PIS

AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning July 2022

PRESENTS THIS REPORT TO:

# **AES GENER**

# 

UNITS 1 and 2

Cochrane, Chile

# REDUCED MINIMUM LOAD BOILER TUNING LOWER MNT TUNING NOx REDUCTION

By: Alex Kossack July 2022



AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning

> By: alex kossack

### <u>ABSTRACT</u>

AES GENER, Cochrane Units 1 and 2 are both IHI built, natural-circulation, water-cooled furnace, superheater, reheater and economizer.

The boiler pressure parts are manufactured both by IHI's Aioi-Works and by IHI's Indonesian-Works both having large experience in the construction of super critical steam generators, that run at and above 600 Deg C Superheated steam at or below super critical pressures.

Both units are coal fired, capable of burning bituminous, sub-bituminous or a mixture of both types of coal, either individually by mill or mixed in silos.

Coal pulverization is achieved by 5 IHI mills, the unit also is equipped with several overfire air ports and side air ports (OAP and SAP) that are installed above the top row of burners and branch air from the secondary air duct, that in turn is routed into the furnace by the OAP and SAP ports and controlled by air dampers, in order to achieve staged combustion to control NOx and CO.

Air balance between OAP and SAP is established by adjusting manual dampers based on our experience and tuning efforts and by observing actual combustion conditions. Air (OAP SAP) is supplied via the same secondary air ducts as the windbox, but a ramification is done before the secondary air enter the main burner windboxes.

NOx limit for both units is 200 mg/Nm3 and CO is 100 ppm per unit.

Primary air control is a standard hot/cold damper control and PA flow is controlled via a curve in the DCS that controls PA flow vs. feeder speed.

Coal flow is measured in Tons/hr and air flow is also measured in T/hr. For combustion control, the feeder speed is measured in percent of the feeder speed provided by 5 gravimetric feeders.

The control system is provided by an Emerson OVATION DCS.



UNIT 1 and 2 Reduced Minimum Load Tuning

July 2022

# 1.1.2 Boiler Specification

<ol> <li>General         <ul> <li>Type of Steam Generator</li> <li>Main fuel</li> <li>Supplemental fuel</li> </ul> </li> </ol>	IHI SR Single Drum Natural Circulation, Reheat Type for Outdoor Service Pulverized coal Fuel Oil No.2 Oil
<ul> <li>Steam / water condition (at BMCR)</li> <li>Evaporation</li> <li>Steam pressure at superheater out</li> <li>Steam temperature at superheater</li> <li>Steam pressure at reheater outlet</li> <li>Steam temperature at reheater out</li> </ul>	outlet T.P. 566.8 deg.C T.P. 40.74 bara
<ul> <li>2) Draft System</li> <li>- Air and Flue gas system</li> <li>- Primary air system</li> <li>- Number of trains</li> </ul>	Balanced draft system Cold primary air fan system Two train
3) Furnace Size - Furnace width - Furnace depth - Furnace height (knuckle~roof)	13.4 m 12.7 m 42.3 m
<ul> <li>4) Burner Arrangement</li> <li>- Burner arrangement</li> <li>- Number of Coal burners</li> </ul>	; Opposed firing system ; 3 /row x 3 rows (front wall) ; 3 /row x 2 rows (rear wall) ; Total 15 burner with 3 spares
<ul> <li>Type of Coal burners</li> <li>Number of Ignitor</li> <li>Type of Ignitor</li> </ul>	; Intervene dual flow type ; 1 per each coal burner, 15 in total ; Air atomizing, direct ignition



#### AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning

July 2022

#### 1. INTRODUCTION

Unit 1 and 2 were during commissioning and all chains optimized for what were the operational conditions at the time.

At that time, the minimum load had been set by the plant and dispatch at 85 MWg.

After several meetings with Mr. Edinson Bascuñan and Mr. Hugo Marin we were requested to lower the minimum load on both units.

Having informed both about the procedures and the tuning needs, we confirmed this could be done but only with the help of a new logic specially designed and conceived for extremely low loads and with new curves specifically designed for safe operation at those new low loads.

This is because at these low loads, and since the units will operate at less than 30% MCR, the units must be operated differently, and new conditions created in automatic for this.

I briefly explained the results, experiences and observations obtained at other plants, at very low operating loads (MW), where we had achieved loads as low as around 15-20% MCR.

At those other plants I was quite successful in tuning for operation well below <30% MCR, and obtained rather good results, which allows them a lot more flexibility and span during low load demands by dispatch and improved NOx control and emissions, whilst lowering CO as well.

For this, and as has been done in other plants, I requested the help of the Plant I&C Manager, Mr. Nelson Salas, and the assistance of the highly qualified specialist, Mr. Javier Brizuela and Roberto Caldera.

This assistance was necessary so that they could assist me and work with the I&C of the plant implementing the necessary logic that I would design and to enter the new curves and configurations that we needed. The logic changes made to Unit 1 were exactly the same as those made to Unit 2, with minor variations to the PID values.

This was done at the same time that I was testing and making the new curves for the unit, all to be done at very low loads, and the help of Mr. Marco Castro was important in coordinating all the efforts and collecting boiler data for me.

The excellent level of professionalism of all Operators and test and laboratory staff was also very high.



July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

#### 2) EXECUTIVE SUMMARY

The work developped on Units 1 and 2 at Cochrane are based on the requirements established in the technical bases of this assignement.

The development was based on improving the performance of ancillary services, heat rate and production operations for a new technical minimum, indicated in the following points:

• Achieve a better response of the units for different load gradient values (MW/min).

To achieve these objectives, the following activities were carried out:

- Adjustment and tuning of boilers with changes in control philosophy
- New optimized primary air curves
- New optimized secondary air curves
- Pressure optimizations and windbox operation
- New burner damper curves
- Changes to Mill Primary air curves.
- New optimized Excess air control (O2)
- Newly designed and optimized control logic for all loads and low loads. (\*)
- (\*) Further information and details about the logic changes can be found in points 1) to 7) in Annex I attached with this report.
- Adjustment of the operating parameters to define a new technical minimum value.

The unit has a defined technical minimum of 85 MW, at lower loads the unit would exceed its regulatory NOX limit of (200 mg/Nm3). Adjustments made to operate at a new, lower technical minimum allowed the unit to operate at 60MW.

To achieve this, the following actions were carried out:

- Adjustments to low load mill curves
- > Windbox damper settings and new curves for regulation
- Burner air register adjustments and curves
- Separate burner damper curves
- Main windbox inlet damper curves
- > OAP/SAP damper curves
- > OAP/SAP air distribution damper adjustments
- Adjustments to all windbox damper curves.



July 2022

# UNIT 1 and 2 Reduced Minimum Load Tuning

#### 3) DEVELOPMENT

Until June 2022, the unit could only go down to 85MW as a minimum load and the plant wanted to reduce the MNT (minimum technical threshold) value. NOx emissions were one of the limiting reasons.

Tuning was eventually scheduled for Units 1 and 2, with Unit 1 tuning in May and Unit 2 in June 2022.

The plan was to tune up earlier, but various delays and setbacks upset the initial schedule and the tuning was only scheduled for May 2022 and June 2022 respectively.

A tuning plan was made (see below) and with this, I provided enough information for the plant to start preparing the necessary and various logic change permits required, plan unit loads with dispatch, etc.

As for the logic change details and drawings, since these are the property of the Plant, please refer to the internal report issued by Mr. Javier Brizuela and Mr. Roberto Caldera, on the changes in logic, although these changes and operating philosophy were defined by me and explained in detail later in this reports annex I attachment.

At the time, the plant's desired low load target was 65 MW gross, based on various emails and conversations, but I tried to go lower and actually achieved a much lower value of 60MWg.

In Unit 1 with mills A and C. In Unit 2 with mills A and B we achieved 60MW gross, maintaining good emission control.

It is possible with one mill operation to run the unit. However, this is a one mill operation and significant changes need to be made as well as more intensive testing.

Several emails and instructions were previously sent, of which the most important and relevant to the topic were the following:

- a) Objective -If possible Adjust the control system to operate below 65MW gross
- b) Increase Windbox to furnace pressure at lower loads
- c) Obtain this with a pair of mills
- d) Lower NOx, especially at high and low loads
- e) Lower CO

Since running a unit at this low load of >30% MCR, there is a risk of overheating the Reheater, the load reduction was gradual and started at 85MW gross, with slow decreases in load each time as we progressed into the tuning until we reached 60MW.

Once proven that the unit could in fact run under these conditions and at these lower loads, tuning proceeded, this time knowing it would not pose any risk to the equipment or personnel.

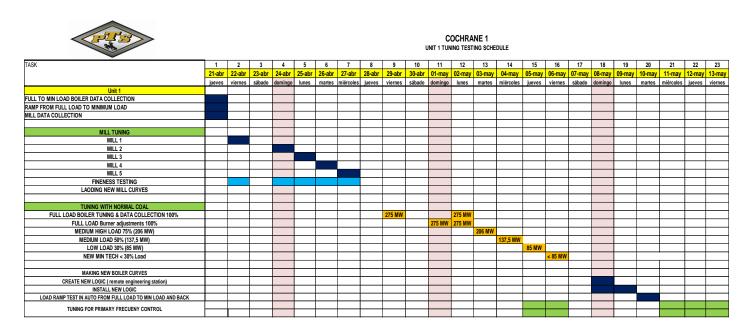


July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

#### 4) LOW LOAD TUNING PROGRAM

In order to achieve the requests of running at lower loads, I proposed a series of tests, with the unit running, that would allow modifications to the lower end of the boiler curves, and Mills, improve on these and improve operations in general, at the same time assuring the lowest NOx and CO emissions possible, increase Windbox pressure and assure decent flame geometry.



IPT P33											UNIT 2	COCHR TUNING TES		HEDULE									
TASK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	30-may	31-may		02-jun	03-jun	04-jun	05-jun	06-jun	07-jun	08-jun	09-jun	10-jun	11-jun	12-jun		14-jun	15-jun	16-jun	17-jun	18-jun	19-jun	20-iun	21-jun
	lunes		miércoles		viernes		domingo		martes	miércoles	jueves	viernes		domingo		martes	miércoles		viernes	sábado	domingo	lunes	martes
Unit 2				1										, j				1					
FULL TO MIN LOAD BOILER DATA COLLECTION																							
RAMP FROM FULL LOAD TO MINIMUM LOAD																							
MILL DATA COLLECTION																							
MILL TUNING																							
MILL A																							
MILL B																							
MILL C																							
MILL D																							
MILL E																							
FINENESS TESTING																							
LAODING NEW MILL CURVES																							
TUNING WITH NORMAL COAL																							
FULL LOAD BOILER TUNING & DATA COLLECTION 100%								275 MW		275 MW													
FULL LOAD Burner adjustments 100%									275 MW	275 MW													
MEDIUM HIGH LOAD 75% (206 MW)											206 MW												
MEDIUM LOAD 50% (137,5 MW)												137,5 MW											
LOW LOAD 30% (85 MW)															85 MW	< 85 MW							
NEW MIN TECH < 30% Load																							
MAKING NEW BOILER CURVES																							
CREATE NEW LOGIC (remote engineering station)																							
INSTALL NEW LOGIC																							
LOAD RAMP TEST IN AUTO FROM FULL LOAD TO MIN LOAD AND BACK																							
TUNING FOR PRIMARY FRECUENY CONTROL (200 - 275 Mw)																							
TUNING FOR PRIMARY FRECUENY CONTROL (85 - 200 Mw)																							
HORA ENTRADA (CHILE	23:00	20:00	20:00	20:00	20:00		20:00	20:00	20:00	20:00	20:00	23:00			8:00	8:00	8:00	8:00	20:00		20:00	20:00	



#### AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning

### 5) TESTING AND SETTING UP OF BOILERS

As is done with a normal boiler and combustion tuning, the tuning and data checks consisted of a series of moves to the various combustion components and changes to the firing controls would be made to assess the behavior of the unit and measure the emission results obtained with these lower loads.

These include but are not limited to moves to main burner air dampers, burner air registers, OAP/SAP dampers, mill primary air curves, excess air, etc.

Each day we would start at a higher load and slowly decrease load as we went. The next day, the staring load would be the lowest load achieved the previous day and so on.

Also each day we would lower load further, until the minimum load was achieved and we could not lower load anymore, due to constraints or obstacles that we could not transpose, such as NOx limits.

Tuning was done over a period of 13 days and a total of 107 tests were completed on Unit 1 and 118 tests on Unit 2. Ranging from full load down to 60MW.

We started by performing a full boiler check running from full load down to 85MW on day 1 on each unit.

