TURN-KEY PLANT SOLUTIONS

BIOMASS BOILERS & HEAT PLANTS

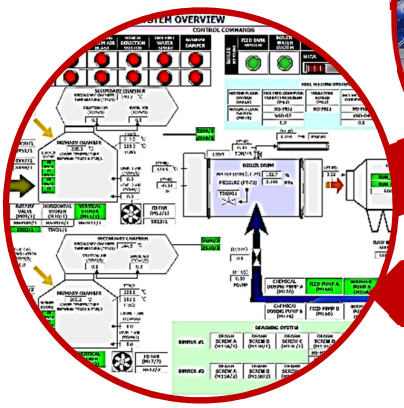
TIMBER DRYING KILNS

VISDAMAX MALAYSIA

YOUR ONE STOP SOLUTION FOR HEAT PLANTS, TIMBER DRIERS, FUEL STORAGE & HANDLING SYSTEM & CO-GENERATION PLANTS

FUEL STORAGE & HANDLING

GENERAL & CUSTOM ENGINEEERING



CUSTOM PLANT AUTO CONTROLS

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VISDAMAX MALAYSIA

VISDAMAX MALAYSIA

VISDAMAX Malaysia is a privately owned manufacturing company in Malaysia that specializes in turnkey projects covering biomass fueled boilers, heat plants, timber drying kilns, fuel storage and handling systems, customized & general engineering works, customized plant control systems and co-generation power plants.

Founded in 1993 by a team of people with over 30 years of experience, Visdamax started off by supplying semi-automatic timber drying kilns & biomass fueled steam boilers to the local Malaysian & Indonesian markets. As we grew over the years, we have enhanced our manufacturing quality and engineering designs and today, we export fully automatic biomass fueled boilers, timber drying kilns, fuel storage and handling equipment to many foreign countries. Among them are Australia, Japan, New Zealand & Russia. Our propriety boiler the Bio-T (Turbomax) Boiler is especially well received in countries with strict emissions regulations like Australia, Japan and New Zealand for its smokeless and natural low emissions along with its ability to burn wet fuels and high efficiencies.

Our factory has a production floor space of about 66,000 sqft and is fully equipped with a variety of fabrication equipment including 5 gantry cranes, 3 forklifts and a wide variety of metal working machines. With a team of about 80 dedicated engineers, staff and fabricators, we have an average annual turnover of approximately RM 12 million per year with peaks up to RM 29 million.

Our goal to our customers is to provide excellent product design, service and support at an affordable and competitive price without compromising on quality. This commitment to our customers has remained the same throughout the years. Customers have always expressed their satisfaction on the products that we have supplied to them. Given the opportunity, we would like to extend to you the same service that we have given to our very many clients.

2016-2017
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WITH EXPORTS TO OVER 12 COUNTRIES AND AGENTS IN AUSTRALIA, JAPAN & NEW ZEALAND

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TURNKEY PLANT SOLUTIONS

VISDAMAX Malaysia can provide turnkey plant solutions making life easy for the end user without having to deal with various sub-contractors & suppliers. With our experienced team of installers and project managers, we have handled large projects covering everything from civil foundations to equipment installation, building supply & erection, high pressure pipe works, electrical panels, distribution boards, plant certifications, test run, training and commissioning. Our experience gained from projects in various countries around the world (Australia, Japan, New Zealand, Russia & South East Asia) has made us very versatile in our ability to deliver complete turnkey plant solutions with minimal issues. Last but not least, with agents in the major countries that we operate in, local support is never far away and end users can have a peace of mind with after sales service.

TURNKEY PLANT SOLUTIONS

Above: Biomass fired steam boiler plant in Japan with complete fuel handling, civils and ancillaries along with timber drying kilns. This is a complete heat & timber drying plant. See pictures below.

Left: High temperature bogie truck loaded drying kilns next to the biomass fired steam boiler in Japan.

Right: We can also handle the steam & condensate return piping and ancillary equipment thus completing the entire plant turnkey.

TURNKEY PLANT SOLUTIONS

Left: ESP flue gas filtration system and ash collection system at a different project in Japan. Such systems can also be incorporated into the turnkey plant proposal if required.

Right: Full installation service can be provided for all equipment supplied. Visdamax staff are familiar with safety regulations from various countries including Australia, Japan & New Zealand.

TURNKEY PLANT SOLUTIONS

Left: Visdamax can design, supply and install building structures suited to local regulations to go with our equipment. Such designs will usually accommodate and match our equipment smoothly as opposed to have a separate contractor supply the building.

Right: Civil foundations can also be supplied to ensure minimal issues arise during equipment installation. Such foundation works will normally be done by a local contractor but under the supervision and employ of Visdamax. This way, we control the quality and accuracy of the foundation work.

Left: Electrical power distribution board, MCC boards and field wirings can also be supplied as part of the turnkey solution thus minimizing the need for various subcontractors. Boards can be designed and fabricated to comply with a wide variety of local and foreign standards or as required.

BIOMASS BOILERS & HEAT PLANTS

BIO-T TURBOMAX **PAGE 08**

VISDAMAX Malaysia has been supplying biomass fired steam boilers, hot water and oil heaters around the world for over 20 years. Not only can we supply boilers and heaters to our clients, but we can also supply a complete engineering solution for their specific energy needs. Depending on the requirements, we have a variety of solutions for most applications. Our product ranges from basic semi-auto combination boilers predominantly for the South East Asian markets, to our fully automated proprietary Bio-T boilers and heaters that have been installed in countries such as Australia, Japan, New Zealand & Russia. With renewable energy sources being an important criteria to help reduce global warming, biomass fired systems are fast becoming an ever important aspect of business operation and we remain committed to delivering the best solution to our clients.

COMBIMAX **PAGE 18**

VISDAMAX (M) SDN. BHD. EMAIL: info@visdamax.com.my ; sales@visdamax.com.my ; TEL: +60-(0)4-4892099 FAX:+60-(0)4-4892097/+60-(0)4-4892098

BIOMASS BOILERS & HEAT PLANTS

OUR PROPRIETARY FULLY AUTOMATED BIO-T FURNACE & BOILER SYSTEM

"THE BIO-T BURNER".....THE ENVIRONMENTALLY FRIENDLY, RELIABLE METHOD OF CONVERTING BIOMASS ENERGY FOR POWER GENERATION, TIMBER DRYING & VENEER KILNS, AGRICULTURAL AND COMMERCIAL HEAT ENERGY.

Our proprietary Bio-T furnace is a fully automated boiler system with its designs originating from New Zealand. Its unique features encompass the following:

- Ability to combust fuels with high moisture contents up to 130% on dry basis effectively.
- Minimal moving parts in the furnace and zero grates reduces maintenance works.
- High combustion efficiencies minimizes fuel consumption.
- High turn down ratios (5:1) allows for more flexible operation.
- Clean combustion leading to low particulate & gas emissions. Smokeless operation.
- Low fan power consumption with the need for a single FD fan only.
- Automated PLC controls for minimal operator intervention, smooth & safe plant operations.
- Controlled combustion temperatures improves furnace refractory and boiler tube life.
- Shippable in containers to be assembled at site reduces costly flat rack freight charges.

TECHNICAL SPECIFICATIONS

Bio-T Model No	Approximate Maximum Continuous Thermal Outputs			Approximate Fuel Consumption	
	Steam (kgs/hr) From & At 100°C	Hot Water (MWth) Outgoing 180°C	Thermal Oil (MWth) Outgoing 300°C	Fuel @ 50%MC on dry basis (T/day)	Fuel @ 130% on dry basis (T/day)
1800	2,000	1.3	1.1	12.1	21.0
2700	4,000	2.5	2.1	24.2	42.1
3300	6,000	3.8	3.2	36.5	63.3
3600	8,000	5.0	4.3	48.5	84.2
4200	10,000	6.3	5.4	60.7	105.3
4500	12,000	7.5	6.4	72.8	126.3

- Higher outputs (20T) can be achieved based on plant configuration & client preference for economizers or flue gas recirculation systems.
- Boilers and heaters can be designed to any suitable code including ASME, BS, EN, IBR, PD, etc. 3rd party verification comes as standard.
- Steam high pressure water tube boilers can also be supplied for power or co-generation purposes upon request.
- Various other options such as auto-deashing, heat recovery, incinerator, etc systems can be provided on request.

BIOMASS BOILERS & HEAT PLANTS

PLANTS WORLD-WIDE

We have the Bio-T system installed in the following countries around the world:

- Australia : 2 Units
- Japan : 4 Units
- Malaysia : 6 Units
- New Zealand : 6 Units
- Russia : 2 Units

USABLE BIOMASS FUEL

Acceptable wet & dry fuels:

- Wood Residues (Ideal) : Sawdust, woodchips, shavings, bark, pellets, etc
- Palm Residues: Palm kernel shell, palm fiber, shredded EFB, etc
- Other biomass fuels.

VARIOUS OUTPUTS

The Bio-T can generate the following types of heat output:

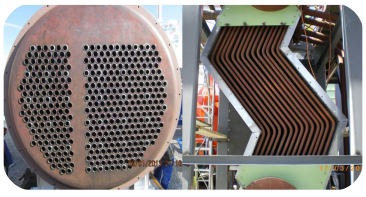
- Steam : Saturated, superheated, low or high pressures (Up to 45barg).
- Hot Water : Atmospheric or high pressure (Up to 200°C).
- Thermal Oil (Up to 300°C).

THE BIO-T IS A VERSATILE FURNACE SYSTEM CAPABLE OF BEING DESIGNED & CUSTOMIZED TO SUIT MANY APPLICATIONS AROUND THE WORLD

POWER GENERATION

The thermal energy (steam or oil) generated from the Bio-T system can also be mated to a steam turbine or ORC system for power or co-generation

BOILER/HEATER TYPE



The Bio-T system can be mated to the following types of boilers / heaters:

- Fire tube boiler.
- Water tube boiler.
- Coil system for thermal oil.
- Any other custom designed heat exchangers

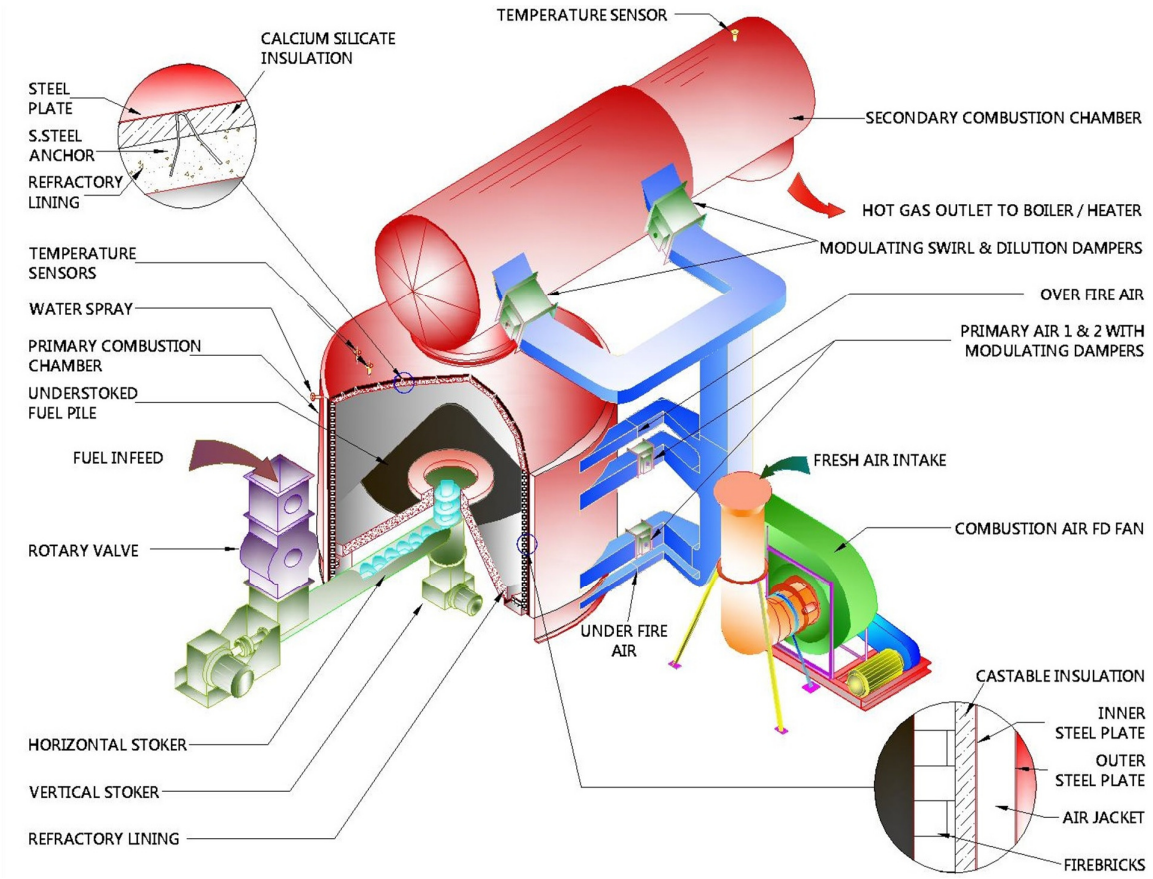
FILTRATION SYSTEM

The Bio-T system can be mated to various filtration systems to suit local conditions:

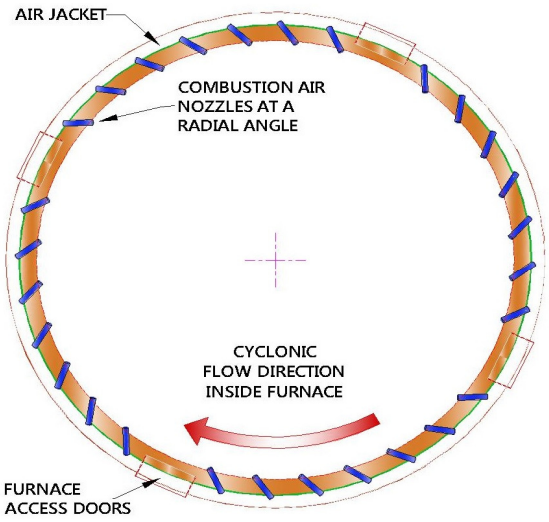
- No filtration: <200mg/Nm3
- Cyclone / Multicyclone : <150mg/Nm3
- ESP or Bagfilter : <50mg/Nm3

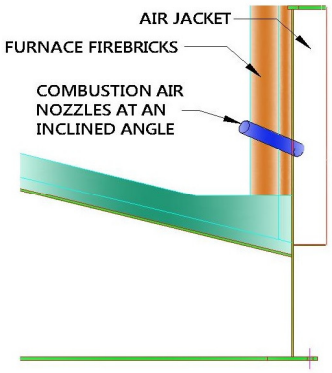
MODULAR SYSTEM

Due to the modularity of the Bio-T furnace, large systems can be erected either as a single large unit or multiple units for redundancies. Single large systems can go up to 15MWth in size and consists of 2 furnaces feeding a single boiler / heater.

