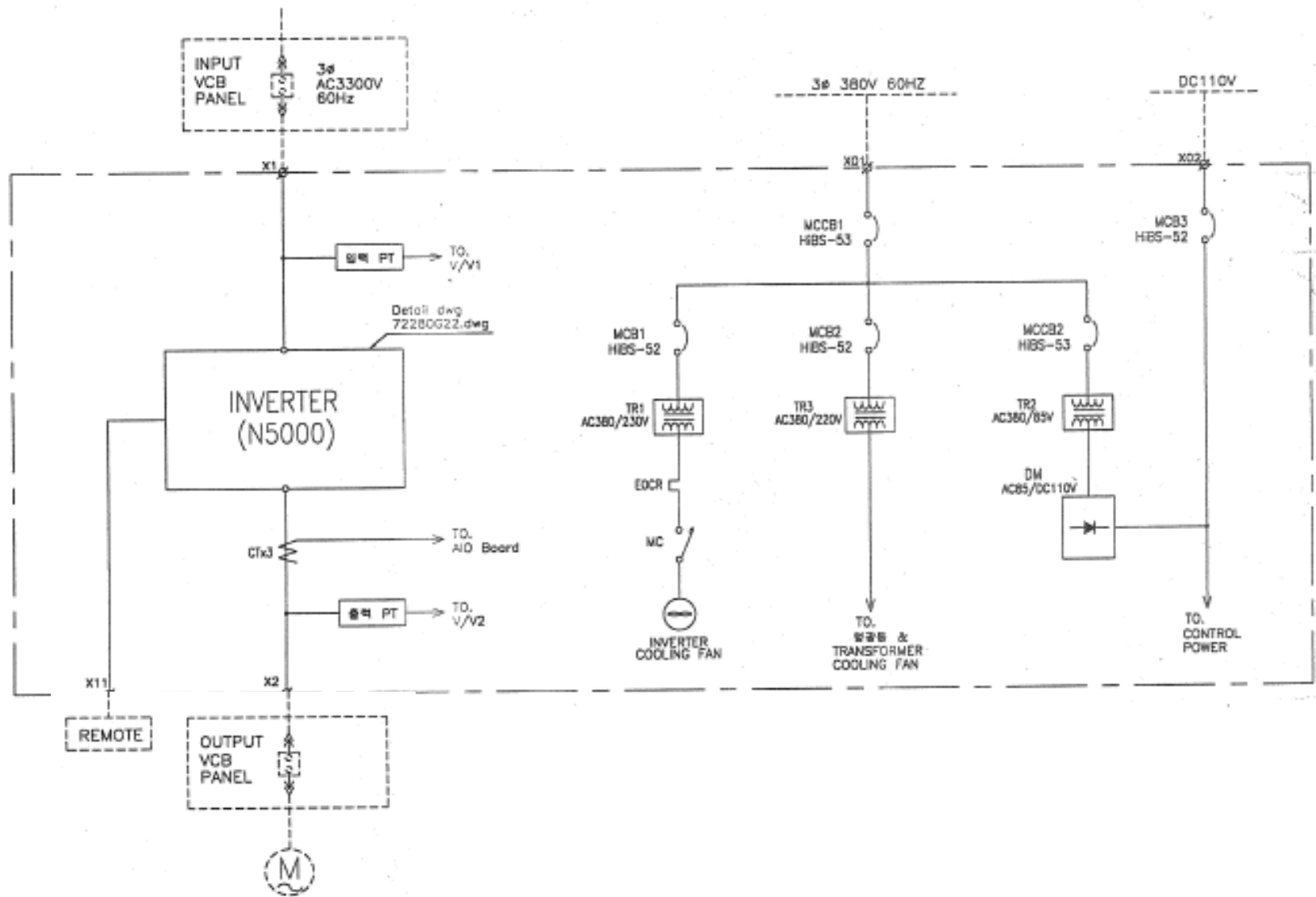
SYSTEM CONFIGURATION







1. Motor / Application
 - Voltage : 3300V,60HZ
 - Output
500KW,
550KW
650KW
 - Pole : 2 pole



2. Inverter

– 3300V, 750KVA / 1000KVA : 4 sets





2. Inverter