The tuning started at full load, followed by the half load tuning starting at 206 MWg, then 137 MWg, then the low load tuning starting at 85 MWg and ending at 60 MW G, having obtained a load reduction of 25 MWG from the original low load of 85MWg.

The first test run of the boiler was done in the AS FOUND state with the unit burning normal fuel at the minimum load the plant could support at the time. This was the multiple load test.

Following this, various boiler control parameters were tested and changed while observing how the unit would react. Based on those reactions, control change solutions were proposed and changed or modified accordingly. The data was provided from the trading desk through Excel by Mr. Marco Castro.

At the same time, Mr. Javier Brizuela and Mr. Roberto Caldera would be working in the DCS implementing the logic changes I had asked for, in order to allow operation at these low loads.

Control changes made during the test and evaluation sessions included:

- Different windbox damper positions affecting combustion
- New damper settings
- New OAP and SAP configuration
- New burner damper and register positions
- Mill tuning
- Excess air curve modifications
- Mill PA curve reduction at lower feeder speeds
- Other changes.



UNIT 1 and 2 Reduced Minimum Load Tuning

July 2022

# 6) TEST DATA

Due to their size and the amount of data collected, the data sheets are attached with this report, in the form of Excel files, and will be sent with the email in where the report is sent.

Mr. Castro received a daily copy of this data sheet each day with the results obtained and loads achieved.

At same time, the normal unit's lower end of the curves was also improved and redesigned for operations at these lower loads.

During the tuning and testing, special attention was provided to the flame scanners and flame conditions and with each test the values noted in the test data sheet.

The Excel files with the technical sheets of the Boiler are:

- Initial Boiler Load Ramp Data Test
- Full load test Mill C ON
- Full Load Test Mill C OFF
- Medium and low load testing
- Minimal Low Load Testing
- Load ramp tests



July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

# 7) TUNING IMPORTANT NOTES

The following important notes are important to mention in this report. They refer to observations and events that occurred during the tuning, that are worth noting.

#### Some of the issues were corrected or bypassed, others will remain and require future addressing

Below is a list of events. Some were corrected, others unfunded and others still need correction, but none interfere with achieving the low loads we were aiming for.

- 7.1) NOx at low loads was controlled with ammonia injection. After adjusting, the achievement reduced the ammonia injection to a minimum consumption at 60 MW
- 7.2) During tuning Mill airflow trip was at 42 ton/hr and was lowered to 35 ton/hr to avoid tripping mills once we lower the PA airflow to values as low as 10 Ton/hr. Later this was modified in the logic changes to a permanent value.
- 7.3) reduced the PA flow to a ratio that varies from 1.8 to 3.4 depending on the mill load.
- 7.4) Ignition points were observed and checked with each move.
- 7.5) tuned with all mill pairs.
- 7.6) limited the dropping of PA flow to 1.8 just for safety reasons. This gives us a large margin for instrument error and other unexpected effects inside the mills, such as roping, preferential coal paths etc.



#### AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning

# 8) CHANGES IN LOGIC AND OPERATION OF THE BOILER

The new logic was written, loaded and activated with tuning by Mr. Javier Brizuela and Mr. Roberto Caldera as we went along. The logical philosophy was provided by me.

#### The logic changes document both for Unit 1 and 2 can be found in Annex 1 at attached this report.

This logic was also populated with new curves accordingly (see below for new curves)

Logic loading was completed during tuning and logic for Windbox (auxiliary air set point), OAP and SAP and for operation below 85 MW gross were terminated. The new logic for very low load operation is as follows:

**8.1 GENERAL LOW LOAD LOGIC:** will switch to low load operation below 90 MWG and return to high load operation above 94 GMW. This is known as LOW LOAD logic and will be based on MW instead of relying on pressures and temperatures for combustion control, flame geometry and flame stability.

**8.2 HHL burner sleeve damper logic**: Below the low load setpoint and with 2 mills in service, the gates will now go from first stage pressure based windbox modulation to a MW based fixed position setting. The curves and data were provided by me and are as follows. This is valid for the operating condition of Mill "C", in service or out of service.

				HIDNE	DELEE	VE DAMPI	DE			C MILL C	NEE.	AROV			8414/			EVC	ESS AIR C	MILL OF
MA		OP >10.8	_			>10.8 <90 MV	_		START CU		/rr -		T>60 + IGNI			SHUTDOW	VN	EAC	LSS AIR C	MILL OFF
MIA	coal T/h	%			coal T/h	%			coal T/h	KVL %			coal T/h	%		F Oil P	%		BM dmd	% O2
1	0	28		1	0	32			0	28		1	0	15		0	50	1	0	10
2	15	28		2	15	32			20	33		2	30	15		20	50	2	30	8.5
3	18	28		3	20	34			27	50		3	100	15		40	50	3	37	8.23
4	20	33		4	25	40			30	52								4	54	4.6
5	27	50		5	30	44			35	55								5	81	3,45
6	30	52		6														6	107	3.5
7	35	55		7							1							7	150	3.5
8				8														8		
9				9														9		
10				10														10		
11				11			1											11		
12				12														12		
			_				-		DAMOTO		0.11	ADOV		1.0144.00					FOC ND	
			_			EVE DAMP	-	nnL				-						1	ESS AIR C	10
MA	IN NORMAL			MAIN N	1	>10.8 <90 M V	1	<u> </u>	START CU	1	-		T>60 + IGNI			SHUTDOV		- ·	-	
-	coal T/h	%			coal T/h		-	<u> </u>	coal T/h	%	-		coal T/h	%		F Oil P	%	2	30	8.5
1	0	35 35		1	0 15	34 34	-	<u> </u>	0	28 38	-	1 2	0	15 15	4 1-	20	50 50	3	38	8 4.57
2	15	35		2	20	34		<u> </u>	20	41	-	3	100	15		40	50	4	82	3.55
4	20	35		4	20	40		<u> </u>	30	41		3	100	10		40	50	5	105	3.55
5	20	41		5	30	40		<u> </u>	35	50					1  -			7	150	3.4
6	30	41		6	- 30	-44		<u> </u>	- 55	50								8	1.50	5.4
7	35	50		7				<u> </u>										9		
8	- 55			8														10		
9				9														11		
	-			10											1  -			12		
10																				



July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

			BURN	ER SLEE	VE DAMPI	ERS	HHL (	DAMPERS	C MILL	OFF -	ABOV	/E AND BE	LLOW 90	0MW			EXC	ESS AIR C	MILL OF
MAI	IN NORMAL	OP >10.8	AIN N	ORMAL OP	>10.8 <90 MV			START CU	RVE			T>60 + IGN	TER		SHUTDOW	N			
	coal T/h	*		coal T/h	%			coal T/h	%			coal T/h	%		F Oil P	%		BM dmd	% 02
1	0	30	1	0	32			0	28		1	0	15		0	50	1	0	10
2	15	35	2	15	25			20	45		2	30	15		20	50	2	30	8.5
3	19	40	3	16	28	_		27	55	_	3	100	15		40	50	3	37	8.23
4	20	50	4	20	36			30	60								- 4	54	4.6
5	27	60	5	30	45			35	60								5	81	3.45
6	30	62	6														6	107	3.5
7	35	62	7														7	150	3.5
8			8							_							8		
9			9			_				_							9		
10			10														10		
11			11														11		
			11														11		
			12	ER SLEE	VE DAMP	PERS	HHL	DAMPERS	C MILL	ON - A	ABOV	E AND BE	LLOW 90	MW			12	ESSAIR	
11 12 MAI	IN NORMAL	OP >10.8	12 BURN		VE DAMP	_	HHL	DAMPERS START CU		ON - I	ABOV	E AND BE T>60 + IGNI		MW	SHUTDOW	N	12	ESSAIR (	MILL ON
12	IN NORMAL coal T/h	OP >10.8	12 BURN			_	HHL			ON - I	ABOV			MW	SHUTDOW F Oil P	N N	12		-
12			12 BURN	ORMALOP	≻10.8 <30 M V	_	HHL	START CU	RVE	ON - A	ABOV	T>60 + IGN	TER	MW			12 EXC	BM dmd	% 02
12 MAI	coal T/h	%	12 BURN MAIN N	CRMAL OP	>10.8 <50 M V	_	HHL	START CU coal T/h	RVE %	ON - I		T>60 + IGN coal T/h	TER %	MW	FOILP	%	12 EXC 1	BM dmd 0 30 39	% 02 10 8.5 7.9
12 MAI	coal T/h 0	% 40	12 BURN MAIN N	coal T/h	⊳10.8 <50MV % 34	_	HHL	START CU coal T/h 0	RVE % 28	ON - /	1	T>60 + IGN coal T/h 0	TER % 15		F Oil P 0	% 50	12 EXC 1 2	BM dmd 0 30	% 02 10 8.5 7.9 4.5
12 MAI 1 2	coal T/h 0 15 18 20	% 40 40 40 45	12 BURN 4 AIN N 1 2 3 4	COAL OP COAL T/h 0 15 20 25	>10.8 <50 M V % 34 34 36 40	_	HHL	START CU coal T/h 0 20 27 30	RVE % 28 45 48 50	ON - /	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15		F Oil P 0 20	% 50 50	12 EXC 1 2 3	BM dmd 0 30 39 58 85	% 02 10 8.5 7.9 4.5 3.2
12 MAI 1 2 3	coal T/h 0 15 18 20 27	40 40 40 45 48	12 BURN 1 2 3	coal T/h 0 15 20	>10.8 <50 M ¥ % 34 36	_	HHL	START CU coal T/h 0 20 27	RVE % 28 45 48	ON - )	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15	MW	F Oil P 0 20	% 50 50	12 EXC 1 2 3 4 5 6	BM dmd 0 30 39 58 85 108	% 02 10 8.5 7.9 4.5 3.2 3.3
12 MAI 1 2 3 4	coal T/h 0 15 18 20 27 30	540 40 40 40 45 48 50	12 BURN 1 2 3 4 5 6	COAL OP COAL T/h 0 15 20 25	>10.8 <50 M V % 34 34 36 40	_	HHL	START CU coal T/h 0 20 27 30	RVE % 28 45 48 50	ON - /	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15		F Oil P 0 20	% 50 50	12 EXC 1 2 3 4 5 6 7	BM dmd 0 30 39 58 85	% 02 10 8.5 7.9 4.5 3.2
12 MAI 1 2 3 4 5 6 7	coal T/h 0 15 18 20 27	40 40 40 45 48	12 BURN 1 2 3 4 5 6 7	COAL OP COAL T/h 0 15 20 25	>10.8 <50 M V % 34 34 36 40	_	HHL	START CU coal T/h 0 20 27 30	RVE % 28 45 48 50	ON - /	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15		F Oil P 0 20	% 50 50	12 EXC 1 2 3 4 5 6 7 8	BM dmd 0 30 39 58 85 108	% 02 10 8.5 7.9 4.5 3.2 3.3
12 MAI 1 2 3 4 5 6 7 8	coal T/h 0 15 18 20 27 30	540 40 40 40 45 48 50	12 BURN 1 2 3 4 5 6 7 8	COAL OP COAL T/h 0 15 20 25	>10.8 <50 M V % 34 34 36 40	_	HHL	START CU coal T/h 0 20 27 30	RVE % 28 45 48 50	ON -	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15		F Oil P 0 20	% 50 50	12 EXC 1 2 3 4 5 6 7 7 8 9	BM dmd 0 30 39 58 85 108	% 02 10 8.5 7.9 4.5 3.2 3.3
12 MAI 1 2 3 4 5 6 7 8 9	coal T/h 0 15 18 20 27 30	540 40 40 40 45 48 50	12 BURN 1 2 3 4 5 6 7 7 8 9	COAL OP COAL T/h 0 15 20 25	>10.8 <50 M V % 34 34 36 40	_	HHL	START CU coal T/h 0 20 27 30	RVE % 28 45 48 50	ON - )	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15	MW	F Oil P 0 20	% 50 50	12 EXC 1 2 3 4 5 6 7 8 9 9 10	BM dmd 0 30 39 58 85 108	% 02 10 8.5 7.9 4.5 3.2 3.3
12 MAI 1 2 3 4 5 6 7 8	coal T/h 0 15 18 20 27 30	540 40 40 40 45 48 50	12 BURN 1 2 3 4 5 6 7 8	COAL OP COAL T/h 0 15 20 25	>10.8 <50 M V % 34 34 36 40	_	HHL	START CU coal T/h 0 20 27 30	RVE % 28 45 48 50	ON	1 2	T>60 + IGNI coal T/h 0 30	TER % 15 15		F Oil P 0 20	% 50 50	12 EXC 1 2 3 4 5 6 7 7 8 9	BM dmd 0 30 39 58 85 108	% 02 10 8.5 7.9 4.5 3.2 3.3

**8.3 Main windbox damper HLA Logic:** Below the low load set point and with 2 mills in service, the main windbox dampers will now go from first stage pressure based windbox modulation to a fixed position setting based on MW.