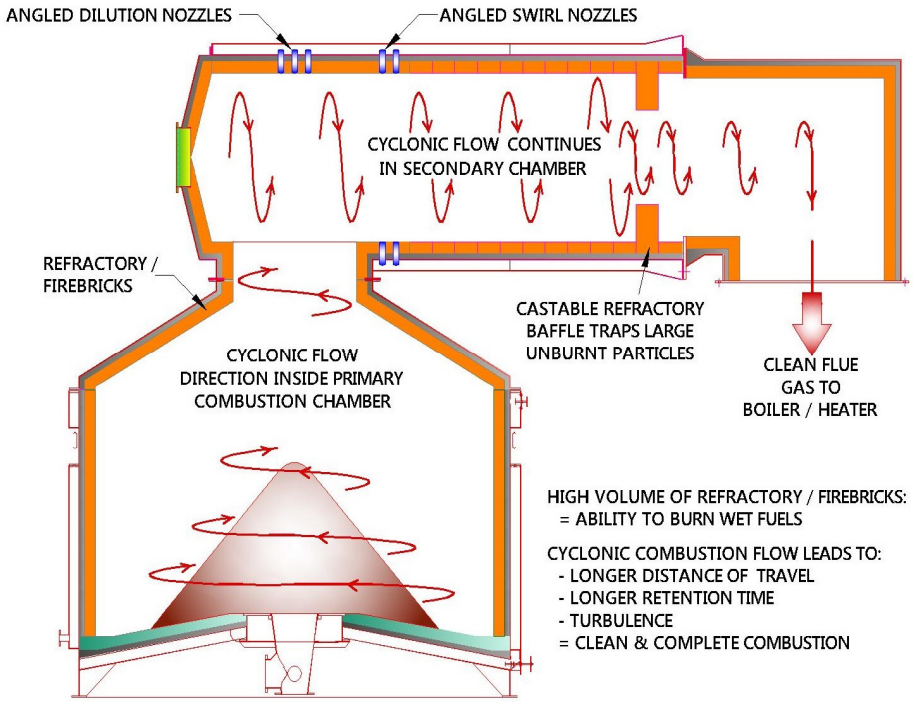


The Bio-T furnace is a unique 2 chamber combustion system with an under stoked fuel pile at the heart of the primary combustion chamber. The only moving part with respect to the furnace is the vertical stoker that feeds the fuel in from the bottom. Due to this innate design, the fuel pile is in a conical shape and acts as an insulator to protect the vertical stoker from excessive heat thus leading to minimal maintenance since no direct heat contact is present. While the furnace is in operation and as fuel is fed in from the bottom, the fuel gets drier as it progresses to the top of the pile. This helps when burning extremely wet fuel as the inherent design acts as a fuel drier. Pile height can be controlled via a gamma ray sensor or by temperature which allows the user to vary the pile size accordingly. This size adjustment ability enables the system to have high turn down ratios of up to 5:1 per furnace.



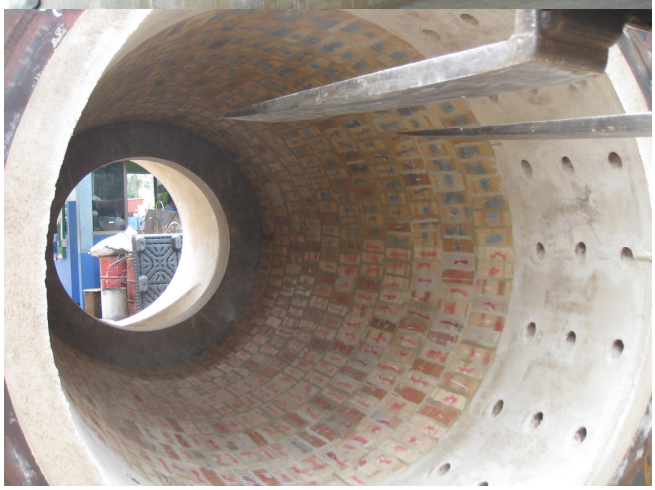


Combustion air from the FD fan (No ID fan is required, hence saves $$$) is metered accordingly via modulating dampers and enters the furnace through an air jacket that surrounds the primary chamber. (Modulating dampers are PID loop controlled via the PLC system) This air jackets acts as both an air preheater and insulator for the furnace body. The combustion air is then injected into the primary combustion chamber via many nozzles, all aligned at an angle with respect to the pile (See diagram above. The purpose of the nozzle angle is to force the combustion air to burn in a cyclonic manner. The simple reason being, a cyclonic

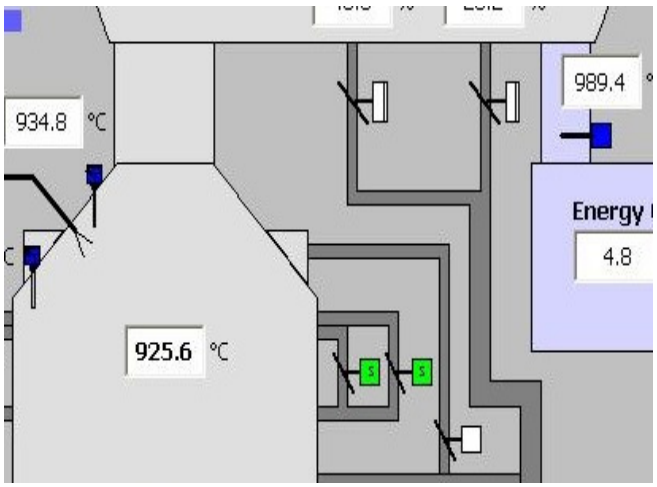


motion offers both longer distance of travel for any fly particulates as well as turbulence which is good for clean combustion and heat transfer. (See diagram on left) Modulating air dampers coupled with the fuel metering feed (VSD speed controlled) allows the PLC to control the fuel to air ratio of the system leading to a cleaner and more complete combustion.

As fuel is burning in a cyclonic and upwards angle, it will move to the secondary chamber where more combustion air at an angle is added. This further forces any fly / unburnt particulates to burn in a cyclonic manner. Finally, we have a castable baffle in the secondary chamber just before the exit to the boiler / heater. The purpose is to trap any large sized fly particulate from entering the heat exchanger system. By centrifugal force, larger particles will be flung to the outer edge of the wall where they will be trapped by the castable baffle and continue to burn until complete. These unique features ensures that only the cleanest flue gas is allowed to enter the boiler / heater part.

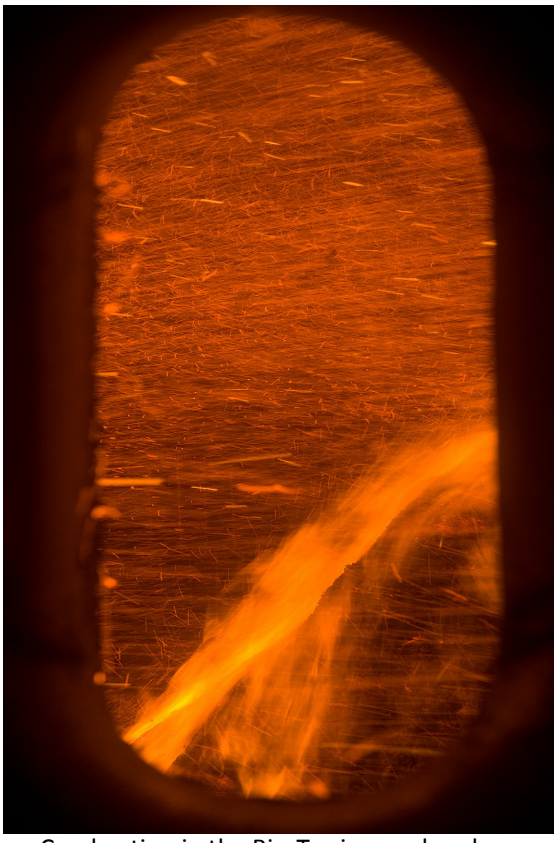


On top of the unique combustion air nozzle angle, the Bio-T furnace also comes with a high volume of refractory lined insulation and firebricks (left). This along with the controlled combustion air dampers, allows the furnace to operate at very high temperatures (See screenshot below) thus being able to combust fuels with high moisture contents up to 130% on dry basis. (Ie: A 2.3kg block of wood consisting of 1kg of wood and 1.3kgs of water) The ability to burn wet fuels minimizes the need for any fuel pre-drying thus simplifying the biomass furnace system while the high combustion temperature ensure very clean burning. (No fuel pre-drying means minimal to zero blue haze)

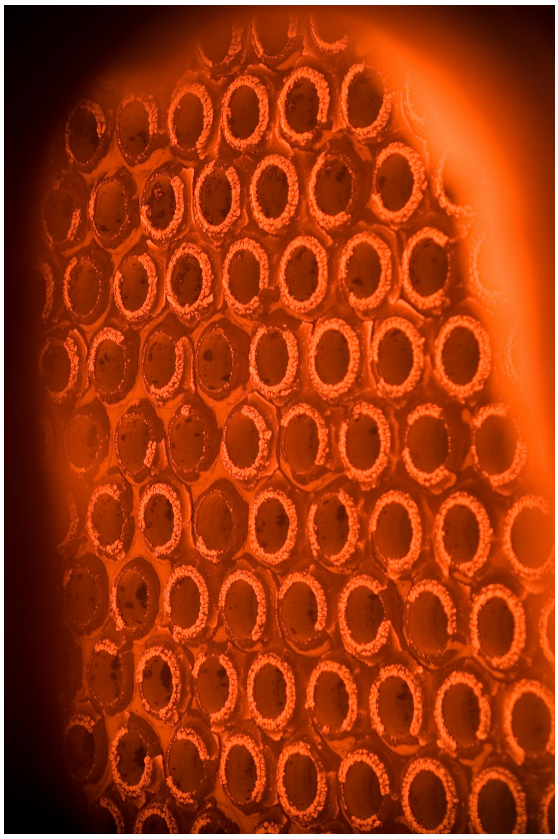


BIOMASS BOILERS & HEAT PLANTS

THE COMBINED UNIQUE FEATURES OF THE BIO-T FURNACE SYSTEM YIELDS VERY CLEAN & EFFICIENT BURNING NOT SEEN IN ANY OTHER CONVENTIONAL BIOMASS FURNACE SYSTEM.



Combustion in the Bio-T primary chamber: Presence of fly particulates in the flue gas stream still visible.



Zero fly particulates visible prior to entry into boiler tubes due to very clean combustion from the Bio-T furnace unique features.

CLEAN COMBUSTION SYSTEMS YIELDS THE FOLLOWING BENEFITS:

- Lower fuel consumption due to the higher combustion efficiencies. Minimal wastage from unburnt fuel.
- Less tube cleaning maintenance. Longer operation times between clean.
- Lower particulate emissions. Minimal to zero black smoke operation. Simpler filtration equipment.
- Zero Carbon Monoxide emissions. Environmentally friendly.

Zero Filtration Equipment: <=200mg/Nm3 Emissions	Cyclone/Multicyclone Filtration Equipment: <=150mg/Nm3 Emissions	Electro Static Precipitator Filtration Equipment: <=50mg/Nm3 Emissions

- On condition of using clean wood residue fuels (sawdust, woodchips and without bark) and with plant operating correctly.

Snapshots during dark smoke observation

on 09 February 2012

Photo 1
Dark smoke observation at Stack No. 3 (Scale = 0)

Photo 2
Dark smoke observation at Stack No.3
(Close up)

RINGELMANN-CHART READING

Location :

Hour : 14.00 - 15:00 **Date :** 9/2/2012

02		0	1/4	1/2	3/4		0	1/4	1/2	3/4
	0	0	0	0	0	30	0	0	0	0
	1	0	0	0	0	31	0	0	0	0
	2	0	0	0	0	32	0	0	0	0
	3	0	0	0	0	33	0	0	0	0
	4	0	0	0	0	34	0	0	0	0
	5	0	0	0	0	35	0	0	0	0
	6	0	0	0	0	36	0	0	0	0
	7	0	0	0	0	37	0	0	0	0
	8	0	0	0	0	38	0	0	0	0
	9	0	0	0	0	39	0	0	0	0
	10	0	0	0	0	40	0	0	0	0
	11	0	0	0	0	41	0	0	0	0
	12	0	0	0	0	42	0	0	0	0
	13	0	0	0	0	43	0	0	0	0
	14	0	0	0	0	44	0	0	0	0
	15	0	0	0	0	45	0	0	0	0
	16	0	0	0	0	46	0	0	0	0
	17	0	0	0	0	47	0	0	0	0
	18	0	0	0	0	48	0	0	0	0
	19	0	0	0	0	49	0	0	0	0
	20	0	0	0	0	50	0	0	0	0
	21	0	0	0	0	51	0	0	0	0
	22	0	0	0	0	52	0	0	0	0
	23	0	0	0	0	53	0	0	0	0
	24	0	0	0	0	54	0	0	0	0
	25	0	0	0	0	55	0	0	0	0
	26	0	0	0	0	56	0	0	0	0
	27	0	0	0	0	57	0	0	0	0
	28	0	0	0	0	58	0	0	0	0
	29	0	0	0	0	59	0	0	0	0

Point of observation

Distance of stack : 350 m

Direction of stack : North-East

Direction of wind : West - prevailing during observation

Velocity of wind : Medium

Equiv. No. 1 Units

0 ..... Unit No. 5 0

0 ..... Unit No. 4 0

0 ..... Unit No. 3 0

0 ..... Unit No. 2 0

0 ..... Unit No. 1 0

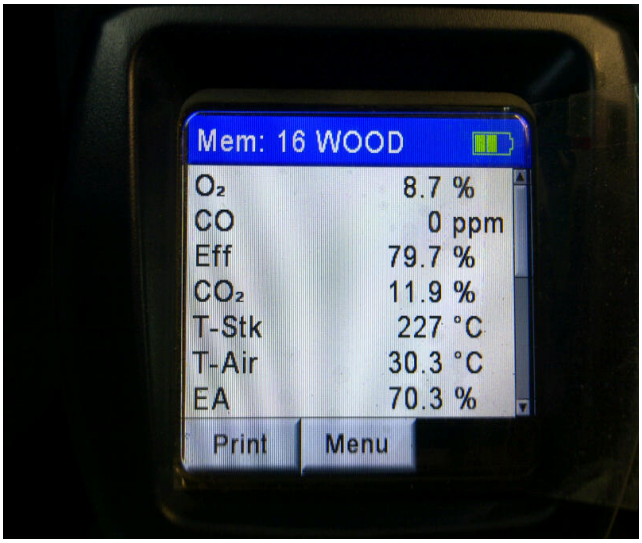
240 ..... Unit No. 0 0

240 ..... Unit 0

$\frac{0}{240}$ X 20pct =

= 0 pct Smoke density

Observer: Nuraziyanti Abdul karim
Checked By: Mohd. Rapudin Markassan



Top Left & Right: Ringlemann test performed on chimney smoke emissions at a plant in Penang, Malaysia. Zero smoke emitted.

Left: Combustion flue gas analyzer results:
Zero Carbon Monoxide.
High System Combustion Efficiency.

Results taken from a basic Bio-T plant operating correctly with no Economizer or Flue Gas Recirculation (FGR) system. Additional emissions control equipment can be added to satisfy location specific requirements.