– 3300V, 750KVA / 1000KVA : 5 sets





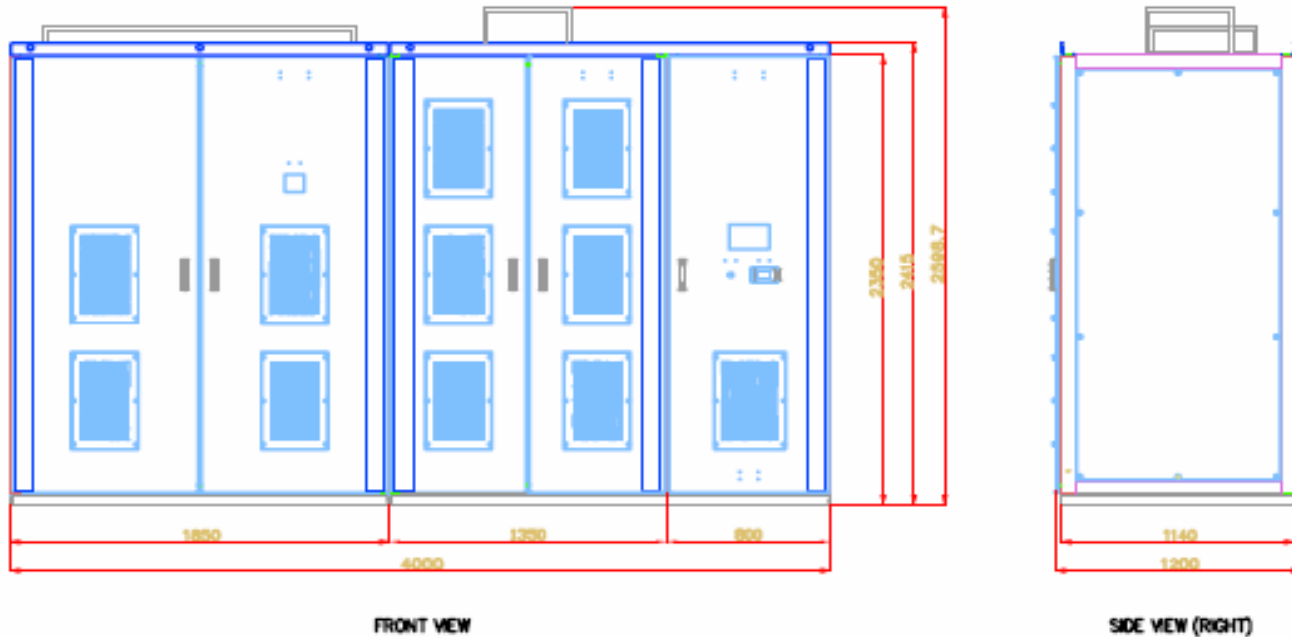
Inverter Input VCB



Inverter / Bypass & Output VCS

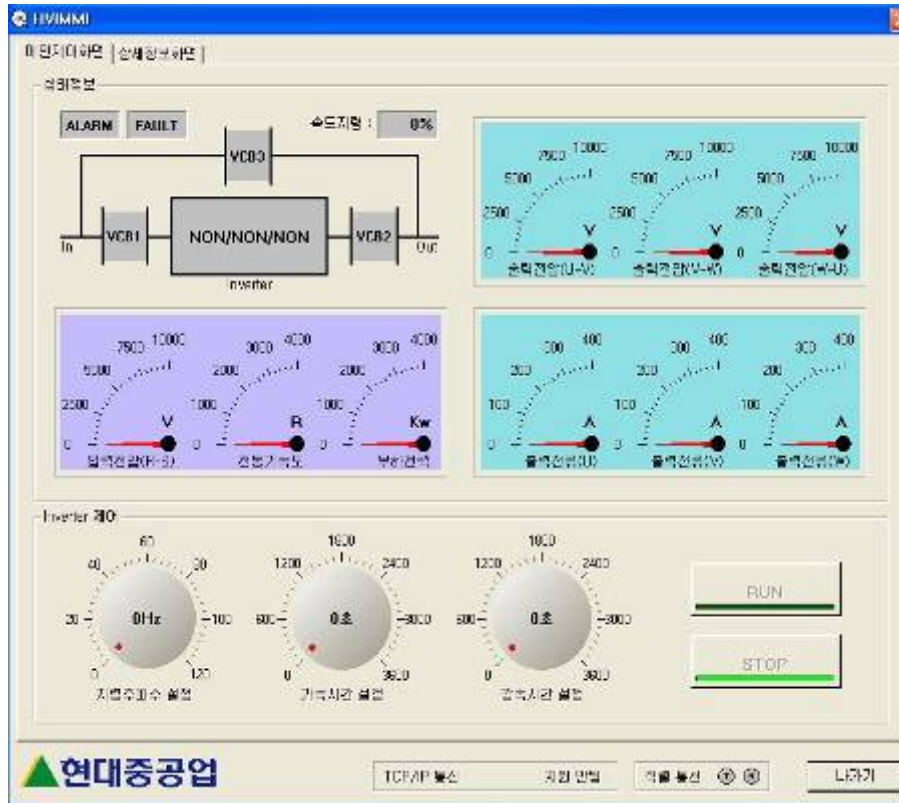


Outline Dimension





MMI Display



Inverter Operating Curve



Output Voltage & Current