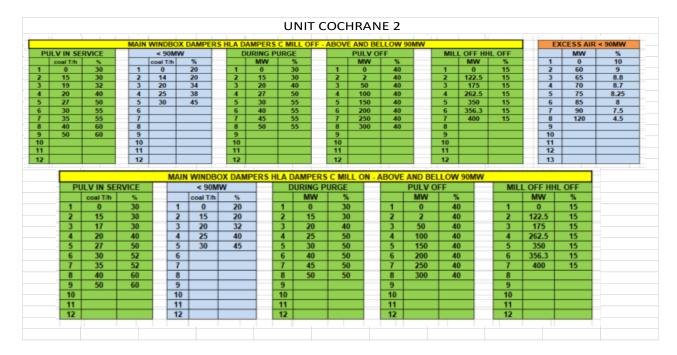
The curves and data were provided by me and are as follows. This is valid for the operating condition of Mill "C", in service or out of service.

				MAIN V	VINDBO	X DAMPE	RS H	LA DA	MPERS	C MIL	L OFF -	ABOV	e and be	LLOW 9	0MW					EXC	CESS AIR	< 90MW
۶Ū	LV IN S	ERVICE			< 90MV	V		DI	URING P	URGE			PULV C	FF		MIL	L OFF HI	IL OFF			MW	%
T	coal T/h	%			coal T/h	%			MW	%			MW	%			MW	%		1	0	10
	0	30		1	0	22		1	0	3		1	0	40		1	0	15		2	60	9.25
$\downarrow$	15	30		2	15	22		2	15	3		2	2	40		2	122.5	15		3	70	8.7
4	18	32		3	20	30		3	20	3		3	50	40		3	175	15		4	85	8.25
$\downarrow$	20	45		4	25	38		4	25	4		4	100	40		4	262.5	15		5	90	8
	27	60		5	30	45		5	30	4		5	150	40		5	350	15		6	120	4.6
	30	60		6				6	40	4		6	200	40		6	356.3	15		7		
	35	60		7				7	45	4		7	250	40		7	400	15		8		
4	40	60		8				8	50	4	5	8	300	40		8				9		
4	50	60		9				9				9				9				10		
4				10				10				10				10			_	11		
4				11				11			_	11				11			_	12		
				12				12				12				12				13		
						1			1 I		1									1		
Г					MAIN		OX [	DAMF	PERS HI		MPER	<mark>S С М</mark> І	LL ON -	ABOVE	AND	BELLO	W 90M	v				<b>—</b>
Γ	PUL	V IN SER	VICI	E		< 90N	1W			DL	JRING F	PURGE	- F	PULV OF	FF		М	ILL OFF	HHL	OFF		
Г	c	oal T/h	%			coal T/h		%			MW	9	6		MM	/	%			MW	%	
	1	0	- 30		1	0		20		1	0	3		1	0		40	1		0	15	
Γ	2	15	- 30		2	15		20		2	15	3		2	2		40	2		122.5	15	
E		18	33		3	20		30		3	20	4		3	50		40	3	·	175	15	_
	3		- 50		4	25		38		4	25	5		4	100		40	4		262.5	15	_
	4	20				30	L .	45		5	30	5		5	150		40	5		350	15	_
	4 5	27	6		5	- 30											40	6		356.3	15	
	4 5 6	27 30	6	)	6	30				6	40	5		6	200							-
	4 5 6 7	27 30 35	6	)	6 7	30				7	45	5	0	7	250		40	7	,	400	15	1
	4 5 6 7 8	27 30 35 40	60 60	)	6 7 8	30				7 8			0	7 8				7	,			1
	4 5 6 7 8 9	27 30 35	6	)	6 7 8 9	30				7 8 9	45	5	0	7 8 9	250		40	7				
	4 5 6 7 8	27 30 35 40	60 60	)	6 7 8	30				7 8	45	5	0	7 8	250		40	7	, 1 0			



July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning



**8.4 SAP logic OAP**: Below the low load set point, the shock absorbers will now go from existing high load curves and work on low load curves provided by me as follows. The curves and data were provided by me and are as follows. This is valid for the operating condition of Mill "C", in service or out of service.

	FRONT L	FET	_	F	SAP A RONT R	IGHT	MPER	S MILL C C			REAR RIG	нт		AP AND O	
	Airflow %	%			Airflow %	%		Airflow %			Airflow %	%		MW	%
1	0	0	- 1	1	0	0	1	0	0	1	0	0	1	0	0
2	30	50		2	30	50	2	30	50	2	30	50	2	50	45
3	37	50		3	37	50	3	37	50	3	37	50	3	60	50
1	42	50		4	42	50	4	42	50	4	42	50	4	75	50
5	58	60		5	58	60	5	58	60	5	58	60	5	80	60
5	75	90		6	75	90	6	75	90	6	75	90	6	90	60
,	100	90		7	100	90	7	100	90	7	100	90	7	120	60
3			1	8			8			8			8		
,				9			9			9			9		
0				10			10			10			10		
1				11			11			11			11		
			_			AND OAP D	AMPER	S MILL C	ON	1	і <sub>.</sub> . і		ALL S		
	FRONT L	EFT		F	RONT F	RIGHT		REAR L	EFT		REAR RIG	GHT		MILL C C	
	Airflow %	%			Airflow %	%		Airflow %			Airflow %	%		MW	%
1	0	0		1	0	0	1	0	0	1	0	0	1	0	0
2	30	50		2	30	50	2	30	50	2	30	50	2	50	45
3	38	50		3	38	50	3	38	50	3	38	50	3	60	50
1	42	50		4	42	50	4	42	50	4	42	50	4	65	60
5	57	65		5	57	65	5	57	65	5	57	65	5	80	60
6	75	80		6	75	80	6	75	80	6	75	80	6	90	60
7	100	85		7	100	85	7	100	85	7	100	85	7	120	60
3				8			8			8			8		
)				9			9			9			9		
0				10			10			10			10		
1				11			11		1	11			11		



July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

				SAP A	ND OAP I	DAM	PERS	MILL C O	FF					ALL S	AP AND	OAP <9
	FRONT LE	EFT	F	RONT R	IGHT			REAR LI	EFT	_		REAR RIG	<b>SHT</b>	- 1	MILL C O	FF
	Airflow %	5		Airflow %	5			Airflow %	%			Airflow %	*		MW	%
1	0	0	1	0	0		1	0	0		1	0	0	1	0	0
2	30	55	2	30	55		2	30	55		2	30	55	2	50	52
3	38	60	3	38	60		3	38	60		3	38	60	3	60	65
4	46	65	- 4	46	65		- 4	46	65		- 4	46	65	4	70	65
5	60	70	5	60	70		5	60	70	_	5	60	70	5	85	60
6	78	80	6	78	80	_	6	78	80		6	78	80	6	90	60
7	100	85	7	100	85	_	7	100	85		7	100	85	7	120	60
8			8				8				8			8		
9			9				9				9			9		
10			10				10			_	10			10		
11			11				11				11			11		
	FRONT LE	EFT	F	RONT R	AND OAP	DAM	PERS	REAR LI				REAR RIG	нт		AP AND MILL C C	
	Airflow %	%		Airflow %	5			Airflow %	%	-		Airflow %	%		MW	%
1	0	0	1	0	0		1	0	0		1	0	0	1	0	0
2	30	55	2	30	55		2	30	55		2	30	55	2	50	52
	38	60	3	38	60		3	38	60		3	38	60	3	60	65
3	45	70	- 4	45	70		4	45	70		- 4	45	70	4	70	65
4		75	5	60	75		5	60	75		5	60	75	5	85	60
4 5	60		6	75	80		6	75	80		6	75	80	6	90	60
4 5 6	75	80					7	100	85		7	100	85	7	120	60
4 5 6 7		80 85	7	100	85	-	· ·									
4 5 6 7 8	75		8	100	85		8				8			8		
4 5 6 7 8 9	75		8	100	85		9				9			9		
4 5 6 7 8	75		8	100	85											



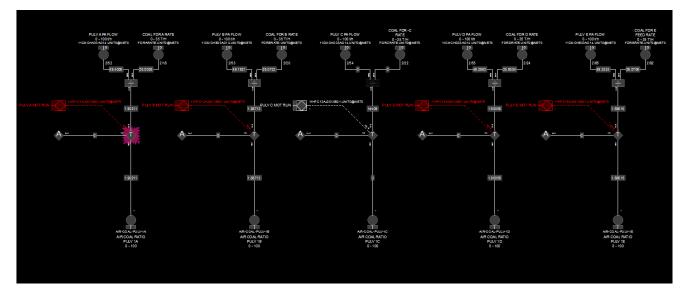
AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning

#### ANEX 1 LOGIC CHANGES

By: Alex Kossack PTS - WY

#### COCHRANE UNIT 1 LOGIC CHANGES and OTHER REQUESTS LOGIC CHANGES

1) Install in Ovation a MILL FUEL/AIR ratio window on all mill pages DONE 26 APRIL



#### FEEDER A, B, C, D, E (DROP 2 TASK 4 SHEET 121).





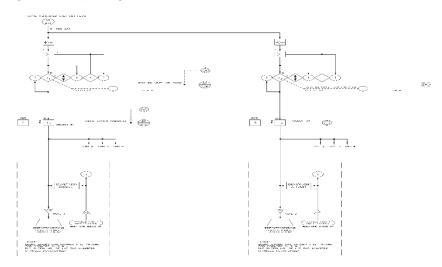
#### **AES GENER**

UNIT 1 and 2 Reduced Minimum Load Tuning

				N	EW Cl	JRV	ES FO	OR DCS	APRIL 2	022 TL	INING				
Α	PRIMAR	Y AIR	BP	RIMARY	AIR		СР	RIMARY	' AIR	DF	RIMAR	( AIR	EP	RIMARY	AIR
	Х	Y		Х	Y			Х	Y		Х	Y		Х	Y
	Feeder Speed	Air		Feeder Speed	Air			Feeder Speed	Air		Feeder Speed	Air		Feeder Speed	Air
	T/hr	T/hr		T/hr	T/hr			T/hr	T/hr		T/hr	T/hr		T/hr	T/hr
1	0	41	1	0	41		1	0	41	1	0	41	1	0	41
2	10	41	2	10	41		2	10	41	2	10	41	2	10	41
3	16	41	3	16	41		3	16	41	3	16	41	3	16	41
4	25	48.5	4	25	48.5		4	25	48.5	4	25	48.5	4	25	48.5
5	40	60	5	40	60		5	40	60	5	40	60	5	40	60
6			6				6			6			6		
7			7				7			7			7		
8			8				8			8			8		
9			9				9			9			9		
10			10				10			10			10		

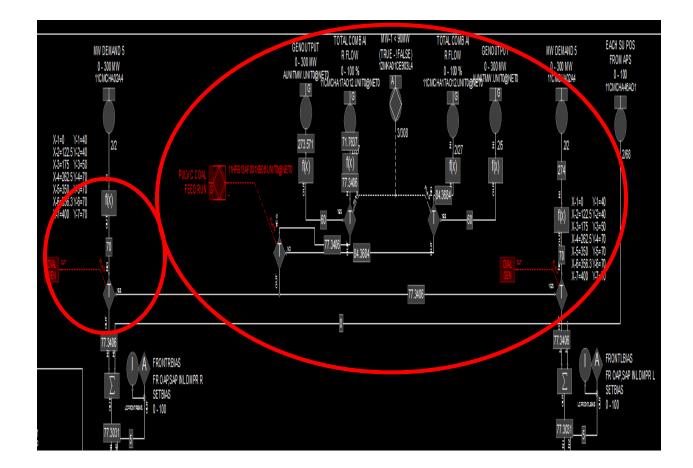
2) Install the following curves in all Mills **DONE 29 APRIL** 

3) OAP AND SAP main control – change OAP and SAP master control from load to Total Airflow percentage. A sample logic for this is below. **DONE 29 APRIL** 









# FRONT OAP/SAP DAMPER (DROP 2 TASK 4 SHEET 69)

- 11HLA36AA071
- 11HLA76AA071

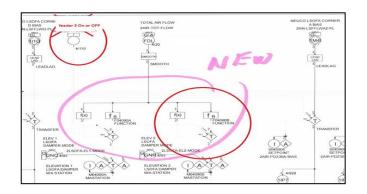
#### FRONT OAP/SAP DAMPER (DROP 2 TASK 4 SHEET 69-1)