CES/ISO-K/0307/09

EXECUTIVE SUMMARY

Dust emission measurements were carried out on Boiler No. 1 according to the Malaysian Standard MS 1596:2003 between 13:30 pm to 14:30 pm hours on 22 December 2009. Table 1 shows a summary of the results.

Summary of the Dust Emission Measurements:

Description	Units	Dust Concentration (g/m³) Stack NO.1
Dust Emission Load	g/Nm³ @actual	0.174

Left: Emissions test results from a basic Bio-T plant in Malaysia with no filtration equipment and still being able to achieve sub 200mg/Nm3 particulate emissions.

Boiler 2 Stack Exit

Table 10: Sampling Details

Sample	Start Time	End Time	Actual Gas Volume Sampled (m^3)	Total Isokinicity (%)
Run 1	10:46	11:46	0.552	**93**
Run 2	17:50	18:40	0.563	**124**

Table 11: Duct Gas Parameters

	Average Gas Temperature (°C)	Moisture Content (%)	Average CO_2 Content (%)	Average gas velocity (m/s)	Volumetric gas flow, NTP, dry (m^3/s)
Run 1	203	19.3	12	9.8	4.5
Run 2	200	20.4	10	12.6	5.6
Average	**202**	**19.9**	**11**	**11.2**	**5.0**

Table 12: Particulate Emissions

		Concentration (mg/m^3, STP, dry, 12% CO_2)	Concentration (mg/m^3, STP, dry)	Mass Emission (kg/hr)
Run 1	PM_{10}	65 ± 5	64 ± 4	1.02 ± 0.15
	TSP_{PM10}	76 ± 5	75 ± 5	1.21 ± 0.18
Run 2	PM_{10}	77 ± 5	64 ± 4	1.30 ± 0.20
	TSP_{PM10}	97 ± 7	81 ± 6	1.63 ± 0.24
Average	**PM_{10}**	**71 ± 5**	**64 ± 4**	**1.16 ± 0.17**
	TSP_{PM10}	**87 ± 6**	**78 ± 5**	**1.42 ± 0.21**

Above: Emissions test results from a Bio-T plant with a 2 stage cyclone filtration system in New Zealand achieving sub 150 mg/Nm3 particulate emissions. (Under the best of conditions, the plant actually achieved sub 100mg/Nm3)

濃 度 計 量 証 明 書

(報告様式－D210)
第 13E01100号
証明年月日　平成25年5月13日

計量証明事業(濃度) 登録茨城県第5号
計量証明事業(音圧) 登録茨城県第8号
計量証明事業(振動) 登録茨城県第3号
作業環境測定事業登録茨城県第12号

April 26

株式会社　三菱化学アナリテック　東日本事業所
〒300-0332 茨城県稲敷郡阿見町中央8丁目3番1号
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御依頼を受けました試料についての計量の結果を次のとおり証明致します。

環境計量士　杉田 和俊

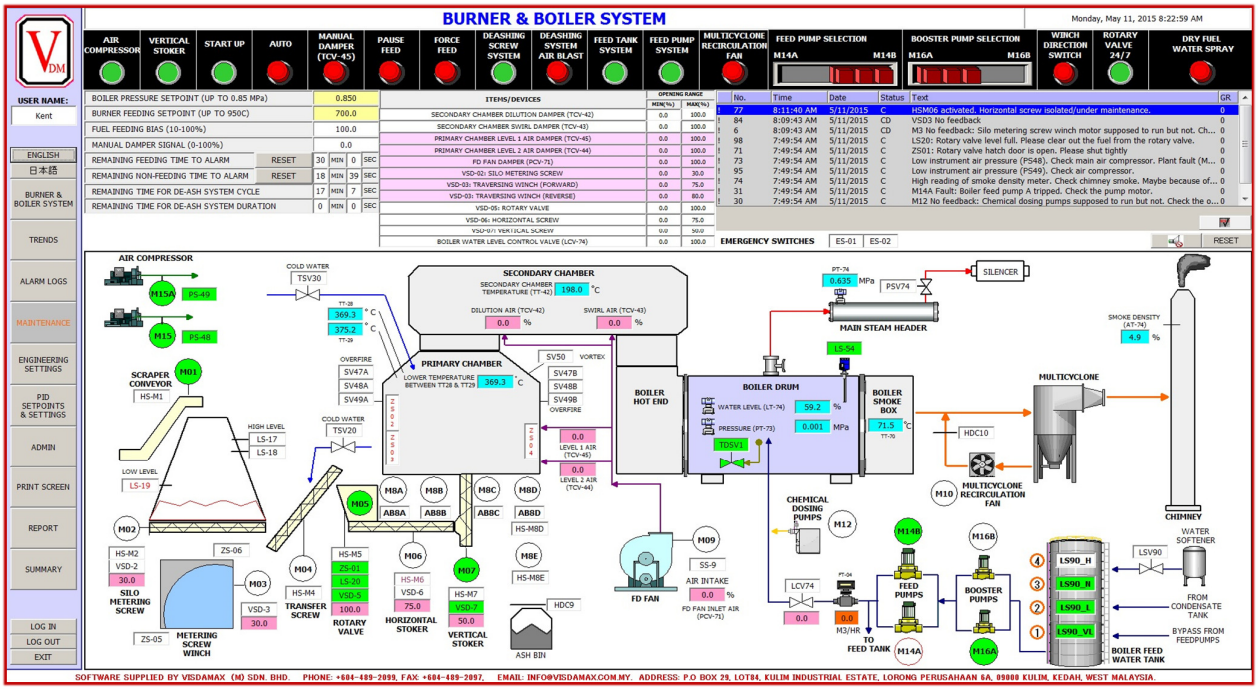
測定年月日 時分	平成25年 4月 26日 11:00～12:35	試料採取	弊方
設備名称	3号ボイラー	試料分類	排ガス・飛灰

計量の対象	単位	計量結果	基準値	定量下限	計量の方法
Wet gas ＊湿り排ガス流量	m³N/h	11,400	――	-	JIS Z 8808
Dry gas ＊乾き排ガス流量	m³N/h	10,100	――	-	JIS Z 8808
Fumes Temp ＊排ガス温度	℃	160	――	1	JIS Z 8808
Dust Density ダスト濃度	g/m³N	0.002	0.1	0.001	JIS Z 8808
Sox Density 硫黄酸化物濃度	ppm	<1	――	1	JIS K 0103 イオンクロマトグラフ法
Sox ＊硫黄酸化物排出量	m³N/h	<0.01	0.95	0.01	計算による
Nox Density 窒素酸化物濃度	ppm	120	――	20	JIS K 0104 イオンクロマトグラフ法
Nox(Oxygen 6%) 酸素6%換算窒素酸化物濃度	ppm	140	350	20	計算による
Water ＊水分量	%	11.2	――	0.1	JIS Z 8808
Oxygen 酸素濃度	%	8.4	――	0.2	JIS K 0301 オルザット分析法
－以下余白－					

[備考] ＊印の対象は、計量法第107条の計量対象外です
ダスト濃度の基準値は協定基準値を適用

Above: Emissions test results from a Bio-T plant with an Electro Static Precipitator (ESP) filtration system in Japan achieving sub 50 mg/Nm3 particulate emissions. (Actual particulate emissions was actually only 2mg/Nm3)

PLC & SCADA FULLY AUTOMATED CONTROLS TAKE THE BIO-T SYSTEM ONE STEP FURTHER IN TERMS OF SAFETY, EASE OF OPERATION, EFFICIENCY AND PERFORMANCE



A furnace system is only as good as its controller or operator. To minimize the reliance on manual input and operation, the Bio-T system is mated to a fully automated PLC controller with advanced SCADA systems. The benefits from doing so are:

- Easier plant operation as the PLC controller handles the day to days tasks automatically allowing the operator to focus on other more important aspects.
- Safer plant operation as critical set-points for temperatures, pressures, flows, water levels, etc are constantly monitored and interlocked automatically.
- Consistent output due to the automated controls. Firing rate is modulated by varying air flows and fuel feeding rates to ensure target output is maintained.
- More efficient operation due to the automated fuel to air ratio controls.
- Secure access with multi-level user accounts to prevent unauthorized access.
- Data trending (graphs) and records allows operators to assess the system history for analysis to improve plant operations.
- Alarm log records allow operators and managers to view plant errors over long periods of time.
- Remote operation or viewing via mobile phones, tablets or laptop is possible.

Left: Sample PLC hardware system embedded inside our MCC electrical boards. Common PLC controllers used in our systems include ABB, Allen Bradley, Mitsubishi, Siemens and others on specific request.

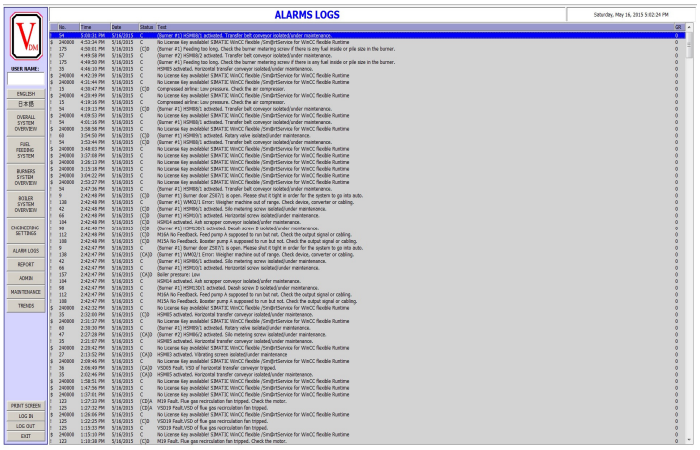
SCADA systems and / or HMI Touch Panels are supplied as standard complement to our PLC controllers for fully automated plant controls and monitoring.

BIOMASS BOILERS & HEAT PLANTS

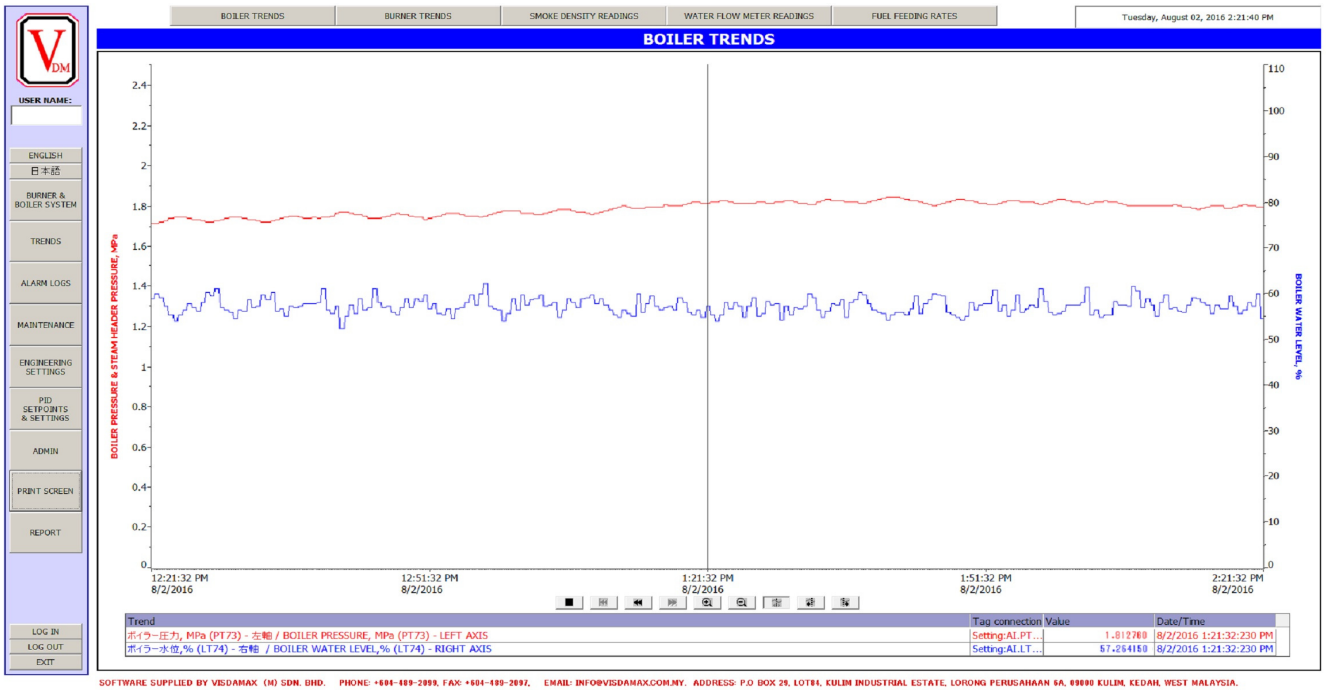
Right: A fully automated PLC plant system along with its graphical user interface allows client operators or engineers to tweak settings for best safety and performance controls. Set-points can be altered to suit varying plant operating conditions thus leading to best performance for a specific condition. Safety settings can also be altered to achieve a higher level of protection if required for example when a problem has been found but if the plant still needs to run. With restricted user access via accounts and password, managers need not fear of unauthorized changes.

SOFTWARE SWITCHES

ITEMS			SETPOINT		HYSTERISIS
BOILER WATER LEVEL CONTROL		VERY LOW (%) - ALARM. PLANT FAULT. BOTH PUMPS RUN. MANUAL RESET IS NEEDED.	20.0	+	10.0
		LOW (%) - ALARM ONLY	30.0	+	10.0
		HIGH (%) - ALARM ONLY	85.0	-	5.0
BOILER PRESSURE CONTROL		LOW (MPa) - ALARM ONLY	0.300	+	0.050
		HIGH (MPa) - MINIMUM DAMPER OPENING	0.930	-	0.030
		VERY HIGH (MPa) - ALARM & PLANT FAULT	0.960	-	0.030
STEAM HEADER: HIGH PRESSURE (MPa) - PSV20 TURN ON			0.850	-	0.070
SMOKE DENSITY METER: HIGH READING (%) - ALARM ONLY			4.5	-	0.5
CH6-NOx AVERAGE READING (HOURLY): HIGH READING (PPM)			250.0	-	10.0
CH7-SO2 AVERAGE READING (HOURLY): HIGH READING (PPM) - ALARM ONLY			50.0	-	10.0
BURNER NO.1	PRIMARY CHAMBER	MIN TEMPERATURE FOR AUTO (℃)	100.0	+	5.0
		LOW TEMPERATURE (℃) - MINIMUM DAMPERS OPENING	150.0	+	5.0
		1st LEVEL HIGH TEMPERATURE (℃) - OVERFIRE AIR NOZZLES (SV47/1) ACTIVATED.	600.0	-	5.0
		2nd LEVEL HIGH TEMPERATURE (℃) - OVERFIRE AIR NOZZLES (SV48/1) ACTIVATED.	620.0	-	5.0
		3rd LEVEL HIGH TEMPERATURE (℃) - VORTEX AIR ACTIVATED (SV51/1)	650.0	-	5.0
		4th LEVEL HIGH TEMPERATURE (℃) - MINIMUM DAMPERS OPENING	840.0	-	5.0
		5th LEVEL HIGH TEMPERATURE (℃) - WATER QUENCH VALVE ACTIVATED (TSV30/1).	860.0	-	5.0
		6th LEVEL HIGH TEMPERATURE (℃) - ALARM. PLANT FAULT. MANUAL RESET IS NEEDED.	950.0	-	5.0
	SECONDARY CHAMBER	1ST LEVEL HIGH TEMPERATURE (℃) - ALARM	1000.0	-	5.0
		2ND LEVEL HIGH TEMPERATURE (℃) - ALARM & PLANT FAULT	1050.0	-	5.0
WATER SPRAY FOR VERY DRY FUEL TEMPERATURE (℃) - TSV31/1 ACTIVATED			500.0	-	5.0



Left: Alarm logs allow the operator or manager to view any and all plant faults that has occurred over any period of time. The system can also be programmed to send email notices for critical alarms to targeted individuals so that key personnel are aware of any major issues.