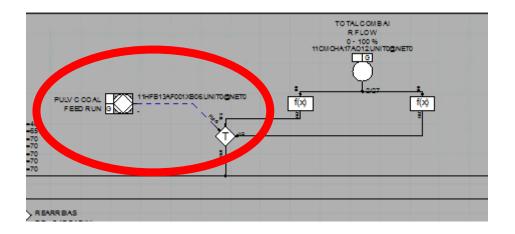
- 11HLA37AA071
- 11HLA77AA071



July 2022

4) Create 2 (Fx) for OAP and SAP one for Mill C ON and one for mill C OFF, with a transfer block activated by feeder C proven (see red below). **DONE 29 APRIL** 







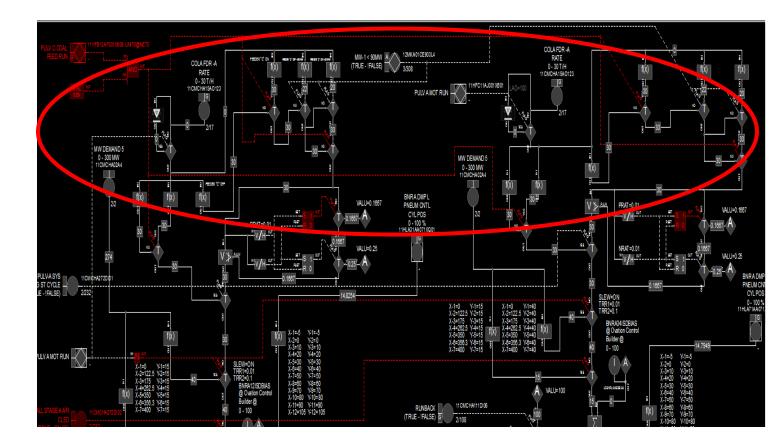
# **AES GENER**

UNIT 1 and 2 Reduced Minimum Load Tuning

5) Create 2 (Fx) for all HLA and all HHL, one for Mill C ON and one for mill C OFF, with a transfer block activated by feeder C proven. Same logic as OFS, (see red above), but with different indexes. Using the current indexes MW for HLA and Coal Flow for HHL **DONE 02 MAY** 

#### MAIN WINDBOX DAMPERS

- 11HLA31AA071 (LEFT) / 11HLA71AA071 (RIGHT) BURNER "A" (DROP 2 TASK 4 SHEET 64).
- 11HLA32AA071 (LEFT) / 11HLA72AA071 (RIGHT) BURNER "B" (DROP 2 TASK 4 SHEET 65).
- 11HLA33AA071 (LEFT) / 11HLA73AA071 (RIGHT) BURNER "C" (DROP 2 TASK 4 SHEET 66).
- 11HLA34AA071 (LEFT) / 11HLA74AA071 (RIGHT) BURNER "D" (DROP 2 TASK 4 SHEET 67).
- 11HLA35AA071 (LEFT) / 11HLA75AA071 (RIGHT) BURNER "E" (DROP 2 TASK 4 SHEET 99).



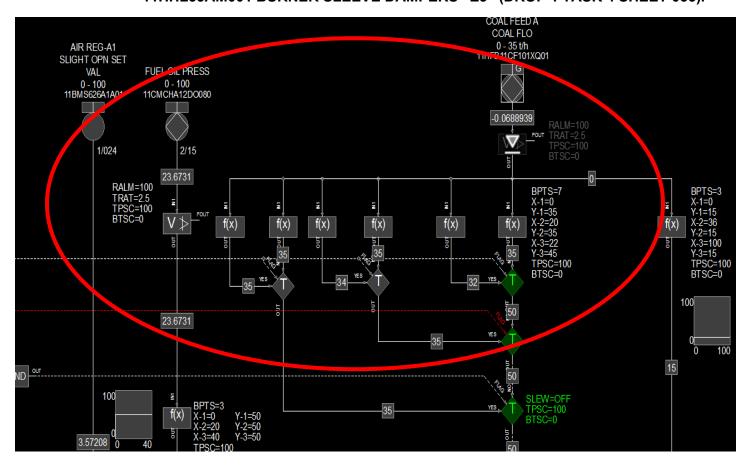


#### AES GENER

UNIT 1 and 2 Reduced Minimum Load Tuning

#### **AIR REGISTER CONTROL**

- 11HHL11AM001 BURNER SLEEVE DAMPERS "A1" (DROP 1 TASK 4 SHEET 010).
- 11HHL12AM001 BURNER SLEEVE DAMPERS "A2" (DROP 1 TASK 4 SHEET 011).
- 11HHL13AM001 BURNER SLEEVE DAMPERS "A3" (DROP 1 TASK 4 SHEET 012).
- 11HHL21AM001 BURNER SLEEVE DAMPERS "B1" (DROP 1 TASK 4 SHEET 013).
   11HHL22AM001 BURNER SLEEVE DAMPERS "B2" (DROP 1 TASK 4 SHEET 017).
- 11HHL23AM001 BURNER SLEEVE DAMPERS "B3" (DROP 1 TASK 4 SHEET 017).
   11HHL23AM001 BURNER SLEEVE DAMPERS "B3" (DROP 1 TASK 4 SHEET 021).
- 11HHL31AM001 BURNER SLEEVE DAMPERS "C1" (DROP 1 TASK 4 SHEET 014).
- 11HHL32AM001 BURNER SLEEVE DAMPERS "C2" (DROP 1 TASK 4 SHEET 014).
- 11HHL33AM001 BURNER SLEEVE DAMPERS "C3" (DROP 1 TASK 4 SHEET 022).
- 11HHL41AM001 BURNER SLEEVE DAMPERS "D1" (DROP 1 TASK 4 SHEET 015).
- 11HHL42AM001 BURNER SLEEVE DAMPERS "D2" (DROP 1 TASK 4 SHEET 019).
- 11HHL43AM001 BURNER SLEEVE DAMPERS "D3" (DROP 1 TASK 4 SHEET 023).
- 11HHL51AM001 BURNER SLEEVE DAMPERS "E1" (DROP 1 TASK 4 SHEET 016).
- 11HHL52AM001 BURNER SLEEVE DAMPERS "E2" (DROP 1 TASK 4 SHEET 020).
- 11HHL53AM001 BURNER SLEEVE DAMPERS "E3" (DROP 1 TASK 4 SHEET 035).



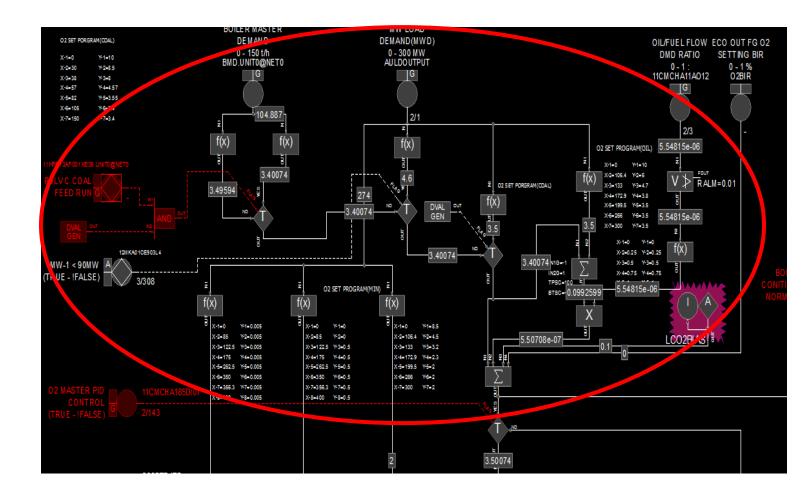


#### **AES GENER**

UNIT 1 and 2 Reduced Minimum Load Tuning

#### 6) EXCESS AIRE

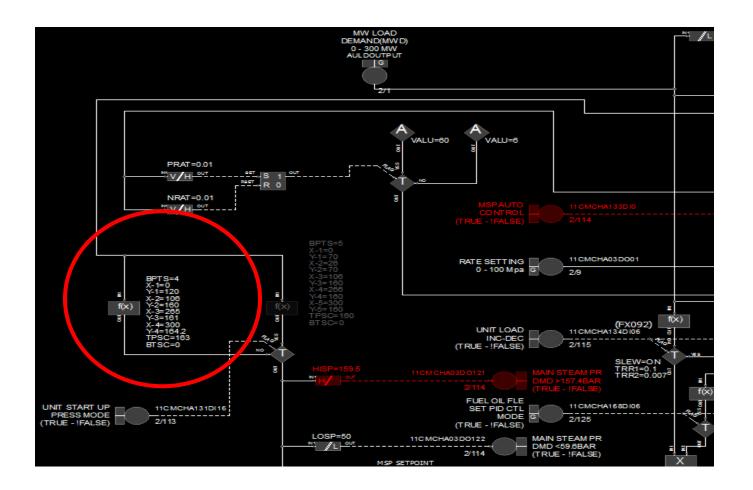
• AIR FLOW CONTROL (DROP 2 TASK 4 SHEET 25).





UNIT 1 and 2 Reduced Minimum Load Tuning

- 7) SLIDING PRESSURE
- BOILER MASTER CONTROL (DROP 2 TASK 4 SHEET 7).





July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

### OLD CURVES

PIS				
		CURVES	COCHRANE UNIT 1	
	UNIT 1	CURVES A	S FOUND DO	NOT USE
	BURNER SLEEVE DA	MPERS HHL DAMPERS		EXCESS AIR
MAIN NORMAL OP >10.8	START CURVE	T>60 + IGNITER	SHUTDOWN	
coal T/h %	coal T/h %	coal T/h %	FOILP %	MW % 0
1 0 35 2 20 35	1 0 35 2 20 35	1 0 15 2 30 15	0 50 20 50	0 10
3 22 45	3 22 45	3 100 15	40 50	133 4.7
<u> </u>	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	<u>3</u> 100 15 <u>4</u>	40 30	172.9 3.8
5 35 45	5 35 45	5		199.5 3.5
6	6	6		266 3.5
7	7	7		300 3.5
8	8	8		
9	9	9		
10	10	10		
11 12	12	11 12		
12	12			
	MAIN WINDBOX DA	MPERS HLA DAMPERS		
PULV IN SERVICE	DURING PURGE	PULV OFF	MILL OFF HHL OFF	
coal T/h %	MVV %	MVV %	MVV %	
1 0 30	1 0 40	1 0 40	1 0 15	
2 15 30 3 20 35	2 2 40 3 50 40	2 2 40 3 50 40	2 122.5 15 3 175 15	
3 20 35 4 25 40	3 50 40 4 100 40	3 50 40 4 100 40	3 175 15 4 262,5 15	
5 30 45	5 150 40	5 150 40	5 350 15	
6 40 45	6 200 40	6 200 40	6 356.3 15	
7 45 45	7 250 40	7 250 40	7 400 15	
8 50 45	8 300 40	8 300 40	8	
9	9	9	9	
10	10	10	10	
12	12	12	12	
				· · · · · · · · · · · · · · · · · · ·
		DAP DAMPERS		
FRONT LEFT	FRONT RIGHT	REAR LEFT	REAR RIGHT	
1 0 40	1 0 40	1 0 40	1 0 40	
1 0 40 2 122,5 40	2 122.5 40	1 0 40 2 122,5 40	2 122.5 40	
3 175 50	3 175 50	3 175 50	3 175 50	
4 262.5 70	4 262.5 70	4 262.5 70	4 262.5 70	
5 350 70	5 350 70	5 350 70	5 350 70	
6 356.3 70	6 356.3 70	6 356.3 70	6 356.3 70	
7 400 70	7 400 70	7 400 70	7 400 70	
8 9	8 9	8 9	<u>8</u> 9	
10	10	10	10	
11	11	11	11	

#### **NEW CURVES**

PT3				
		ER - COCHRANE UNI		

#### UNIT 1 NEW CURVES AFTER BOILER TUNING 9-MAY 2022 Alex and Javier Brizuela

_			-	_	_		_				-	_			_						
			E	BURNE	R SLEE	VE DAMPE	RS	HHL C	AMPERS	C MILL C	DFF -	ABO	E AND BE	LLOW 90	MW				EXC	ESS AIR C	MILL OFF
MAI	N NORMAL	OP >10.8		MAIN N	ORMAL OP	>10.8 <90 M V			START CU	RVE			T>60 + IGN	ITER		SHUTDOW	/N	1 -			
	coal T/h	%	1		coal T/h	%			coal T/h	%	1		coal T/h	%	1	F Oil P	%	1 [		BM dmd	% O2
1	0	28		1	0	32			0	28		1	0	15		0	50		1	0	10
2	15	28		2	15	32			20	33		2	30	15		20	50		2	30	8.5
3	18	28		3	20	34			27	50	1	3	100	15		40	50	1 [	3	37	8.23
4	20	33	1	4	25	40			30	52	1				1			1 [	4	54	4.6
5	27	50	1	5	30	44			35	55	1								5	81	3.45
6	30	52		6															6	107	3.5
7	35	55		7							1							1 [	7	150	3.5
8			1	8							1				1				8		
9			1	9							1				1			1 [	9		
10				10							1							1 [	10		
1			1	11							1				1			1 [	11		
12			1	12							1				1			1 [	12		
											-										
				BURN	ER SLEE	VE DAMP	ERS	HHL	DAMPERS	C MILL	ON -	ABOV	E AND BE	LLOW 90	MW				EXC	ESS AIR C	MILL ON
MAI	N NORMAL	OP >10.8		ALN N	ORMAL OP	>10.8 <90 M W			START CU	IRVE			T>60 + IGN	ITER		SHUTDOW	/N	1 [	1	0	10
	coal T/h	%			coal T/h	%			coal T/h	%	1		coal T/h	%	1	FOILP	%	1 [	2	30	8.5
1	0	35	1	1	0	34			0	28	1	1	0	15		0	50	1	3	38	8
2	15	35	1	2	15	34	1		20	38	1	2	30	15	1	20	50	1	4	57	4.57
3	18	35		3	20	36			27	41		3	100	15		40	50		5	82	3.55
4	20	38		4	25	40			30	44									6	105	3.4
5	27	41		5	30	44			35	50									7	150	3.4
6	30	44		6															8		
7	35	50		7															9		
8				8							1				1 1				10		