Above: Notice the red graph line at a steady ≈18barg steam output over a period of several hours. A Bio-T furnace system mated to a fully automated PLC controller has the ability to deliver consistent and steady outputs. This is extremely useful for critical applications like timber drying or power generation where consistent heat is required.

BIOMASS BOILERS & HEAT PLANTS

VARIOUS PLANTS AROUND THE WORLD

Above: (5MWth, 8000kgs/hr F&A 100°C) Saturated 12barg steam boiler in Malaysia.

Above: (5MWth) High pressure hot water heater in Australia.

Above: (6.3MWth, 10,000kgs/hr F&A 100°C) Saturated 18barg steam boiler in Malaysia.

Above: (2 x 4.4MWth) High pressure hot water heat plant in New Zealand.

Above: (10MWth, 15,000kgs/hr F&A 100°C) Saturated 10barg steam boiler in Japan. (2 Furnace, 1 Boiler setup)

Above: (3 x 7.5MWth) High pressure hot water heat plant in New Zealand.

BIOMASS BOILERS & HEAT PLANTS

OUR STANDARD SEMI-AUTO COMBINATION FURNACE & BOILER SYSTEM

"THE COMBIMAX BOILER".....AN ECONOMICAL, SIMPLE, BASIC & STRAIGHTFORWARD BOILER FOR CONVERTING BIOMASS ENERGY TO USABLE HEAT FOR TIMBER DRYING & VENEER KILNS, LOW PRESSURE POWER GENERATION, AGRICULTURAL AND COMMERCIAL HEAT ENERGY.

The Combimax boiler is a simple semi-automated biomass fired system with the following basic features:

- Ability to combust fuels with moisture contents up to 60% MC on dry basis.
- Ability to consume various forms of wood residues being, sawdust, shavings, wood offcuts, timber offcuts, long slithers of wood, etc
- Various fuel infeed options ranging from manual hand infeed, conveyor infeed or blow-in feeding system.
- Low capital cost investment.
- Automated boiler water level control system.
- Simple operator oriented operation for all other controls.
- Relatively small foot print.

TECHNICAL SPECIFICATIONS

Combimax Boiler Size	Approximate Maximum Continuous Thermal Outputs			Approximate Fuel Consumption	
	Steam (kgs/hr) From & At 100°C	Hot Water (MWth) Outgoing 180°C	Thermal Oil (MWth) Outgoing 300°C	Fuel @ 50%MC on dry basis (T/day)	Fuel @ 130% on dry basis (T/day)
3T	3,000	1.9	Nil	22.6	Nil
4T	4,000	2.5	Nil	30.3	Nil
5T	5,000	3.1	Nil	37.9	Nil
6T	6,000	3.8	Nil	45.4	Nil
8T	8,000	5.0	Nil	60.5	Nil
10T	10,000	6.3	Nil	75.6	Nil

- Combimax boilers have a lower efficiency when compared to an automated Bio-T system. However, like the Bio-T, system efficiency can be increased with the addition of atmospheric water heaters or pressurized economisers.
- Boilers and heaters can be designed to any suitable code including ASME, BS, EN, IBR, PD, etc. 3rd party verification comes as standard.
- Partial automation with PLC to record and trend data can be supplied on request.

BIOMASS BOILERS & HEAT PLANTS

PLANTS WORLD-WIDE

We have the Combi boilers installed in the following countries around the world:

- Guyana : 1 Unit
- Indonesia : 5+ Units
- Malaysia : 20+ Units
- P & G : 1 Unit

USABLE BIOMASS FUEL

Acceptable fuels (MC < 60%DB):

- Wood Residues (Ideal) : Sawdust, woodchips, shavings, offcuts, etc
- Palm Residues: Palm kernel shell and palm fiber.
- Misc other dry fuels.

VARIOUS OUTPUTS

The Combi boiler can generate the following types of heat output:

- Steam : Saturated low or high pressures (Up to 25barg).
- Hot Water : Atmospheric or high pressure (Up to 200°C).

BOILER IS A BASIC & STRAIGHT-FORWARD SEMI-AUTO BOILER SYSTEM THAT IS BOTH ECONOMICAL TO OWN & SIMPLE TO OPERATE

POWER GENERATION

The steam thermal energy generated from the Combi boiler system can also be mated to a medium pressure steam turbine for pure power or co-generation.

BOILER/HEATER TYPE

The Combi boiler system is a combination of both a water tube and fire-tube boiler in one package.

- Fire tube boiler.
- Water wall tube section.

FILTRATION SYSTEM

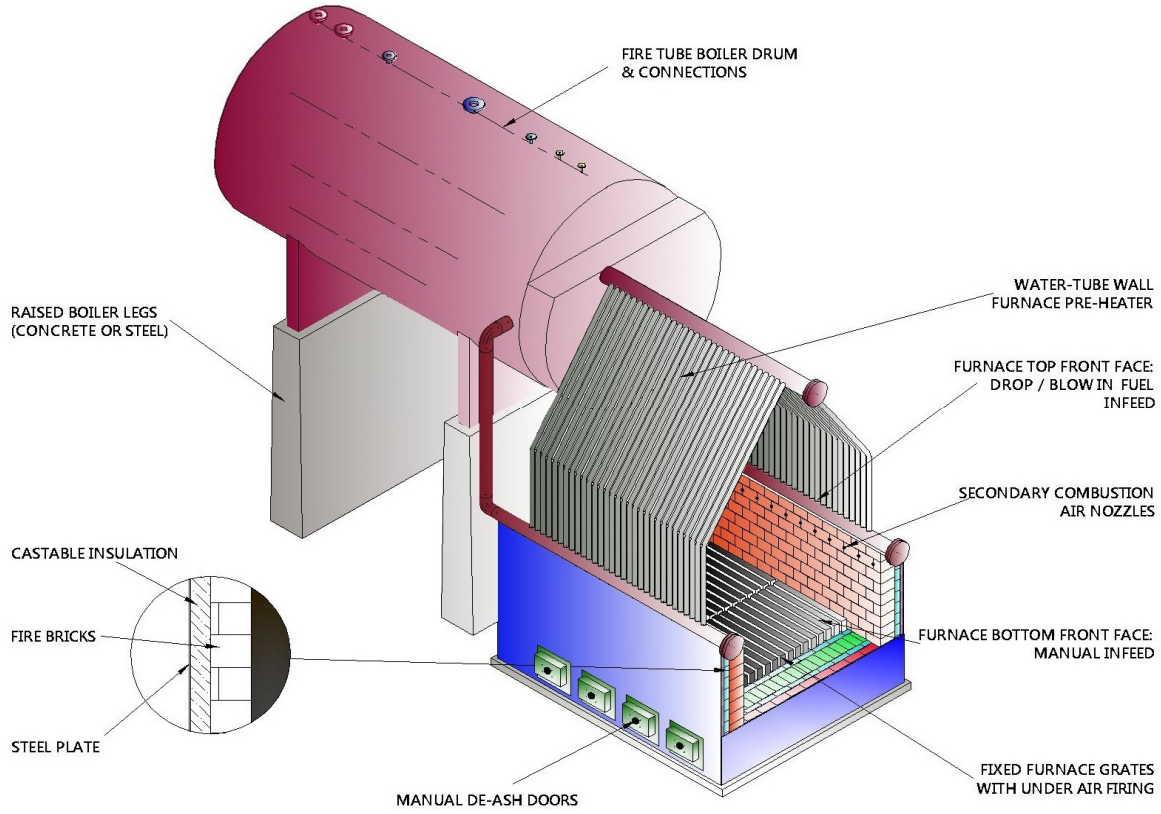
The Combi boiler system is usually mated to a multicyclone system system to achieve <400mg/Nm3 emission. Other possible filtration system includes:

- ESP or Bagfilter : <50mg/Nm3

VARIOUS INFEEDS

Combi boilers can have the following infeed systems:

- Manual hand infeed for wood/timber long offcuts.
- Blow in system for sawdust/shavings.
- Conveyor infeed for wood/timber short offcuts.



The Combimax boiler is an economical, simple and straightforward biomass fired boiler. It is essentially a combination boiler consisting of both a water tube water wall portion and fire tube drum. The Combimax is a semi-automated system in that only the boiler water level control is automated. The remaining fuel infeed and combustion air controls are manual by the operator. Biomass fuel is combusted in the furnace on a fixed grate with the main combustion air coming from under the fuel pile. Secondary combustion air is added via nozzles on the furnace side walls to help complete combustion and to minimize carryover to the fire tube drum. The Combimax can be fed via 3 simple methods: Fuel blow in system, Fuel drop in system and manual hand feed if necessary. There is minimal moving parts in the furnace thus leading to lower maintenance when compared to other similar systems. (Not including wear and tear). The relatively low capital cost for the Combimax and its simple design makes it an attractive biomass boiler solution for many clients looking for an economic system.

Above: Fixed grates with secondary combustion air nozzles being visible.

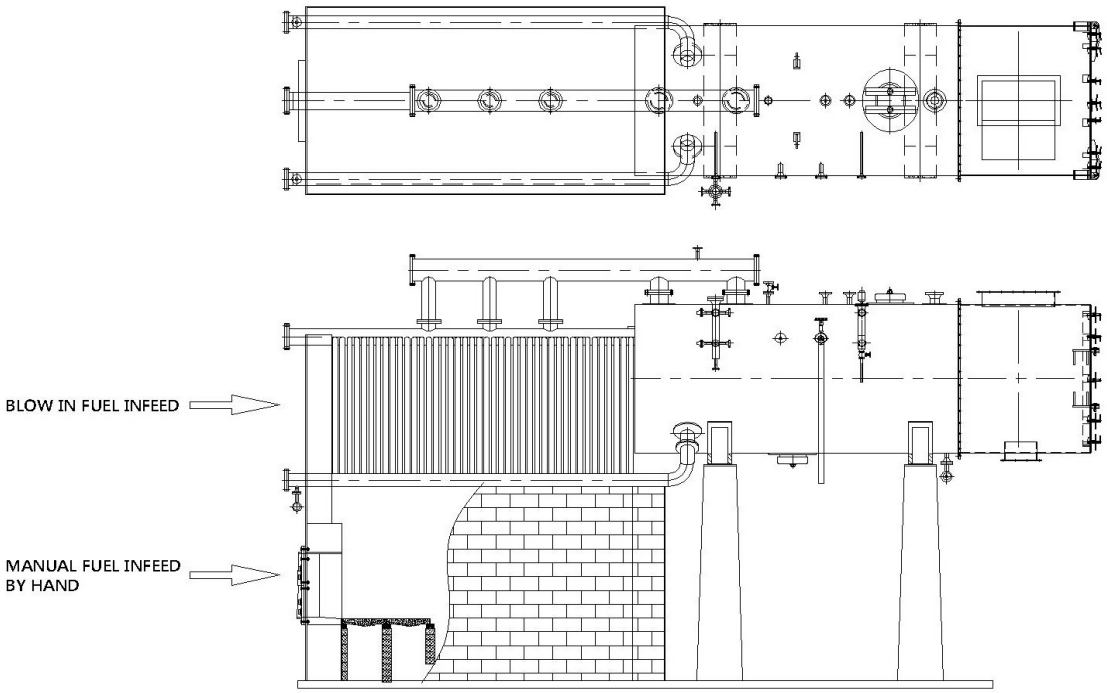
Above: Fuel blow in system. Predominantly for sawdust and shavings.

COMPARISON BETWEEN AUTOMATED BIO-T & SEMI-AUTO COMBIMAX SYSTEMS

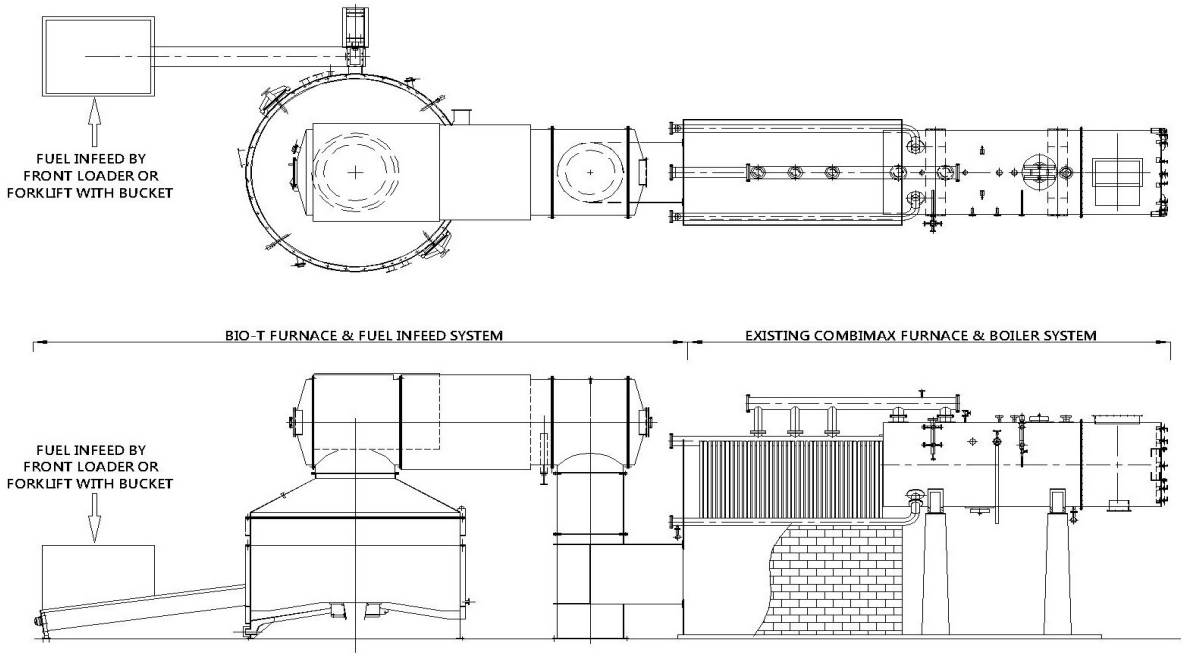
Comparison Points	Bio-T Fully Automated Furnace & Boiler System	Combimax Boiler Semi-Auto Furnace & Boiler System
Feeding System	Automatic pile bed under fed system. Feeding is done automatically based on boiler pressure. VSDs will vary the fuel feeding rate to match steam requirements. Screw will deliver fuel automatically into the furnace.	Manual. Feeding is done based on operator control. Operator decides to feed the system after viewing pressure drop on the gauge. Can be via blow in, drop in or throw in system.
Fuel Type & Moisture Content Limitation	Fuel must be in aggregate form: Sawdust, shavings, pellets or woodchips. Large blocks and offcuts must be shredded/chipped/hogged before being fed into system. The Bio-T can burn fuels with moisture content up to 130% MC on dry basis.	Fuel can be sawdust, woodchips, shavings, log/wood offcuts both short and long. However the average fuel moisture content cannot be wetter than 60-80%MC on dry basis. (Ideally, fuel must be closer to the 60% MC range for best efficiency)
Furnace Refractory Longevity	Long lasting due to zero moving parts in the furnace and zero physical contact.	Shorter life span compared to Bio-T system. Zero moving parts but manual hand feed could lead to some shock damage to the furnace refractories over time.
Plant Control System	Fully automated controls via PLC system with PC, data logging, graphic viewing, etc. Automation covers fuel feeding, fuel to air ratio controls, temperature & pressure controls & safety.	Semi auto system. Only boiler water level is automated controls. Everything else relies on manual operator intervention from feeding to output to safeties.
Heat/Steam Output Consistency/Stability	Stable and consistent heat/steam output is possible due to PLC controls for variable fuel and combustion air to match output needs.	Difficult to achieve due to manual operator controls as opposed to PLC control.
Plant Turndown Ratios	5:1 (Can operate at 20% load)	2:1 (Can operate at 50% load)
Fan Installed Power	Single fan: FD only ≈37kW for an 8TPH or 5MWth system	Dual fan: FD & ID required ≈15+55kW for an 8TPH or 5MWth system
Expected Basic System Efficiency	≈75-78% efficiency at load for basic system.	≈60-65% efficiency at load for basic system.
Expected Fuel Consumption	Lower due to inherent higher system efficiency.	About 10-15% more fuel consumed for the same output due to lower system efficiency.
Expected Particulate Emissions.(On Condition Of Using Clean Fuel)	≈200-400mg/Nm3 with zero filtration. ≈<200mg/Nm3 with multicyclones. ≈<50mg/Nm3 with bag-filters or ESP.	≈<400mg/Nm3 with multicyclones. (Multicyclones or some form of filtration a must else emissions will be very high)
Operating Manpower	1 Licensed operator cum fire-man per shift.	1 Licensed operator & 1 or 2 fire-man per shift.
Capital Cost Investment	Higher.	Lower
Operating Costs	Lower. Savings from lower fuel and power consumption, less maintenance & lower manpower required.	Higher.