July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

				MAIN	WINDBO	X DAMPER	RS HL		APERS	CMILLO	EE - AB	OVE AN	BELLOV	V 90MV	v	_			FX	CESS A	IR < 90MW	
	PI	JLV IN SE	RVICE		< 90M				RING PL				V OFF			L OFF H	IHI OFF			MW	%	
		coal T/h	KVICE %		coal T/h	%			MW	%		P0			MIL		<u>%</u>		1	0	10	
	1	0	30	1	0	22		1	0	30		1			1	0	15		2	60	9.25	
	2	15	30	2	15	22		2	15	30		2			2	122.5	15		3	70	8.7	
	3	13	30	3	20	30		3	20	35		3 5			3	175	15		4	85	8.25	
	4	20	45	4	25	38		4	25	45		4 1	_		4	262.5	15		5	90	8	
								<u> </u>						-					-			
	5	27	60	5	30	45		5	30	45		5 1	_		5	350	15		6	120	4.6	
	6	30	60	6				6	40	45		6 2			6	356.3	15		7			
	7	35	60	7				7	45	45		7 2			7	400	15		8			
	8	40	60	8				8	50	45		8 3	0 4	)	8				9			
	9	50	60	9	+ +			9				9	_	_	9		+		10		_	_
	10			10				10				0	_	_	10				11			
	11			11				11				1	_	_	11				12		_	
	12			12			1	12				2	_		12	-			13			
							DCUI	A DA	UDEDC	C MILL O			PELLON	001414							_	
	PL	JLV IN SE	RVICE	MAIN	< 90M	DX DAMPE	KS HL		RING PL			VE ANI	BELLOW		L OFF H	IL OFF						
		coal T/h	%		coal T/h	%			MW	%		M	v %			MW	%	+ $+$				
	1	0	30	1	0	20		1	0	30		1	-		1	0	15	+ $+$			+	
	2	15	30	2	15	20		2	15	30		2			2	122.5		+ $+$			+	
	3	18	33	3	20	30		3	20	40		3 5			3	175	15	+ $+$			+	
	4	20	50	4	25	38		4	25	50		4 1			4	262.5	15	+ $+$	_		+	
	5	27	60	5	30	45		5	30	50		5 1			5	350	15	+ $+$	_		+	
	6	30	60	6		-10		6	40	50		6 2			6	356.3	15	+ $+$	_		+	
	7	35	60	7				7	40	50		7 2			7	400	15	+ $+$	_		+	
	8	40	60	8	+ +			8	50	50		8 3			8	400	- 15					
	9	50	60	9	+ +			9				9	<u> </u>	<u> </u>	9	+	+					_
	10			10	+ +			10				0			10	+	+					
	1 11			11			1	11				1			11		+					
	11			11				11 12				2			11			-				
		1			1		1	12	1	1		2										
	12	1		12	SAP	AND O		12	IPERS		C OF	2 F			12				4			
	12 FRONT L			12	SAP FRONT	RIGHT		12	IPERS	REA	C OF	2 FT	1		12 REAF	RIGH			4		MILL C C	FF
	12 FRONT L Airflow %	%		12	SAP FRONT Airflow	RIGHT		12		REA	C OF R LE	E FT %			12 REAF	ww %	%		4			۶ ۶
	12 FRONT L			12	SAP FRONT	RIGHT		12	1	REA	C OF R LE	2 FT		1 2	12 REAF	w %			4	1	MILL C C	9
	FRONT L Airflow % 0 30 37	0 0 50 50	)	12 1 1 2 3	SAP FRONT Airflow 0 30 37	RIGHT	0 0	12	1 2 3	REA Airflo 0 30 37	C OF R LE	2 FT 50 50		2	REAF	0 % 7	% 0 50 50				MILL C C MW 0 50 60	9 ( 4 5
	FRONT L Airflow % 0 30 37 42	% 0 50 50 50	)	12 1 1 2 3 4	SAP FRONT Airflow 0 30 37 42	RIGHT % % 0 50 50 50	0 0 0	12	1 2 3 4	REA Airflo 0 30 37 42	C OF R LE	2 FT 50 50 50		2 3 4	REAF Airflo 3i 3 4	0 7 2	% 0 50 50 50		-	1 2 3 4	MILL C C MW 0 50 60 75	9 ( 4 5 5
	FRONT L Airflow % 0 30 37 42 58	% 0 50 50 50 60	) )	12 1 2 3 4 5	SAP FRONT Airflow 0 30 37 42 58	RIGHT % % 0 50 50 50 60	0 0 0 0 0	12	1 2 3 4 5	REA Airflo 0 30 37 42 58	C OF R LE w %	2 FT 50 50 50 60		2 3 4 5	REAF Airfle 0 3 3 4 5	0 % 7 2 8	% 0 50 50 50 60			1 2 3 4 5	MILL C C MWV 0 50 60 75 80	0FF 9 ( 4 5 5 6
	FRONT L Airflow % 0 30 37 42 58 75	% 0 50 50 50 60 90		12 1 2 3 4 5 6	SAP FRONT Airflow 0 30 37 42 58 75	RIGHT % % 0 50 50 50 60 90	0 0 0 0 0 0 0	12	1 2 3 4 5 6	REA Airflo 0 30 37 42 58 75	C OF R LE w % D 7 2 3 5	2 FT 0 50 50 50 60 90		2 3 4 5 6	12 REAF Airfle 0 3 4 5 7	0 % 0 0 7 2 8 5	% 0 50 50 50 60 90			1 2 3 4 5 6	MILL C C MW 0 50 60 75 80 90	0FF 9 ( 4 5 5 6 6
	FRONT L Airflow % 0 30 37 42 58	% 0 50 50 50 60		12 1 2 3 4 5 6 7	SAP FRONT Airflow 0 30 37 42 58	RIGHT % % 0 50 50 50 60	0 0 0 0 0 0 0	12	1 2 3 4 5 6 7	REA Airflo 0 30 37 42 58	C OF R LE w % D 7 2 3 5	2 FT 50 50 50 60		2 3 4 5 6 7	REAF Airfle 0 3 3 4 5	0 % 0 0 7 2 8 5	% 0 50 50 50 60			1 2 3 4 5 6 7	MILL C C MWV 0 50 60 75 80	0FF 9 ( 4 5 5 6 6
	FRONT L Airflow % 0 30 37 42 58 75	% 0 50 50 50 60 90		12 1 2 3 4 5 6	SAP FRONT Airflow 0 30 37 42 58 75	RIGHT % % 0 50 50 50 60 90	0 0 0 0 0 0 0	12	1 2 3 4 5 6	REA Airflo 0 30 37 42 58 75	C OF R LE w % D 7 2 3 5	2 FT 0 50 50 50 60 90		2 3 4 5 6	12 REAF Airfle 0 3 4 5 7	0 % 0 0 7 2 8 5	% 0 50 50 50 60 90			1 2 3 4 5 6	MILL C C MW 0 50 60 75 80 90	0FF 9 ( 4 5 5 6 6
	FRONT L Airflow % 0 30 37 42 58 75	% 0 50 50 50 60 90		12 1 2 3 4 5 6 7 8	SAP FRONT Airflow 0 30 37 42 58 75	RIGHT % % 0 50 50 50 60 90	0 0 0 0 0 0 0	12	1 2 3 4 5 6 7 8	REA Airflo 0 30 37 42 58 75 10	C OF R LE w % D 7 2 3 5	2 FT 0 50 50 50 60 90		2 3 4 5 6 7 8	12 REAF Airflo 0 3 4 5 7 10	0 % 0 0 7 2 8 5	% 0 50 50 50 60 90			1 2 3 4 5 6 7 8	MILL C C MW 0 50 60 75 80 90	0FF 9 ( 4 5 5 6 6
	FRONT L Airflow % 0 30 37 42 58 75	% 0 50 50 50 60 90		12 1 2 3 4 5 6 6 7 8 9	SAP FRONT Airflow 0 30 37 42 58 75	RIGHT % % 0 50 50 50 60 90	0 0 0 0 0 0 0	12	1 2 3 4 5 6 7 8 9	REA Airflo 0 30 37 42 58 75 10	C OF R LE w % D 7 2 3 5	2 FT 0 50 50 50 60 90		2 3 4 5 6 7 8 9	12 REAF Airfle 0 3 4 5 7 10	0 % 0 0 7 2 8 5	% 0 50 50 50 60 90			1 2 3 4 5 6 7 8 9	MILL C C MW 0 50 60 75 80 90	0FF 9 ( 4 5 5 6 6
	FRONT L Airflow % 0 30 37 42 58 75	% 0 50 50 50 60 90		12 1 1 2 3 4 5 6 7 7 8 9 10	SAP FRONT Airflow 0 30 37 42 58 75 100	RIGHT % % 0 50 50 50 60 90	0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 7 8 9 10 11	REA Airflo 0 30 37 42 58 75 10	C OF R LE W % D 7 2 2 3 5 5 0	2 FT 0 50 50 60 90		2 3 4 5 6 7 8 9 10	12 REAF Airfle 0 3 4 5 7 10	0 % 0 0 7 2 8 5	% 0 50 50 50 60 90			1 2 3 4 5 6 7 7 8 9 9 10 11	MILL C C MW 0 50 60 75 80 90	0FF 9 ( 4 5 5 5 6 6 6 6
	FRONT L Airflow % 0 30 37 42 58 75	9% 0 500 500 600 900 900		12 1 2 3 4 5 6 7 7 8 9 10 11	SAP FRONT Airflow 0 300 37 42 58 58 75 100 58 8 58 58 58	RIGHT % % 5( 5( 6( 9( 9( 9(	00000000000000000000000000000000000000		1 2 3 4 5 6 7 7 8 9 10 11	REA Airflo 0 30 42 58 75 10 58 8 8 8 8 8 8 8 8 8 8 10 8 8 8 8 10 10 10 10 10 10 10 10 10 10 10 10 10	C OF R LE W % D 7 2 2 3 5 5 0	2 FT 0 50 50 50 60 90 90		2 3 4 5 6 7 8 9 10	12 REAF Airflc 33 44 55 77 10	0 % 0 0 7 2 8 5	% 0 50 50 60 90 90			1 2 3 4 5 6 7 8 9 10 11	MILL C C MW 0 50 60 75 80 90 120 120 AP AND MILL C C	0FF 9 ( 4 5 5 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0
2 5 6 7 7 8	12 Airflow % 0 30 37 42 58 75 100	. % 0 50 50 60 90 90		12 1 2 3 4 5 6 6 7 7 8 9 10 11	SAP FRONT Airflow 0 30 37 42 58 75 100 58 100 SAI FRONT Airflow	RIGHT ** % 0 50 50 50 90 90 90 90 PAND C RIGHT **	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 8 9 10 11 11 MPER	REA           Airflo         0           337         337           42         56           775         10           SMILL         REA           REA         Airflo		2 FT 50 50 50 60 90 90 90		2 3 4 5 6 7 8 9 10 11	REAF	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	% 0 50 50 50 60 90 90			1 2 3 4 5 6 7 8 9 9 10 11	MILL C C MW 0 50 60 75 80 90 120 120 AP AND MILL C C MW	0FF 9 (( 4 5 5 5 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 0 0 0 0
2 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0	EFT % 0		12 1 1 2 3 4 5 6 7 8 9 10 11	SAP FRONT Airflow 0 30 37 42 58 75 100 58 75 100 58 FRONT Airflow 0	RIGHT % % 0 55 55 56 66 66 90 90 90 80 80 80 80 80 80 80 80 80 8	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 8 9 10 11 11	REA           Airflo           0           337           42           58           75           10           SMILL           REA           Airflo           0           0           37           42           58           75           58           75           8           Airflo           0	C OF R LE w % 0 7 2 8 5 5 0 0 7 2 8 5 5 0 0 7 7 2 8 8 5 5 0 0 7 7 2 8 8 5 5 0 0 7 7 7 7 7 7 8 8 5 5 7 9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2 FT 50 50 50 50 90 90 90 90		2 3 4 5 6 7 8 9 10 11	12 REAF Airflo 33 44 55 77 10 REAF Airflo	2 8 5 00 7 2 8 5 00 8 8 5 00 8 8 5 00 8 8 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0	% 0 50 50 50 60 90 90			1 2 3 4 5 6 7 8 9 10 11 11 11	MILL C C MW 0 50 60 75 80 90 120 120 120 MILL C C MW 0	0FF 9 (( 4 5 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 0 0 0 0
	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30	. % 0 500 500 900 900		12 1 2 3 4 5 6 6 7 7 8 9 9 10 11	SAP FRONT Airflow 0 30 37 42 58 75 100 100 100 SAI FRONT Airflow 0 30	RIGHT % % 0 50 50 50 60 60 60 90 90 90 90 90 90 80 80 80 80 80 80 80 80 80 80 80 80 80			1 2 3 4 5 6 7 7 8 9 10 11 11 <b>PER</b>	REA           Airflo           0           30           37           42           58           57           10           S           MILL           REA           Airflo           0           30           30	C OF R LE W % 0 7 2 8 5 0 0 7 2 2 8 5 0 0 0 8 5 0 0 0 8 8 5 0 0 0 8 8 5 0 0 0 8 8 5 0 0 0 8 8 5 0 0 0 0	2 FT 50 50 50 60 90 90 90 90		2 3 4 5 6 7 8 9 10 11	REAF Airflo 3 3 4 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	ow % ) 0 7 2 8 5 00 8 8 5 00 8 8 5 00 0 0 0 0 0 0 0 0 0 0 0 0	% 0 50 50 50 60 90 90 90			1 2 3 4 5 6 7 7 8 9 9 10 11 11 11 2	MILL C C MW 0 50 60 75 80 90 120 120 AP AND MILL C C MW 0 50	0FF 9 () 4 5 5 6 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0
00	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 30 30 30 30 30 30 42 58 58 58 58 58 58 58 58 58 58	EFT 50 50 90 90 90 90 90 50 50 50		12 1 1 2 3 4 5 6 6 7 8 9 10 11 11 1 2 3	SAP FRONT Airflow 0 30 37 42 58 75 100 8 8 100 8 8 8 8 8 8 8 8 8 8 8 8 9 8 8 8 8 8 9 8 8 8 8 8 9 8	RIGHT % % 0 55 56 56 99 90 90 90 8 8 8 90 0 55 50 50 50 50 50 50 50 50	DAP 1		1 2 3 4 5 6 6 7 7 8 9 10 11 11 <b>MPER</b>	REA           Airflo           0           33           342           58           75           10           SMILL           REA           Airflo           0           36           31           32	C OF R LE W % 0 7 2 8 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 FT % 0 50 50 50 60 90 90 90 90 90 90		2 3 4 5 6 7 8 9 9 10 11	12           REAF           Airflc           0           33           44           55           10           REAF           Airflc           10           REAF           Airflc           33           33           33	2 RIGH	% 0 50 50 50 60 90 90 90			1 2 3 4 5 6 6 7 8 9 9 10 11 11 11 2 3	MILL C C MW 0 50 60 75 80 90 120 120 120 120 MILL C MILL C MW 0 50 60	0FF 9 ( 4 5 5 5 5 6 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0
2 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 38 42	EFT % 0 500 500 500 600 900 900 900 900 900 900 9		12 1 2 3 4 5 6 6 7 8 9 9 10 11	SAP FRONT Airflow 0 30 37 42 58 75 100 58 100 SAI FRONT Airflow 0 30 30 342	RIGHT % % 0 55 56 66 90 90 80 80 80 80 80 80 80 80 80 8	DAP 1		1 2 3 4 5 6 6 7 8 9 9 100 111 11 2 3 4	REA           Airflo           30           31           42           58           75           10           S           REA           Airflo           0           31           32           58           S           MILL           REA           Airflo           0           33           33           34           35	C OF R LE W % 0 7 2 8 5 0 0 0 2 2 8 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 FT 50 50 50 50 60 90 90 90 90 90 90 90 90 90 90 90 90 90		2 3 4 5 6 7 8 9 10 11 11	12           REAF           Airrlic           0           33           44           55           77           10           110           REAF           Airrlic           10           10           110	xx %           0           0           7           2           8           5           00           RIGH           xx %           0           0           8           0           0           8           0           0           8           2	% 0 50 50 60 90 90 90 90 1T % 0 50 50			1 2 3 4 5 6 7 8 9 9 10 11 11 11 2 3 4	MILL C C MW 0 50 60 75 80 90 120 120 120 MILL C C MW 0 50 60 65	OFF 9 ( 4 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6
00	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 30 30 30 30 30 30 42 58 58 58 58 58 58 58 58 58 58	EFT 50 50 90 90 90 90 90 50 50 50		12 1 1 2 3 4 5 6 6 7 7 8 9 10 11 11 1 1 2 3 4 4 5	SAP FRONT Airflow 0 30 37 42 58 75 100 8 8 100 8 8 8 8 8 8 8 8 8 8 8 8 9 8 8 8 8 8 9 8 8 8 8 8 9 8	RIGHT % % 0 56 56 66 99 90 8 8 8 8 8 90 0 0 55 50 50 50 50 50 50 50	DAP 1 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 6 7 7 8 9 10 11 11 <b>MPER</b>	REA           Airflo           0           33           342           58           75           10           SMILL           REA           Airflo           0           36           31           32	C OF R LE 0 7 2 2 8 5 5 0 0 7 2 2 8 5 5 0 0 0 8 5 5 0 0 8 8 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	2 FT % 0 50 50 50 60 90 90 90 90 90 90		2 3 4 5 6 7 8 9 9 10 11	12           REAF           Airflc           0           33           44           55           10           REAF           Airflc           10           REAF           Airflc           33           33           33	xx %           0           7           2           8           55           00           RIGH           xx %           0           88           200           88           900           88           900           88           900           88           900           88           900           88           90           88           90           88           90      9	% 0 50 50 50 60 90 90 90			1 2 3 4 5 6 6 7 8 9 9 10 11 11 11 2 3	MILL C C MW 0 50 60 75 80 90 120 120 120 120 MILL C MILL C MW 0 50 60	OFF ( 4 5 5 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0
	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 30 30 57	EFT 0 500 500 600 900 900 500 500 500 500 605 605 605 6		12 1 2 3 4 5 6 6 7 8 9 9 10 11	SAP FRONT Airflow 0 30 37 42 58 75 100 58 100 SAI FRONT Airflow 0 30 38 42 57	RIGHT % % 0 55 56 56 99 90 90 90 90 90 90 90 90 90	DAP 1 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 7 8 9 10 11 11 2 3 3 4 5 6 7 7	REA           Airflo           0         0           33           342           55           10           5           5           8           MILL           REA           Airflo           0           36           36           36           36           36           37           38           42           57	C OR R LE W % D 7 2 2 8 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 7 7 7 7 5 5	2 FT 50 50 50 50 60 90 90 90 90 90 90 90 90 90 90 90 90 90		2 3 4 5 6 7 7 8 9 9 10 11 11 12 3 4 5	12           REAF           Airfle           0           33           4/           55           10           REAF           Airfle           Airfle           33           4/           53           34           55           33           34           55	xx %           0           7           2           8           5           00           RRGF           xx %           0           8           0           8           0           8           0           8           0           8           2           7           5	%           0           50           50           50           60           90           90           90           50           50           50           50           50           50           50           50           50           50           50           50           50			1 2 3 4 5 6 6 7 7 8 9 9 10 11 11 2 3 4 5 5	MILL C C MW 0 050 60 75 80 90 120 120 120 120 120 0 60 60 60 60 65 80	OFF 9 4 5 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0
	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 38 42 57 75	EFT % 0 500 500 500 900 900 900 900		12 12 3 4 5 6 6 7 7 8 9 10 11 11 2 3 4 4 5 6 7 8	SAP FRONT 0 30 37 42 58 75 100 SAI FRONT Airflow 0 30 38 42 57 75	RIGHT % % % 0 55 55 56 60 94 94 94 94 94 95 55 55 55 65 55 65 65 55 65 6	DAP 1 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 8 9 9 10 11 11 2 2 3 4 5 6 6 7 8	REA           Airflo           0         30           31         31           42         58           75         75           S MILL         REA           Airflo         0           30         30           31         36           42         51           57         75	C OR R LE W % D 7 2 2 8 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 7 7 7 7 5 5	2 FT 50 50 50 50 60 90 90 90 80 50 50 50 50 50 50 50 50 50 5		2 3 4 5 6 7 8 9 9 10 11 11 11 2 3 4 4 5 6 7 8	12           REAF           Airtle           33           44           55           77           10           REAF           Airtle           33           44           53           64           33           44           53           33           34           57           77	xx %           0           7           2           8           5           00           RRGF           xx %           0           8           0           8           0           8           0           8           0           8           2           7           5	* 0 50 50 50 60 90 90 90 90 90 90 90 50 50 50 50 50 80			1 2 3 4 5 5 6 7 7 8 9 9 10 11 11 11 2 3 4 5 6 6 7 8 8 7 8	MILL C C MW 0 0 50 60 75 80 90 90 120 120 120 120 120 0 0 0 60 60 65 80 90 90	OFF 9 4 5 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0
	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 38 42 57 75	EFT % 0 500 500 500 900 900 900 900		12 1 2 3 4 5 6 7 8 9 10 11 11 2 3 4 4 5 5 6 7 8 9 9	SAP FRONT 0 30 37 42 58 75 100 SAI FRONT Airflow 0 30 38 42 57 75	RIGHT % % % 0 55 55 56 60 94 94 94 94 94 95 55 55 55 65 55 65 65 55 65 6	DAP 1 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 8 9 9 10 11 11 <b>APER</b> 10 11 <b>APER</b> 5 6 7 8 9 9 10 10 10 10 10 10 10 10 10 10	REA           Airflo           0           33           42           58           775           10           SMILL           REA           Airflo           33           36           37           775           10           SMILL           REA           Airflo           33           36           32           52           10	C OR R LE W % D 7 2 2 8 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 7 7 7 7 5 5	2 FT 50 50 50 50 60 90 90 90 80 50 50 50 50 50 50 50 50 50 5		2 3 4 5 6 7 8 9 10 11 11 2 3 4 5 6 6 7 8 9 9	12           REAF           Airtle           33           4           55           77           10           REAF           Airtle           33           44           55           77           10           8           77           10           77           10           77           10           10	xx %           0           7           2           8           5           00           RRGF           xx %           0           8           0           8           0           8           0           8           0           8           2           7           5	* 0 50 50 50 60 90 90 90 90 90 90 90 50 50 50 50 50 80			1 2 3 4 5 6 7 7 8 9 10 11 11 2 3 4 5 6 7 7 8 9 9	MILL C C MW 0 0 50 60 75 80 90 90 120 120 120 120 120 0 0 0 60 60 65 80 90 90	0FF 9 0 4 5 5 6 6 6 6 6 6
	FRONT L Airflow % 0 30 37 42 58 75 100 FRONT L Airflow % 0 30 38 42 57 75	EFT % 0 500 500 500 900 900 900 900		12 12 3 4 5 6 6 7 7 8 9 10 11 11 2 3 4 4 5 6 7 8	SAP FRONT 0 30 37 42 58 75 100 SAI FRONT Airflow 0 30 38 42 57 75	RIGHT % % % 0 55 55 56 60 94 94 94 94 94 95 55 55 55 65 55 65 65 55 65 6	DAP 1 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 6 7 8 9 9 10 11 11 2 2 3 4 5 6 6 7 8	REA           Airflo           0           33           42           58           775           10           SMILL           REA           Airflo           33           36           37           775           10           SMILL           REA           Airflo           33           36           32           52           10	C OR R LE W % D 7 2 2 8 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 7 7 7 7 5 5	2 FT 50 50 50 50 60 90 90 90 80 50 50 50 50 50 50 50 50 50 5		2 3 4 5 6 7 8 9 9 10 11 11 11 2 3 4 4 5 6 7 8	12           REAF           Airfle           33           44           55           77           10           REAF           Airfle           33           44           55           77           10	xx %           0           7           2           8           5           00           RRGF           xx %           0           8           0           8           0           8           0           8           0           8           2           7           5	* 0 50 50 50 60 90 90 90 90 90 90 90 50 50 50 50 50 80			1 2 3 4 5 5 6 7 7 8 9 9 10 11 11 11 2 3 4 5 6 6 7 8 8 7 8	MILL C C MW 0 0 50 60 75 80 90 90 120 120 120 120 120 0 0 0 60 60 65 80 90 90	OFF 9 4 5 6 6 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0