- The above table lists some generic numbers and differences between both the Bio-T & Combimax systems for comparison purposes. For specific details please approach us for more information.
- Assuming the right kind of fuel is available, a Bio-T system will usually pay itself back (the price difference between the Bio-T & Combimax) within 3-4 years due to the efficiency savings. Thereafter, any savings will be to the benefit of the end user.
- Detailed calculations and assumptions can be provided on a case to case basis.
- Traditional Combimax boilers may also be upgraded to a Bio-T system. Please see following page.

EXISTING COMBIMAX USERS CAN UPGRADE TO THE AUTOMATED BIO-T SYSTEM



Above: A standard Combimax boiler showing both the water tube membrane wall preheater along with the fire tube boiler drum.



Above: A sketch of a standard Combimax boiler mated to the Bio-T furnace system. This way, the end user can enjoy the benefits of the Bio-T system without having to replace the existing system.

TIMBER DRYING KILNS

TRACK LOADED KILNS

PAGE 24

VISDAMAX Malaysia has been manufacturing timber drying kilns around the world for over 25 years. Not only can we supply the timber drying kilns to our clients, we can also supply a suitable heat plant to match with the kiln needs thus delivering a complete engineering solution. Our product ranges from simple forklift loaded kilns to track loaded kilns, medium to high temperature kilns and vacuum drying kilns. The various kiln types can come with a variety of options such as aluminum or stainless panels, restraint weights, baffles, variable speed drives, heat recovery, lift & transfer truck system, automated PLC controls, etc. Our timber drying kilns have been installed in countries as far as Australia, China, Guyana, Japan, Papua New Guinea, New Zealand & Russia along with the S.E.A countries of Indonesia, Malaysia & Thailand. (Over 1000+ kilns sold worldwide to date)

FORKLIFT LOADED KILNS

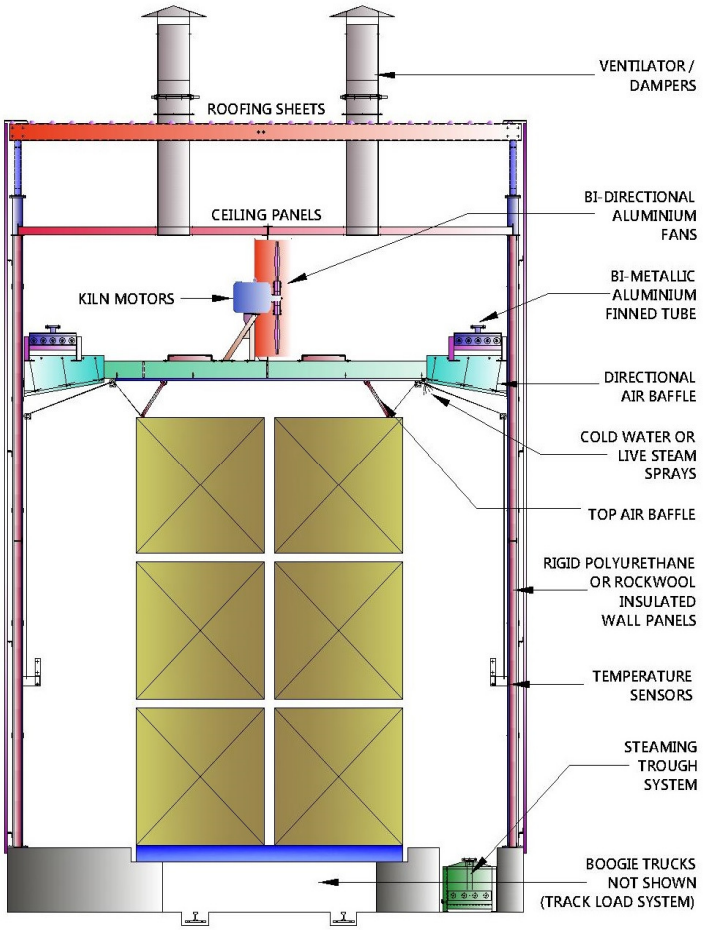
PAGE 29

VISDAMAX (M) SDN. BHD. EMAIL: info@visdamax.com.my ; sales@visdamax.com.my ; TEL: +60-(0)4-4892099 FAX:+60-(0)4-4892097/+60-(0)4-48920

TIMBER DRYING KILNS

TRACK LOADED TIMBER DRYING KILNS

TRACK LOADED KILNS…..ARE PREDOMINANTLY CHOSEN FOR THEIR BETTER TIMBER DRYING QUALITY AND FAST LOADING AND UNLOADING CAPABILITY. THEY ARE APPROPRIATE FOR FAST DRYING OR HIGH VALUE TIMBERS, CONVENTIONAL OR HIGH TEMPERATURE & VACUUM DRYING.



A section view of a track loaded kiln is shown to the left with a variety of standard and optional equipment listed. Track loaded kilns normally have the following advantages over conventional fork lift loaded kilns:

- Ability to load and unload kiln chambers faster.
- Better drying results in terms of lower drying defects and better moisture evenness due to the lower number of timber stacks that the air has to pass through (2 stacks only).
- Faster drying cycle when compared to an equivalent fork lift loaded kiln.
- Various track loaded kiln options available:
  - Lift & transfer / bogie truck loaded kilns.
  - Double ended kilns.
  - Double track kilns.
  - High temperature kilns.
  - Vacuum kilns.
- Their only drawbacks are in terms of the higher capital cost investment and potential space requirement.

To date, we have sold over 200+ track loaded kilns in South East Asia and another 200+ in Australia, Japan, New Zealand & Russia.

TIMBER DRYING KILNS

VARIOUS TYPES OF TRACK LOADED TIMBER DRYING KILNS & THEIR KEY FEATURES

LIFT & TRANSFER TRUCK KILNS

Lift & transfer truck/track kilns offer great flexibility, speed & ease in terms of fast loading & unloading of multiple kilns. No individual boogie trucks are required for the movement of timbers into and out of the kilns. A lift and transfer truck system does the job of loading/unloading the kilns. It is an economical and space saving solution when used in a multi kiln setup. See page 26 for more details.

DOUBLE TRACK KILNS

Double track kilns offer a higher drying capacity per kiln when compared to traditional track loaded kilns while retaining most of their benefits. Imagine 2 traditional track loaded kilns in one building and running on a single set of controller & equipment. Because key components are shared, capital cost investment is low. Chamber sizes of up to 500m3 are possible.
See page 26 for more details.

DOUBLE ENDED KILNS

Double ended kilns offer the fastest loading and unloading of any kiln type. They are generally used for extremely fast drying timbers such as Radiata Pine in a high temperature setup. The dual ended kilns allow dried timber to be pushed out one end while being loaded at the other end. Their only drawback is in the space requirement and the up front investment cost.

HIGH TEMPERATURE KILNS

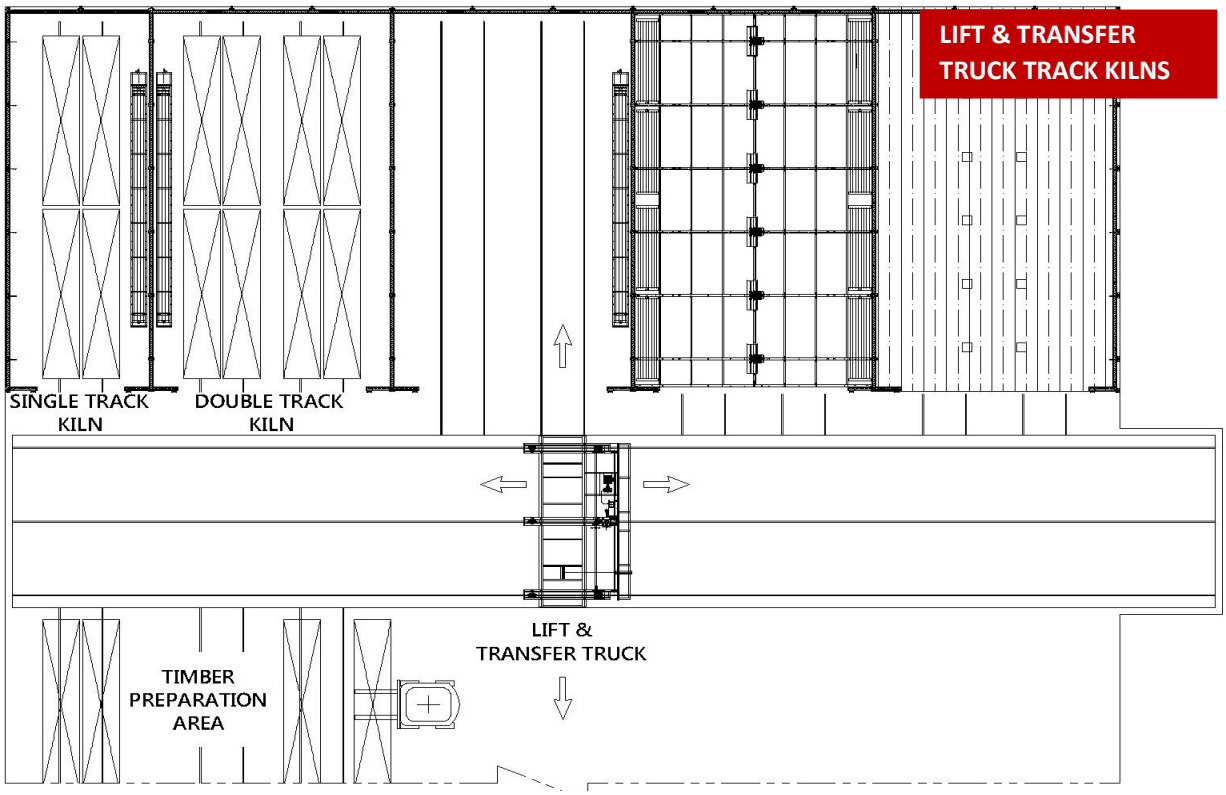
High temperature kilns offer the ability to dry timbers in a shorter time frame while maintaining quality and reducing drying defects. The kiln operates on the principle of using temperatures ranging from 120 to 140 degC inside the chamber to dry timber. The corresponding superheated steam from the evaporation of water under atmospheric conditions allows drying to take place on a much shorter time frame. Predominantly used for fast drying timbers. See page 27.

VACUUM KILNS

Vacuum kilns offer the ability to dry difficult or thick timbers in a much shorter time frame and with less discoloration than conventional kilns. It operates on the principle that a chamber under vacuum requires a lower temperature to evaporate water. This leads to a lower heat consumption as well as less discoloration. The vacuum also provides a pressure difference that allows for faster water evaporation thorough the timber. See page 27.

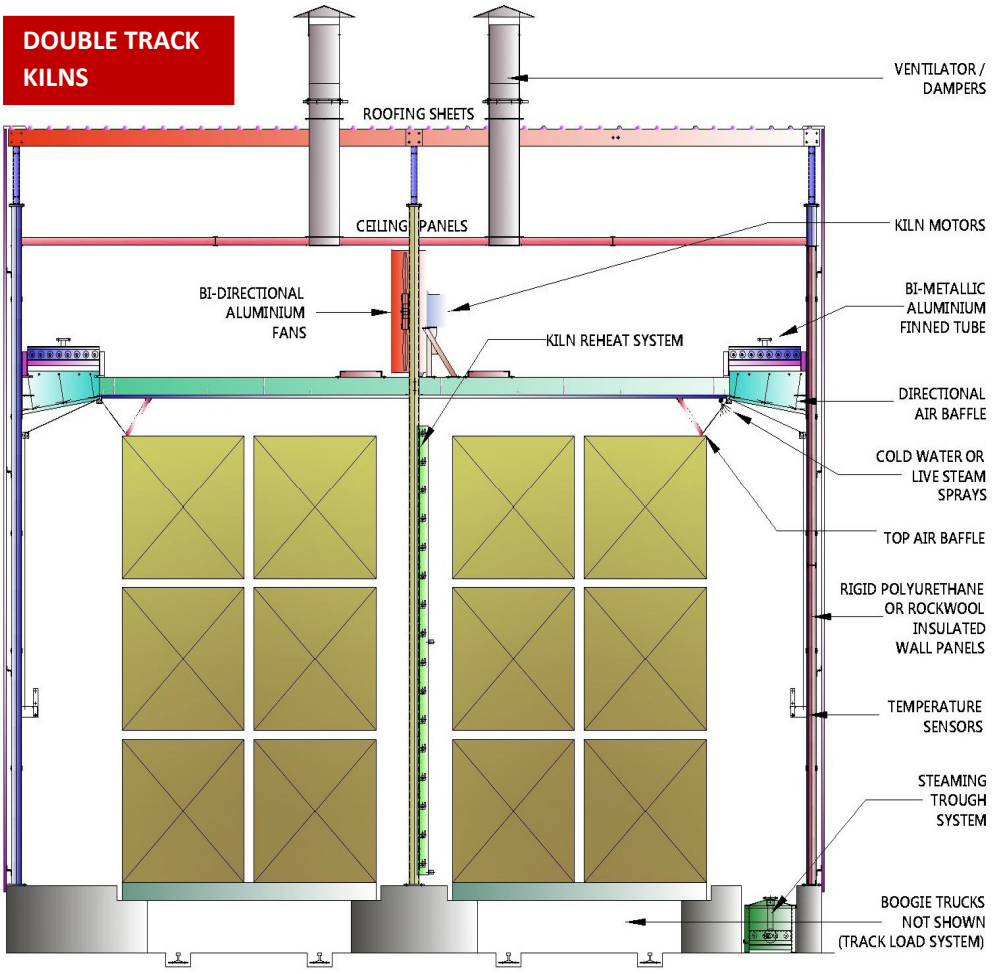
TIMBER DRYING KILNS

LIFT & TRANSFER TRUCK TRACK KILNS



Above layout shows the setup for a simple lift & transfer truck kiln plant with both single and double track kilns. Fast loading of kiln chambers is possible with the lift & transfer truck system.