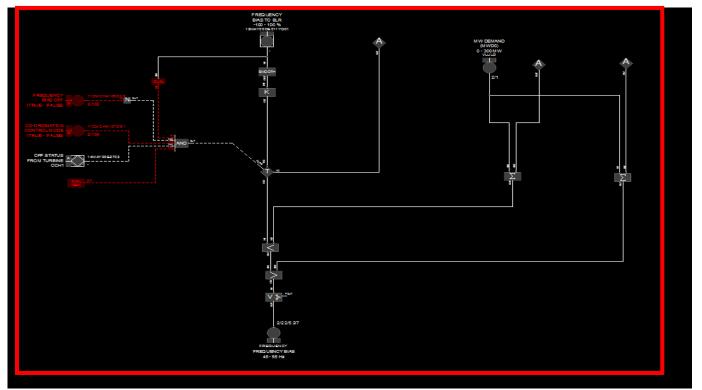


July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

# FRECUENCY CORRECTION

• (DROP 2 TASK 4 SHEET 122).

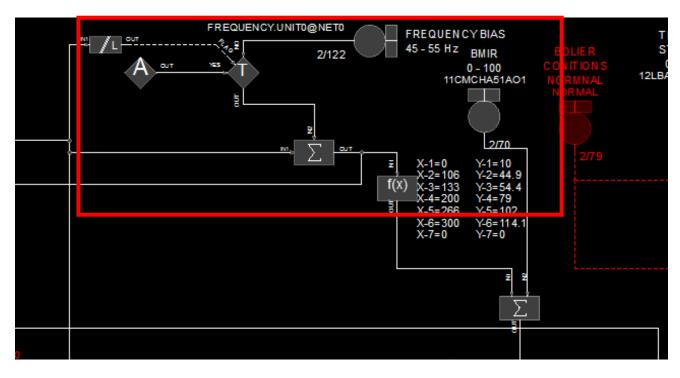




July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

# • BOILER MASTER CONTROL (DROP 2 TASK 4 SHEET 7).

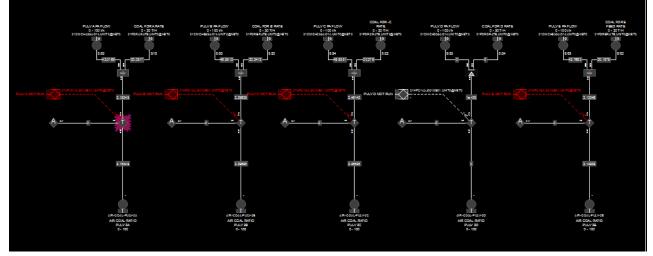




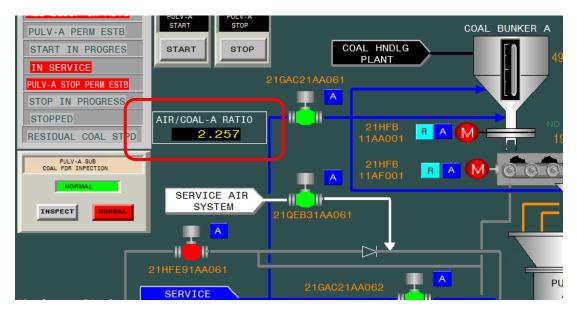
By: Alex Kossack PTS - WY

#### COCHRANE UNIT 2 LOGIC CHANGES and OTHER REQUESTS LOGIC CHANGES

8) Install in Ovation a MILL FUEL/AIR ratio window on all mill pages



# FEEDER A, B, C, D, E (DROP 8 TASK 4 SHEET 121).





UNIT 1 and 2 Reduced Minimum Load Tuning

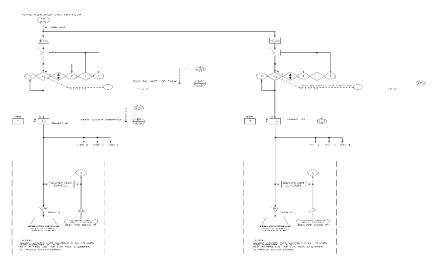
9) Install the following curves in all Mills

			_		Ν	NEM C	UR۱	VES F	OR DC S	JUNE	202	2 TUI	NING				
A	PRIMAR	Y AIR		ΒP	RIMARY	AIR		СР	RIMARY	AIR		DP	RIMAR	AIR	E PF	RIMARY	AIR
	Х	Y			Х	Y			Х	Y			X	Y		X	Y
	Feeder Speed	Air			Feeder Speed	Air			Feeder Speed	Air			Feeder Speed	Air		Feeder Speed	Air
	T/hr	T/hr			T/hr	T/hr			T/hr	T/hr			T/hr	T/hr		T/hr	T/hr
1	0	40		1	0	40		1	0	40		1	0	40	1	0	40
2	10	40		2	10	40		2	10	40		2	10	40	2	10	40
3	16	40		3	16	40		3	16	40		3	16	40	3	16	40
4	25	48		4	25	48		4	25	48		4	25	48	4	25	48
5	40	59		5	40	59		5	40	59		5	40	59	5	40	59
6				6				6				6			6		
7				7				7				7			7		
8				8				8				8			8		
9				9				9				9			9		
10				10				10				10			10		

#### NUEVAS CURVAS DE AIRE PRIMARIO DE PULVERIZADORES

July 2022

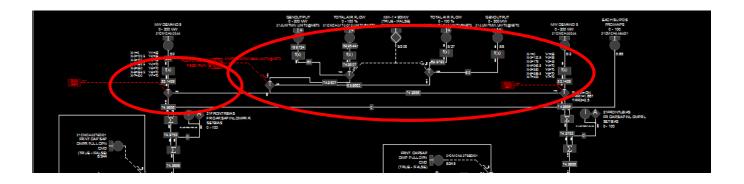
10) OAP AND SAP main control – change OAP and SAP master control from load to Total Airflow percentage. A sample logic for this is below.





July 2022

UNIT 1 and 2 Reduced Minimum Load Tuning

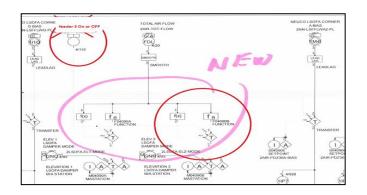


#### FRONT OAP/SAP DAMPER (DROP 8 TASK 4 SHEET 69)

- 21HLA36AA071
- 21HLA76AA071

#### FRONT OAP/SAP DAMPER (DROP 8 TASK 4 SHEET 69-1)

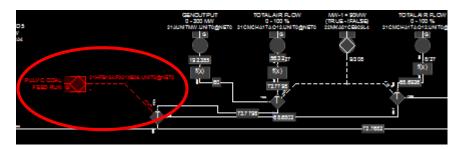
- 21HLA37AA071
- 21HLA77AA071
- 11) Create 2 (Fx) for OAP and SAP one for Mill C ON and one for mill C OFF, with a transfer block activated by feeder C proven (see red below).





July 2022

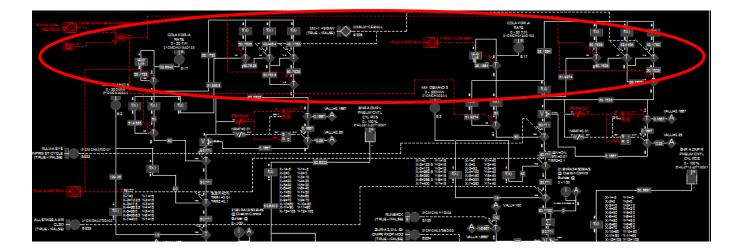
UNIT 1 and 2 Reduced Minimum Load Tuning



12) Create 2 (Fx) for all HLA and all HHL, one for Mill C ON and one for mill C OFF, with a transfer block activated by feeder C proven. Same logic as OFS, (see red above), but with different indexes. Using the current indexes MW for HLA and Coal Flow for HHL

#### MAIN WINDBOX DAMPERS

- 21HLA31AA071 (LEFT) /21HLA71AA071 (RIGHT) BURNER "A" (DROP 8 TASK 4 SHEET 64).
- 21HLA32AA071 (LEFT) / 21HLA72AA071 (RIGHT) BURNER "B" (DROP 8 TASK 4 SHEET 65).
- 21HLA33AA071 (LEFT) / 21HLA73AA071 (RIGHT) BURNER "C" (DROP 8 TASK 4 SHEET 66).
- 21HLA34AA071 (LEFT) / 21HLA74AA071 (RIGHT) BURNER "D" (DROP 8 TASK 4 SHEET 67).
- 21HLA35AA071 (LEFT) / 21HLA75AA071 (RIGHT) BURNER "E" (DROP 8 TASK 4 SHEET 99).





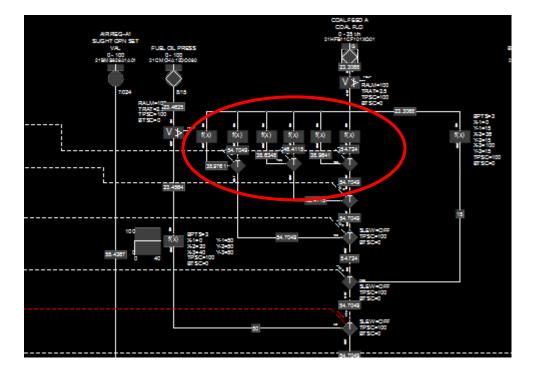
UNIT 1 and 2 Reduced Minimum Load Tuning

#### AIR REGISTER CONTROL

21HHL11AM001 BURNER SLEEVE DAMPERS "A1" (DROP 7 TASK 4 SHEET 010).

July 2022

- 21HHL12AM001 BURNER SLEEVE DAMPERS "A2" (DROP 7 TASK 4 SHEET 011).
- 21HHL13AM001 BURNER SLEEVE DAMPERS "A3" (DROP 7 TASK 4 SHEET 012).
- 21HHL21AM001 BURNER SLEEVE DAMPERS "B1" (DROP 7 TASK 4 SHEET 013).
- 21HHL22AM001 BURNER SLEEVE DAMPERS "B2" (DROP 7 TASK 4 SHEET 017).
- 21HHL23AM001 BURNER SLEEVE DAMPERS "B3" (DROP 7 TASK 4 SHEET 021).
- 21HHL31AM001 BURNER SLEEVE DAMPERS "C1" (DROP 7 TASK 4 SHEET 014).
- 21HHL32AM001 BURNER SLEEVE DAMPERS "C2" (DROP 7 TASK 4 SHEET 018).
- 21HHL33AM001 BURNER SLEEVE DAMPERS "C3" (DROP 7 TASK 4 SHEET 022).
- 21HHL41AM001 BURNER SLEEVE DAMPERS "D1" (DROP 7 TASK 4 SHEET 015).
- 21HHL42AM001 BURNER SLEEVE DAMPERS "D2" (DROP 7 TASK 4 SHEET 019).
- 21HHL43AM001 BURNER SLEEVE DAMPERS "D3" (DROP 7 TASK 4 SHEET 023).
- 21HHL51AM001 BURNER SLEEVE DAMPERS "E1" (DROP 7 TASK 4 SHEET 016).
- 21HHL52AM001 BURNER SLEEVE DAMPERS "E2" (DROP 7 TASK 4 SHEET 020).
- 21HHL53AM001 BURNER SLEEVE DAMPERS "E3" (DROP 7 TASK 4 SHEET 035).