DOUBLE TRACK KILNS



A section view of a double track loaded kiln is shown to the left. Double track kilns have the following benefits & advantages:

- Higher chamber capacity over single track kilns. Capacities ranging from 100m3 to 500m3 is possible.
- More economical due to ability to share equipment and controllers.
- Slightly smaller footprint.
- Retains many of the benefits of a single track loaded kiln.
- Reheat system ensures consistent air temperature through timber stacks.

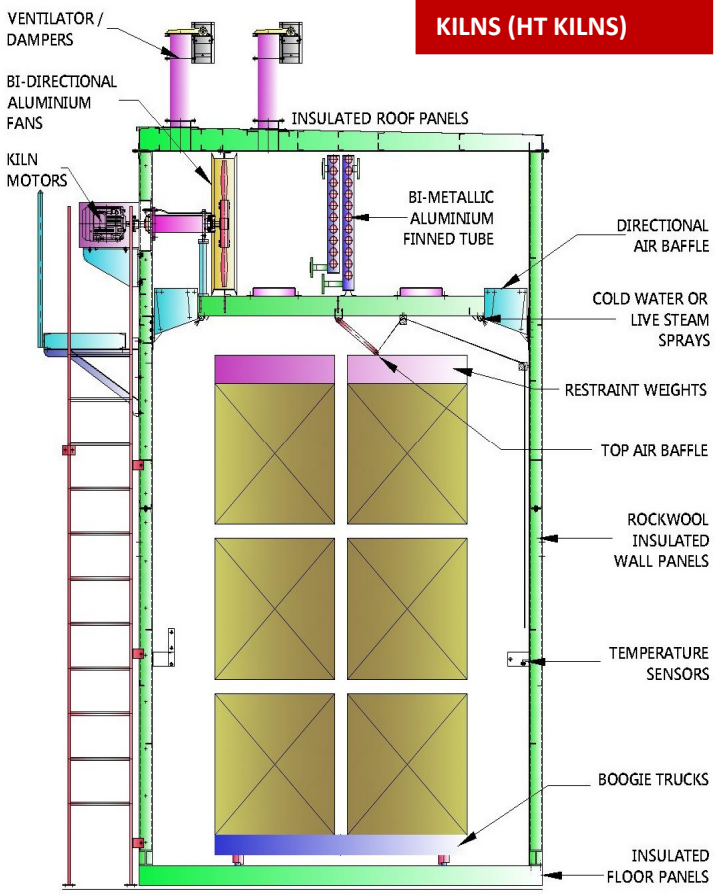
TIMBER DRYING KILNS

HIGH TEMPERATURE KILNS (HT KILNS)

A section view of a track loaded high temperature kiln is shown to the right with a variety of standard and optional equipment shown. Advantages & benefits of a high temperature kiln are:

- Ability to dry regular timbers on a shorter cycle and saves energy when compared to conventional drying kilns.
- Fewer defects on the dried timber. Minimal surface checks, case hardening and twists.
- Suitable for fast drying timbers such as Radiata Pine or fast drying softwoods.
- Reliable and accurate fully automated controllers and modulating valves for fine temperature controls.
- Fully welded & sealed kiln chambers with internal stainless lining for longevity. External kiln motors.
- The only drawbacks to high temperature kilns are in the higher capital cost investment and potentially darker timber coloration.

To date, we have sold over 100+ high temperature track loaded kilns to countries such as Australia, Japan & New Zealand.



VACUUM DRYING KILNS (VAC KILNS)

VAC kilns are an alternative solution to HT kilns for drying timbers faster. They are extremely useful for drying large dimension or difficult to dry timbers. The advantages & benefits of a vacuum kiln are:

- Faster drying cycle with low defects & min discoloration.
- Can come as cylindrical or rectangular chambers for higher capacities.
- Vacuum allows for lower temperature operation and heat loss thus saving heat energy and increases efficiency.
- Can be designed as a combination of HT & vacuum kiln. (2 in 1 system).
- High investment cost. (Higher than HT kilns)

We have sold as many as 20+ units to Japan over the years.

TIMBER DRYING KILNS

VARIOUS TRACK LOADED KILNS AROUND THE WORLD

Above: Multiple lift & transfer truck kilns located in a row. (Most suitable setup for this type of kiln)

Above: Lift & transfer truck system loading timbers into a conventional truck loaded kiln.

Above: Double track kiln with reheat finned tubes for even kiln drying.

Above: 4 x HT Single Track Kilns In Japan.

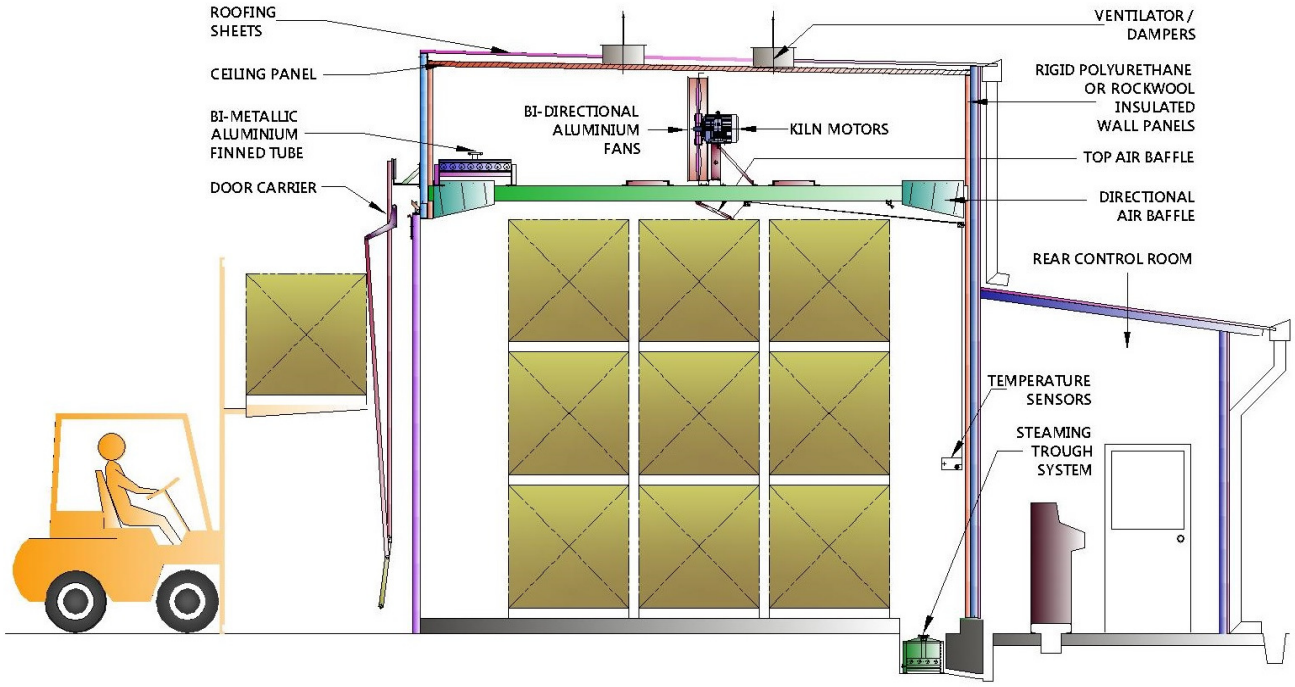
Above: 2 x Rectangular vacuum kilns being installed in Japan.

Above: 1 x Cylindrical vacuum drying kiln in Japan.

TIMBER DRYING KILNS

FORKLIFT LOADED TIMBER DRYING KILNS

FORKLIFT LOADED KILNS…..ARE PREDOMINANTLY CHOSEN FOR THEIR ECONOMIC VALUE & LARGE DRYING CAPACITIES. THEY ARE APPROPRIATE FOR SLOW DRYING TIMBERS OR FOR DRYING LARGE QUANTITIES OF TIMBER.



A section view of a forklift loaded kiln is shown above. Forklift loaded kilns have the following advantages and benefits over track loaded kilns in the following:

- High capacity chambers.
- Suitable for large volume turnover plants with slow drying timbers.
- Lower cost per unit weight of timber to be dried.
- Walls can be made out of prefabricated panels or masonry work to save cost.
- Simplistic operation and low kiln maintenance.

With more than 600+ kilns sold worldwide, you can't really go wrong with a conventional fork lift loaded kiln.

TIMBER DRYING KILNS

THE 2 MAIN METHODS FOR CONSTRUCTING FORKLIFT LOADED KILNS: FULL PRE-FABRICATED PANELS OR MASONRY/BRICK WALL METHOD. A BRIEF COMPARISON BETWEEN THE 2 ARE PRESENTED BELOW:

PRE-FABRICATED WALL PANELS

Pre-fabricated wall panel forklift kilns are predominantly the construction method of choice when installation labour is expensive and if the location is seasonal. (winter) They have the following benefits over a masonry wall kiln design:

- Lower installation cost at site due to a faster installation method but higher equipment cost. Difference in overall cost will depend on the labour cost of country the kilns are installed at.
- Simpler civil work on the client's side. A flat piece of foundation will do. Pre-fabricated wall panels are also lighter leading to lower civil costs.
- Better heat retention due to the inherent properties of the insulating material. This leads to better efficiencies and lower energy consumption.
- Predominantly used insulating material is 50-65mm thick rigid polyurethane encased in an aluminum extruded frame and sheathed in a variety of materials ranging from:
  - Waterproof plywood boards.
  - Aluminum flat or stucco embossed sheets.
  - Stainless flat sheet.
- The only drawback is in potential damage from forklift operator negligence. Can be avoided with steel restraint structures to help protect the panels.

MASONRY / BRICK WALLS

Masonry wall forklift loaded kilns are the preferred choice of construction when labour for erecting the masonry wall is relatively cheap. They have the following key points over that of a pre-fabricated panel kiln:

- Potentially cheaper overall cost if used in countries with cheaper labour and material costs. (Ie: Brick, cement and concrete costs)
- Longer lasting and more durable walls when compared to pre-fabricated panels. Especially when used with forklift loaded kilns. Less prone to wall damage from negligent operators.
- More complex overall civil work on the client's side. Masonry walls have to be done correctly in order for the kiln equipment to fit correctly. Heavier foundations required to sustain the heavy wall loads.
- Greater heat loss from the wall panels will mean slightly more fuel consumed by the boiler generating the heat energy. The losses will be greater if used in countries with cold weather. (Winter)
- Slightly longer drying cycles due to the greater heat loss when compared to pre-fabricated kilns.
- See comparison of rigid polyurethane vs masonry insulating properties on the page 32

TIMBER DRYING KILNS

VARIOUS FORKLIFT LOADED KILNS AROUND THE WORLD

Above: Multiple forklift kilns located in a single row in Malaysia with attached storage shed.

Above: Loading a forklift loaded kiln.

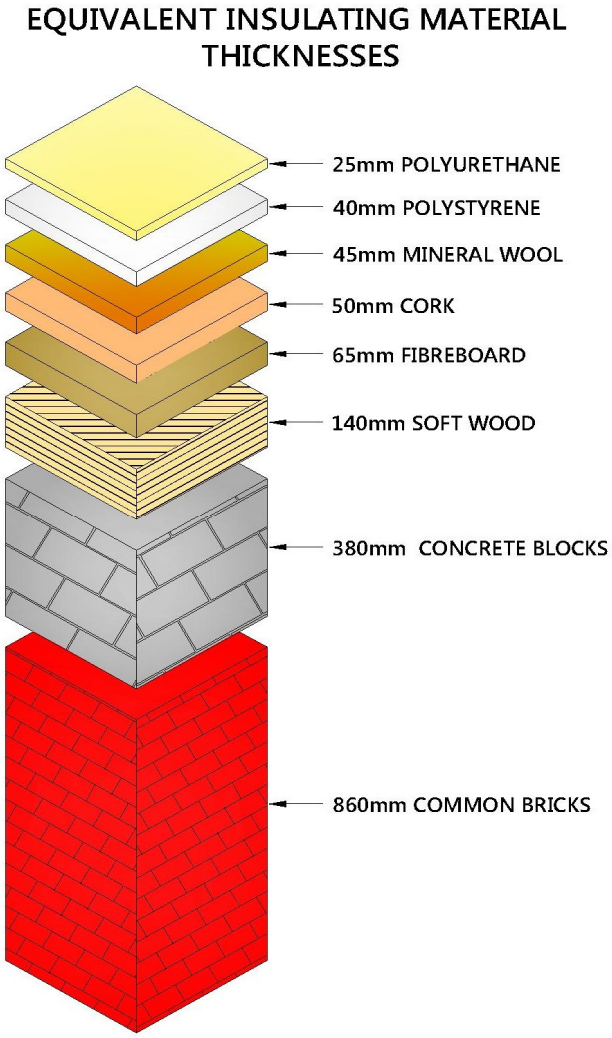
Above: 20 x Face to face Forklift loaded kilns with an attached storage shed in Indonesia.

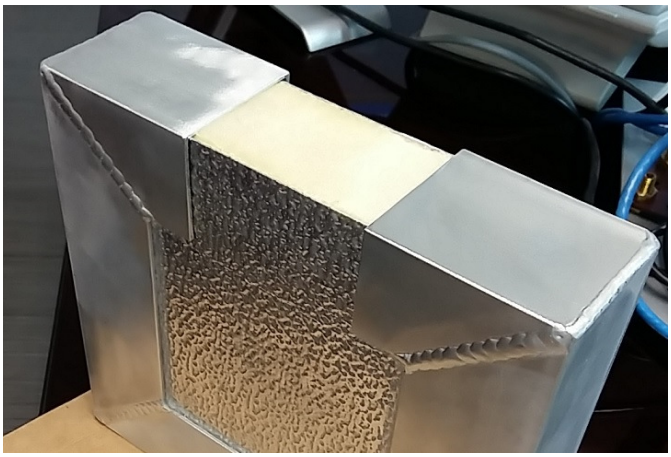
Above: Rear ground control room for forklift lift loaded kilns in Indonesia.

Above: 3 x 100m3 Forklift loaded kilns with fully prefabricated wall panels in Japan.

Above: Forklift loaded kilns with fan motors outside for easier servicing.

Right: A diagram showing the various equivalent insulating material thicknesses. From it, one can see that polyurethane is at the very top of the list due to its inherent insulating properties. Regular or common bricks on the other hand has a much lower insulating property. To match a 25mm thick slab of polyurethane, a much thicker slab of bricks will be required. Mineral rool (Rockwool or polyglass wool) on the other hand is in between the two at about double the thickness of polyurethane.





Above: Sample 50mm thick rigid polyurethane encased in an aluminum frame & sheathed in an aluminum stucco embossed sheet.

Above: Sample kiln inspection door panels made out of rigid polyurethane insulation. Wrapped in a aluminum extruded frame and sheathed (inside = stainless, outside = aluminum) sheets.

Above: Forklift loaded kiln front panel portal frame structure along with prefabricated panels.

TIMBER DRYING KILNS

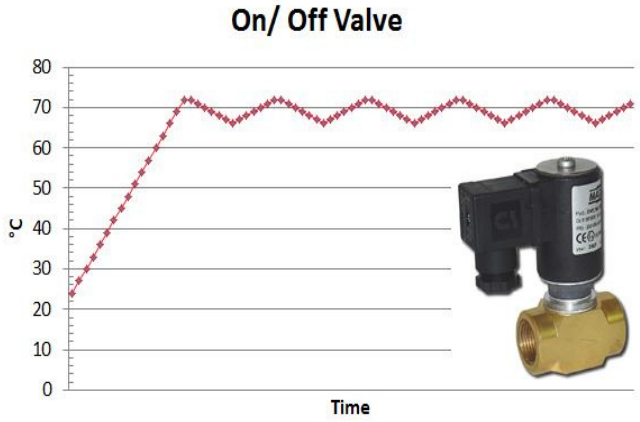
KILN SELECTABLE OPTIONS, MISC EQUIPMENT LITERATURE & PICTURES

Above: Optional timber restraint weights can be added to help minimize warping of timber.

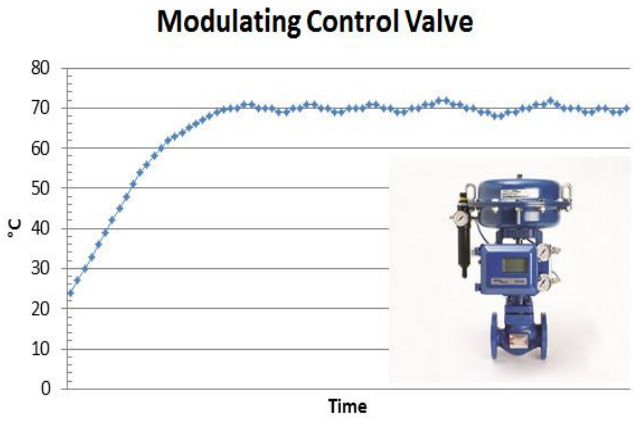
Above: Bi-directional kiln fan with adjustable blade angle. Can be 6 or 12 bladed at 800 / 1000mm dia.

Above: Track loaded kiln bogie trucks shown. Can be aluminum or mild steel. Dual or triple rail.

Above: Optional top baffles to help minimize air bypass for better drying results.



Above: Standard on/off control valve for heating & humidification response and deviations.



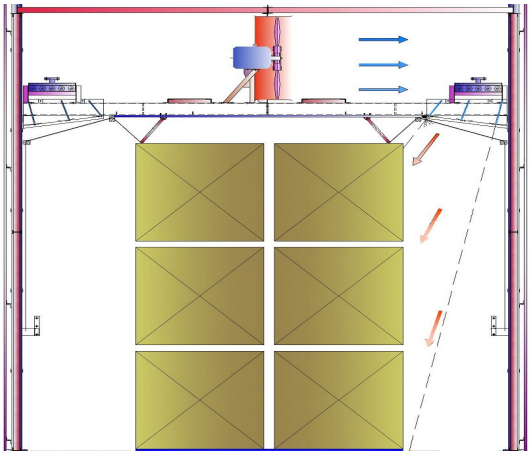
Above: Optional upgrade to modulating control valves for faster response & smaller deviations.

TIMBER DRYING KILNS

KILN SELECTABLE OPTIONS, MISC EQUIPMENT LITERATURE & PICTURES

Above: Standard bi-metallic finned tube heating battery. Tube material can be carbon or stainless steel.

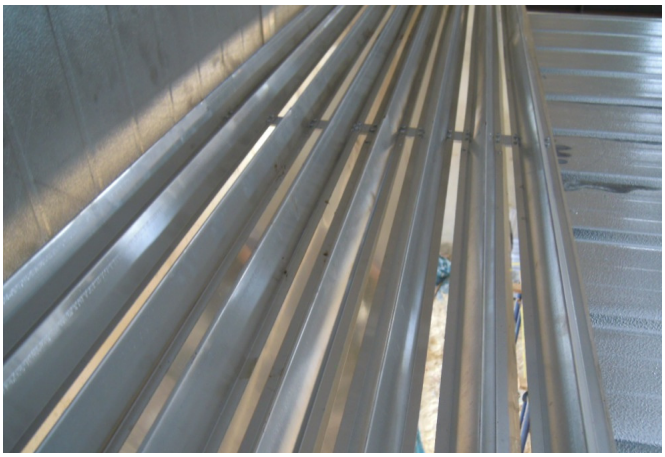
Above: Optional steaming trough system to produce humidification steam at 100degC. Improves drying quality.



Above: Optional adjustable direction air baffles helps to direct air to the appropriate timber areas to obtain more even drying.

Above: Optional cold water spray system for kilns to replace or assist live steam sprays. Enhances drying quality by limiting kiln over temperatures.

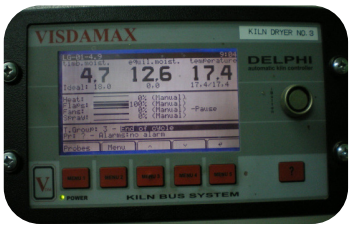
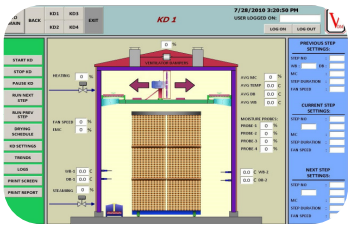
Above: Optional variable speed drives (VSDs) to help save power & enhance drying quality by varying air flow through timber stacks.



Above: Optional air dispersion screens / vanes in kilns to help even out air flow across length of kiln for better drying quality.

TIMBER DRYING KILNS

VARIOUS KILN CONTROLLER OPTIONS OFFERS UNPARALLELLED FLEXIBILITY RANGING FROM SEMI-AUTO TO FULLY AUTOMATED CONTROLLERS & CUSTOMIZABLE PLC CONTROLLER

Features	Semi-Automated Controllers	Pre-Built Automated Controllers	PLC Customizable Automated Controllers
			
Brief Overview	Simple and cost effective kiln control system. (DB & WB controllers only) Temperature and humidity are automated by the controller.	Multipurpose fully automated pre-built controllers. Comes with a variety of features depending on requirements. Not customizable.	Customizable fully automated controllers for demanding or specific systems. Any and all drying aspects can be catered for.
Scope Of Supply & Possible Configurations	Standard 1 DB and 1 WB controller for either on/off or modulating valves. Step control for VSDs if selected.	One controller per KD with interface or can have a single PC connected to several controllers for centralized controls. Can have options for moisture probes, EMC-DB-WB sensors,	Can come in a variety of configurations from simple DB & WB controls to EMC and gradient drying with timber moisture probes, load cells, etc. Control software can be custom written to suit client requirements and in multiple languages.
Drying Method	Step drying based on time schedule. Operator input required for every step change.	Step drying (time schedule / EMC), gradient based drying available. (Limited steps)	Step or gradient based drying available since the system is customizable.
End of Cycle Determination	Manual via operator checks. (Hand held moisture meters)	Automated via time schedule completion or final MC achieved via inline moisture probes.	Automated via time schedule completion or final MC achieved via inline moisture probes.
Preloaded Drying Schedules In Library	Not available.	Drying schedules for multiple species pre-loaded. Fine tuning required for best results.	Drying schedules needs to be created and stored. Can then be loaded in the future for ease of operation.
Controller Location	Localized behind / next to kilns.	Controller can be behind / next to kilns or located in a centralized control room.	Controller can be behind / next to kilns or located in a centralized control room.
Centralized Control	Not available.	Available. Controllers can be controlled from the unit itself or from a centralized PC.	Available. A variety of options can be selected. Controllers can have individual touch panels or can share a single touch panel to save cost. A centralized PC control can also be included.
Data Acquisition / Trending	Not available.	Available only with centralized PC option.	Available on both touch panel and centralized PC option. Can have email alarms sent out to mobile phones or tablets.
Cost	Lowest cost of all options as it is the most basic of systems.	High cost per system. But may be ideal for small plants with few kiln units.	High cost per system. Ideal for plants with many kiln units. (Shared costs) Can have a single controller controlling up to 20 to 30 kilns depending on PLC sizing.

- Pictures above are for illustration purposes only. Actual supplied system may vary from project to project.
- There are several options for the pre-built automated controllers. The most suitable system will depend on the project requirement.
- PLC customizable controllers can have a wide ranging of pricing depending on selected specifications and options. Seeing as they are fully customizable, the controllers can be even linked to the boiler or heat plant system for best performance as needed.

TIMBER DRYING KILNS

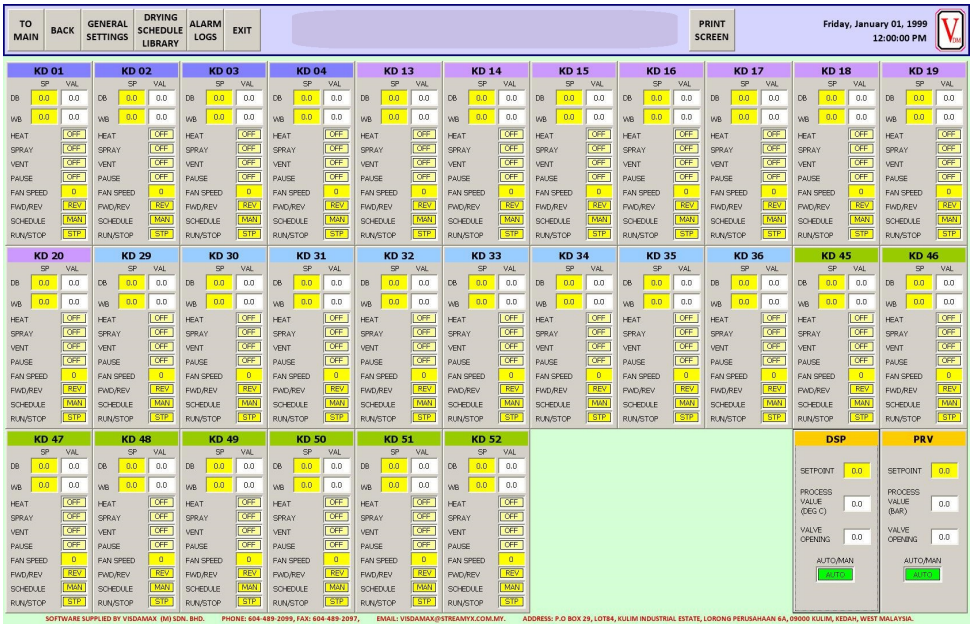
KILN CONTROLLER SAMPLE SCREENSHOTS

Descriptions	
Remark	
Order	
Quantity	
Species	
Phase 1	
Enable phase 1	Enabled
Enable low temperature alarm phase 1	No
Enable high temperature alarm phase 1	Yes
Enable low EMC alarm phase 1	No
Enable high EMC alarm phase 1	No
Climate,Moisture/Pressure	Pressure
Phase 1 TMC based	No
Spray management mode for phase 1	Off
Pump management mode for phase 1	Auto
Heater management mode for phase 1	Auto
Fans management mode for phase 1	Auto
EMC phase 1	12.5
P phase 1	110.0
Temperature phase 1	50
Phase 1 waiting time	24
Fans speed for phase 1	100
Timber moisture thresold for phase 1	65.0
Phase 2	
Enable phase 2	Enabled
Enable low temperature alarm phase 2	Yes
Enable high temperature alarm phase 2	Yes
Enable low EMC alarm phase 2	Yes
Enable high EMC alarm phase 2	Yes

Above: Sample pre-built automated kiln controller drying schedule settings

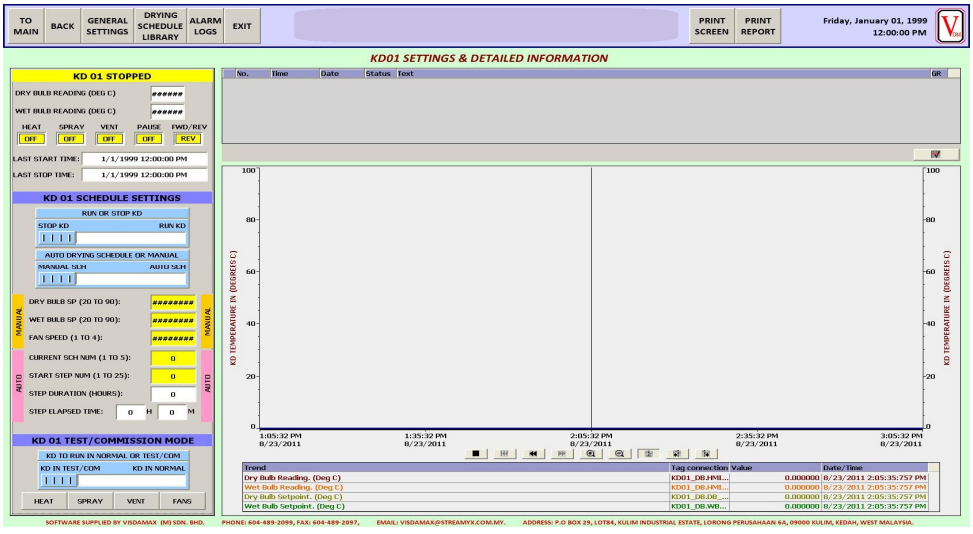
Category/Name	Values	Description
Order		Order
Quantity		Quantity
Species		Species
Remark		Remark
Controller Name	VAC2 v1.0 (DELVAC2mLG01prb05...	Name of the controller connect to ...
Status	No alarms.	Status
Measures		
EMC	6.6	Equilibrium Moisture Content
Air Temp	39.1	Air temperature
Plates/Core temp	39.7	Plates/Core temperature
Temperature	39.1	Regulation temperature
Pressure(kPa)	100.4	Regulation pressure (kPa)
Ideal pressure(kPa)	0	Ideal pressure (kPa)
average TMC	0.8	Average Timber Moisture Content
Timber Probe 1	1.0	Moisture detected on timber prob...
Timber Probe 2	1.0	Moisture detected on timber prob...
Timber Probe 3	0.8	Moisture detected on timber prob...
Timber Probe 4	0.7	Moisture detected on timber prob...
Timer phase	00:00	Timer phase (minutes)
Current drying phase	End of cycle	Current drying phase
TMC prb 1 status	Active	Allows to activate or to exclude th...
TMC prb 2 status	Active	Allows to activate or to exclude th...
TMC prb 3 status	Active	Allows to activate or to exclude th...
TMC prb 4 status	Active	Allows to activate or to exclude th...
Program		
Controller	VAC2 v1.0 (DELVAC2mLG01prb05...	Name of the controller connect to ...
Ideal air moisture	0.0	The air moisture currently require...
Calculated relative humidity	0.0	Calculated relative humidity
Ideal temperature	39.1	The temperature currently require...
Final temperature	39.1	The final temperature required by...
Pressure change mode	Release	Pressure change mode (Aspiration...
Pressure change	Yes	Pressure change (Off/On)

Above: Sample pre-built automated kiln controller information page



Left: Sample screenshot of a PLC kiln controller set up to handle 28 kilns plus a few extra items all from a centralized PC system. Because of their flexibility and customizability, they are ideal for project specific controls and overview.