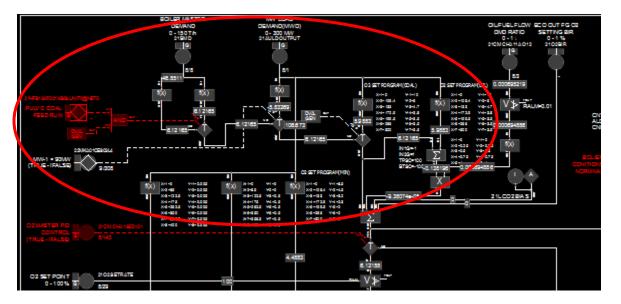




AES GENER UNIT 1 and 2 Reduced Minimum Load Tuning

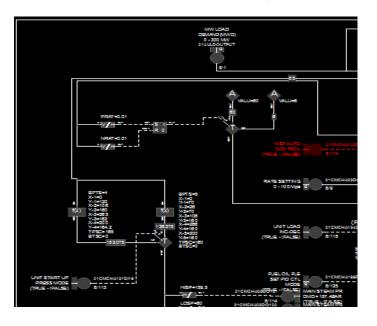
### 13) EXCESS AIRE

• AIR FLOW CONTROL (DROP 8 TASK 4 SHEET 25).



# 14) SLIDING PRESSURE

• BOILER MASTER CONTROL (DROP 8 TASK 4 SHEET 7).





UNIT 1 and 2 Reduced Minimum Load Tuning

# OLD CURVES

					L	JNIT	2		CUR	/ES	AS	5 F(	OUN	D D(	) NC	DT US	E		
					DUDN			MDED		DEDE						EVCERE			
							/E DA	MPER	S HHL DAM							EXCESS			T
MAIN	NORMAL O		┥┝		START C		-	-	T>60 + IGNI				SHUTDOV					_	
-	coal T/h	%			coal T/h	%	-	-	coal T/h	%			F Oil P	%	-	MW	% 02	_	
1	0	35		1	0	35	-	1	0	15			0	50	-	0	10	_	
2	20	35		2	20	35	4	2	30	15			20	50		106.4	6	_	
3	22	45		3	22	45		3	100	15			40	50		133	4.7		
4	30	45		4	30	45		4								172.9	3.8		
5	35	45		5	35	45		5								199.5	3.5		
6				6				6								266	3.5		
7				7				7								300	3.5		
8			1 [	8				8			1								
9				9				9											
10				10				10											
11			1 1	11				11			1								
12				12				12			1								
12			JL	12							1								1
_		_			MAIN	WINDPO		MDED	S HLA DAM	DEDC	_								
DUU		MICE		D															1
PU	LV IN SER		┥┝	0	URING F		-		PULV OF			MIL	L OFF H					 	
	coal T/h	%			MW	%	_		MW	%			MW	%				_	
1	0	30		1	0	30	_	1	0	40		1	0	15					
2	15	30		2	15	30	_	2	2	40		2	122.5	15	·			_	
3	20	35		3	20	35	_	3	50	40		3	175	15	·			_	
4	25	40		4	25	40		4	100	40		4	262.5	15					
5	30	45	4 4	5	30	45	_	5	150	40		5	350	15	·			_	
6	40	45		6	40	45	_	6	200	40		6	356.3	15					
7	45	45		7	45	45		7	250	40		7	400	15					
8	50	45		8	50	45		8	300	40		8							
9				9				9				9							
10				10				10				10							
11				11				11				11							
12			ļ	12				12				12							
							ND C	AP DA	MPERS		_								
F	RONT LE	FT		F	RONT R				REAR LE				REAR RIG	6HT					
	MW	%	[		MW	%			MW	%			MW	%					
1	0	40	[	1	0	40		1	0	40		1	0	40					
2	122.5	40	[	2	122.5	40		2	122.5	40		2	122.5	40					
3	175	50	[	3	175	50		3	175	50		3	175	50					
4	262.5	70		4	262.5	70		4	262.5	70		4	262.5	70					
5	350	70		5	350	70		5	350	70		5	350	70					
6	356.3	70		6	356.3	70		6	356.3	70	1	6	356.3	70					
7	400	70	1 1	7	400	70		7	400	70	1	7	400	70					
8			1 1	8				8			1	8							
9			1 1	9			-	9			1	9							
10			1 1	10			-	10				10							
11			1	11			-	11				11							
12			1 1	12			-	12				12							
				12				12											



# July 2022

Т

UNIT 1 and 2 Reduced Minimum Load Tuning

# NEW CURVES

				MAIN	WINDBO	X DAMPE	RSI	ILA D	AMPERS	C MILL O	FF -	ABOV	E AND BE	LLOW 90N	/W					EX	CESS AIR	< 90MW
P	JLV IN SE	RVICE			< 90M	W		D	URING P	URGE			PULV O	FF		MILL	OFF HH	IL OFF			MW	%
	coal T/h	%			coal T/h	%			MW	%			MW	%			MW	%		1	0	10
1	0	30		1	0	20		1	0	30		1	0	40		1	0	15		2	60	9
2	15	30		2	14	20		2	15	30		2	2	40		2	122.5	15		3	65	8.8
3	19	32		3	20	34		3	20	40	_	3	50	40		3	175	15		4	70	8.7
4	20	40		4	25	38		4	27	50		4	100	40		4	262.5	15		5	75	8.25
5	27	50		5	30	45		5	30	55		5	150	40		5	350	15		6	85	8
6	30	55		6				6	40	55		6	200	40		6	356.3	15		7	90	7.5
7	35	55		7				7	45	55		- 7	250	40		7	400	15		8	120	4.5
8	40	60		8				8	50	55	_	8	300	40		8				9		
9	50	60		9				9			_	9				9				10		
10				10				10			_	10				10				1		
11				11				11				11				11				12		
12				12				12				12				12			1	3		
D	JLV IN SE	DVICE	_	MAIN	WINDBO < 90M		ERS		AMPERS URING P		<u> N - /</u>	BOVE	AND BEL	LOW 90M	w	MILL	_ OFF HH			_		
	coal T/h	%							MW	%	-		MW	%		MILL	MW	%		-		
1					coal T/h	% 20		1	0			1				1	0	15				
1	0	30		1	0	20		1	0	30		1	0	40		1	0	15 15				
_	0 15				0 15	20 20		2	15			1 2 3				1 2 3	122.5	15				
3	0	30 30		1	0	20				30 30		2	0	40 40		2	-					
3 4	0 15 17	30 30 30		1 2 3	0 15 20	20 20 32		2	15 20	30 30 40		2	0 2 50	40 40 40		2	122.5 175	15 15				
1 2 3 4 5 6	0 15 17 20	30 30 30 40		1 2 3 4	0 15 20 25	20 20 32 40		2 3 4	15 20 25	30 30 40 50		2 3 4	0 2 50 100	40 40 40 40		2 3 4	122.5 175 262.5	15 15 15				
3 4 5	0 15 17 20 27	30 30 30 40 50		1 2 3 4 5	0 15 20 25	20 20 32 40		2 3 4 5	15 20 25 30	30 30 40 50 50		2 3 4 5	0 2 50 100 150	40 40 40 40 40		2 3 4 5	122.5 175 262.5 350	15 15 15 15				
3 4 5 6	0 15 17 20 27 30	30 30 30 40 50 52		1 2 3 4 5 6	0 15 20 25	20 20 32 40		2 3 4 5	15 20 25 30 40	30 30 40 50 50 50		2 3 4 5 6	0 2 50 100 150 200	40 40 40 40 40 40		2 3 4 5 6	122.5 175 262.5 350 356.3	15 15 15 15 15 15				
3 4 5 6 7	0 15 17 20 27 30 35	30 30 30 40 50 52 52 52		1 2 3 4 5 6 7	0 15 20 25	20 20 32 40		2 3 4 5 6 7	15 20 25 30 40 45	30 30 40 50 50 50 50 50		2 3 4 5 6 7	0 2 50 100 150 200 250	40 40 40 40 40 40 40 40		2 3 4 5 6 7	122.5 175 262.5 350 356.3	15 15 15 15 15 15				
3 4 5 6 7 8	0 15 17 20 27 30 35 40	30 30 30 50 52 52 60		1 2 3 4 5 6 7 8	0 15 20 25	20 20 32 40		2 3 4 5 6 7 8	15 20 25 30 40 45	30 30 40 50 50 50 50 50		2 3 4 5 6 7 8	0 2 50 100 150 200 250	40 40 40 40 40 40 40 40		2 3 4 5 6 7 8	122.5 175 262.5 350 356.3	15 15 15 15 15 15				
3 4 5 6 7 8 9	0 15 17 20 27 30 35 40	30 30 30 50 52 52 60		1 2 3 4 5 6 7 8 9	0 15 20 25	20 20 32 40		2 3 4 5 6 7 7 8 9	15 20 25 30 40 45	30 30 40 50 50 50 50 50		2 3 4 5 6 7 8 9	0 2 50 100 150 200 250	40 40 40 40 40 40 40 40		2 3 4 5 6 7 8 9	122.5 175 262.5 350 356.3	15 15 15 15 15 15				

						AND OAP D	DAM	PERS			 					OAP <90
	FRONT LEFT FRONT RIGHT								REAR LE	FT		REAR RIG	iHT	MILL C OFF		
	Airflow %	%			Airflow %	%			Airflow %	%		Airflow %	%		MW	%
1	0	0		1	0	0		1	0	0	1	0	0	1	0	0
2	30	55		2	30	55		2	30	55	2	30	55	2	50	52
3	38	60		3	38	60		3	38	60	3	38	60	3	60	65
4	46	65		4	46	65		4	46	65	4	46	65	4	70	65
5	60	70		5	60	70		5	60	70	5	60	70	5	85	60
6	78	80		6	78	80		6	78	80	6	78	80	6	90	60
7	100	85		7	100	85		7	100	85	7	100	85	7	120	60
8				8				8			8			8		
9				9				9			9			9		
10				10				10			10			10		
11				11				11			11			11		

					SAP	AND OAP	DAM	PERS	MILL C C	)N					ALL S	AP AND	OAP <90		
FRONT LEFT FRONT RIGHT							REAR LEFT						REAR RIG	GHT	MILL C ON				
	Airflow %	%			Airflow %	%			Airflow %	%			Airflow %	%		MW	%		
1	0	0		1	0	0		1	0	0		1	0	0	1	0	0		
2	30	55		2	30	55		2	30	55		2	30	55	2	50	52		
3	38	60		3	38	60		3	38	60		3	38	60	3	60	65		
4	45	70		4	45	70		4	45	70		4	45	70	4	70	65		
5	60	75		5	60	75		5	60	75		5	60	75	5	85	60		
6	75	80		6	75	80		6	75	80		6	75	80	6	90	60		
7	100	85		7	100	85		7	100	85		7	100	85	7	120	60		
8				8				8				8			8				
9				9				9				9			9				
10				10				10				10			10				
11				11				11				11			11				

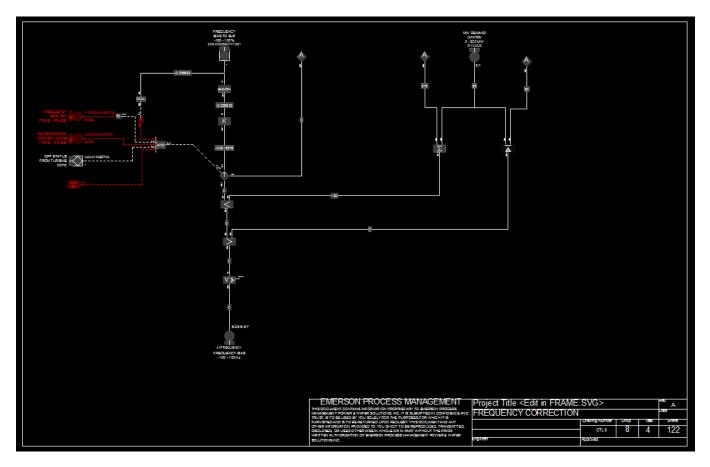
Г



UNIT 1 and 2 Reduced Minimum Load Tuning

# FRECUENCY CORRECTION

• (DROP 8 TASK 4 SHEET 122).



July 2022



UNIT 1 and 2 Reduced Minimum Load Tuning

July 2022

• BOILER MASTER CONTROL (DROP 8 TASK 4 SHEET 7).

X1-1 V1-10 X2/06 V2+# 9
*********************************
85 0 3
9114