Right: Sample screenshot of an individual kiln control page. Graphs for both process and setpoint values for the DB & WB probes come as standard. Apart from trends, the system also provides an alarm table to record any incidents.



FUEL STORAGE & HANDLING SYSTEMS

FUEL STORAGE SILOS

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VISDAMAX Malaysia can also supply a wide variety of fuel storage and handling system ranging from steel storage silos to bunkers to conveyors (belt, screw & scrapper), to pneumatic handling and moving floor systems. The fuel storage & handling systems can also be linked via PLC controls to our heat plant SCADA for easy operation at a centralized plant control and overview station. Our ability to package these system together with our heat plants make for a simple one stop solution to our clients. Our fuel storage & handling systems have been installed in countries as far as Australia, Japan, Malaysia, New Zealand, Russia & Thailand.

FUEL HANDLING SYSTEM

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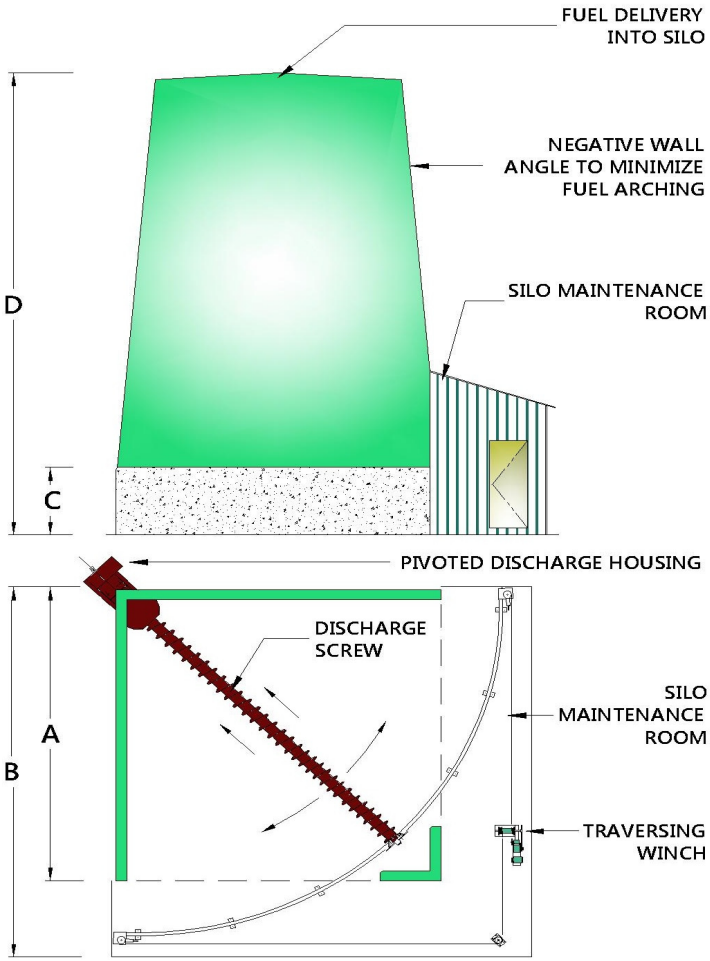
FUEL STORAGE & HANDLING SYSTEMS

FUEL STORAGE SYSTEMS

FUEL STORAGE SYSTEMS…..CAN COME IN THE FORM OF A SILO OR BUNKER AND IS AN IMPORTANT ASPECT OF HEAT PLANT OPERATIONS AS THEY OFFER THE END USER THE ABILITY TO KEEP THE PLANT RUNNING OVER LONG PERIODS OF TIME WHEN THERE IS NO INCOMING NEW FUEL.



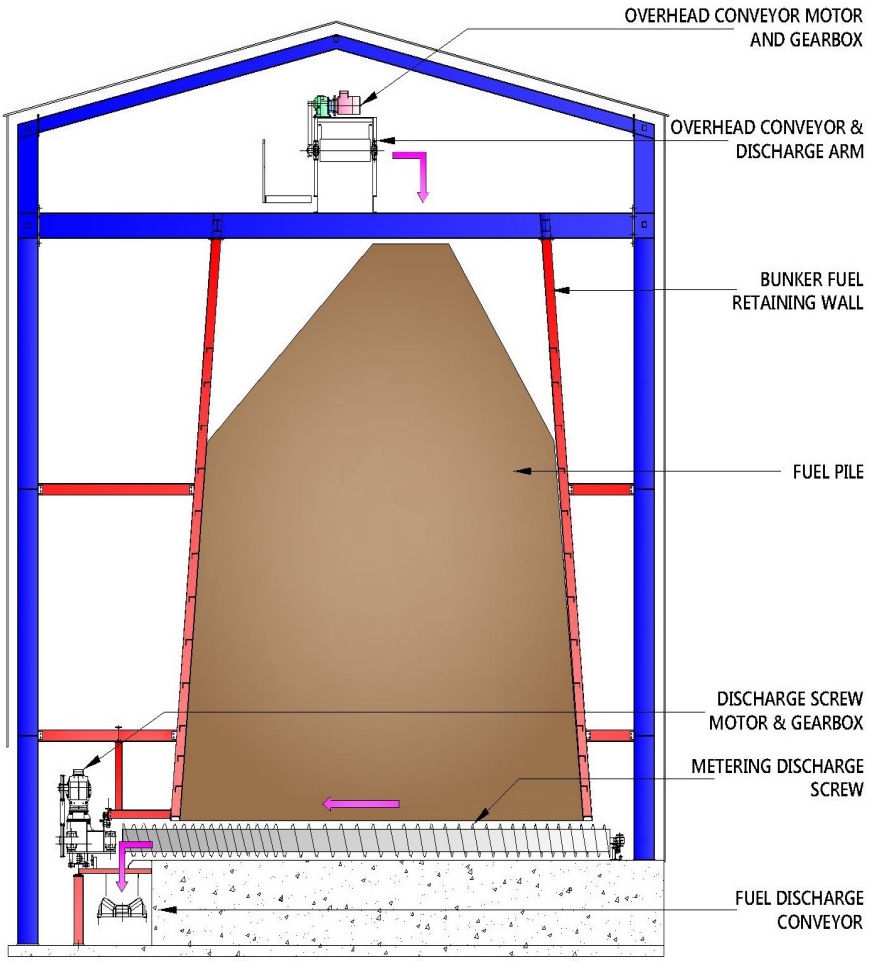
A section view of our standard steel storage silo is shown on the left with the major components. Key benefits of utilizing the steel silos include:

- Sizes ranging from small 20m3 daybins up to 400m3 for max fuel storage. Common sizes: 50, 100, 150, 200, 250 & 400m3)
- Suitable for a wide variety of fuels such as sawdust, shavings, woodchips, bark, etc.
- Simple high level sensors or advanced radar level system for accurate fuel level measure.
- Negative wall angles (Inverse tapered) minimizes chance for fuel to arch within the silo body.
- Single traversing metering screw more economical than traditional systems with multiple extraction screws at the base.
- Discharge screw comes with a variable speed drive for precise volume metering.
- Easy and low cost site assembly as walls shipped in modular pieces for fast erection.
- Wall material can be made out of plywood to save cost over steel plates if required.
- Can be automated and linked to other plant controls if required.

FUEL STORAGE & HANDLING SYSTEMS

A section view of our bunker type mass fuel storage system is shown on the right. Key benefits of the bunker fuel system include:

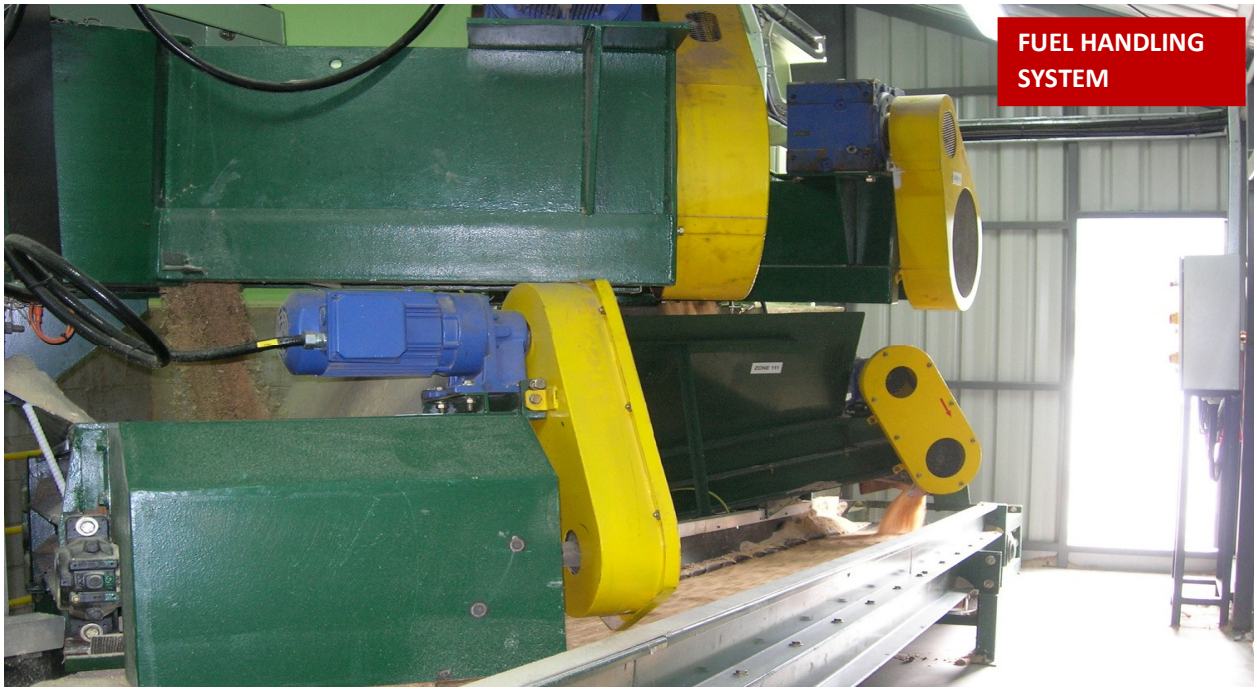
- Customizable sizes ranging from 500m3 up to 2000m3 per storage bay.
- Suitable for a wide variety of fuels such as sawdust, shavings, woodchips, bark, etc.
- Simple high level sensors or advanced radar level system for accurate fuel level measure.
- Negative wall angles (Inverse tapered) minimizes chances for fuel to arch within the silo body.
- Traversing extraction screw at the base helps to minimize costs.
- Discharge screw comes with a variable speed drive for precise volume metering.
- Wall material can be made out of plywood to save cost over steel plates if required.
- Client can supply main structures themselves to save cost.



Pictures on the left display a few elevated silos. Also shown are some pneumatic fuel delivery systems. Such silos are normally used for:

- Ability to discharge to trucks when necessary while at the same time deliver the required fuel for process plant use. Can be designed for both.
- Can be designed to be suitable for a wide variety of fuel ranging from sawdust to woodchips.
- Simple high level sensors or advanced radar level system for accurate fuel level measure.
- Motorized agitator arm for the cylindrical silo and large base opening with agitating motion on the vertical silos help to minimize fuel arching problems.
- Fuel volume can range between 50 to 400m3.

FUEL STORAGE & HANDLING SYSTEMS



FUEL HANDLING SYSTEM

FUEL HANDLING SYSTEMS

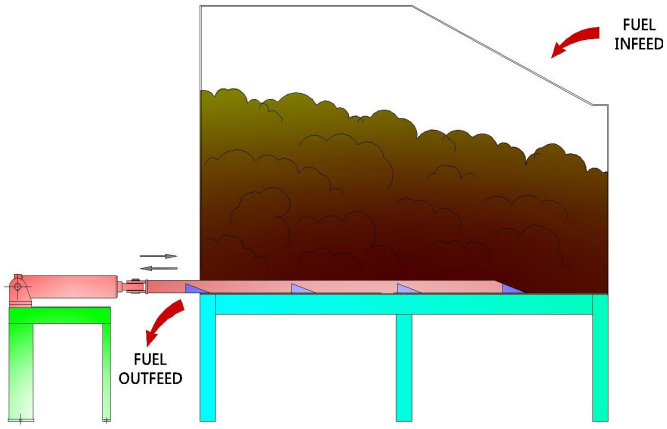
FUEL HANDLING SYSTEMS…..FORM AN INTEGRAL PART OF ANY PLANT IN HELPING TO MOVE FUEL FROM ONE LOCATION TO ANOTHER. OUR FUEL HANDLING EQUIPMENT CAN CONSIST OF A VARIETY OF CONVEYORS, PNEUMATIC HANDLING AND / OR MOVING FLOOR SYSTEMS.

At Visdamax Malaysia, we carry a wide ranging variety of fuel handling equipment. Among the commonly supplied items are:

- Fuel transfer conveyors of the following types:
  - Belt conveyors. (Above picture)
  - Screw conveyors. (Left picture)
  - Scrapper chain conveyors. (Bottom left picture)

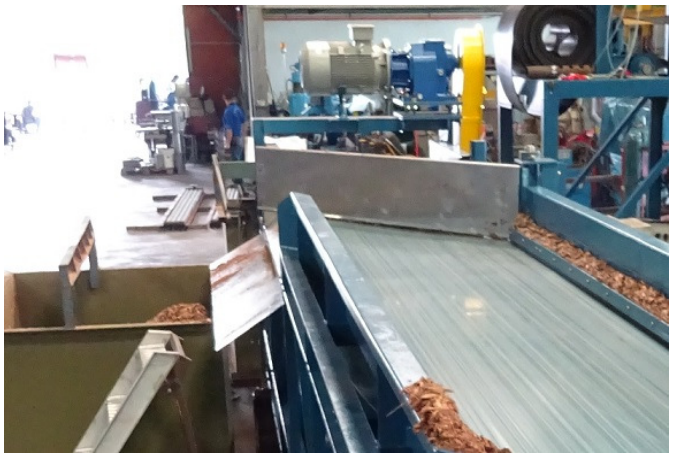
  The above conveyors can also come in a variety of configurations ranging from diverting arms, to variable speed control to specific designs.
- Pneumatic fuel handling equipment such as blower fans, ducting, diverting gates, etc.
- Moving floor fuel delivery system complete with the hydraulic system.
- The following equipment can also be added on request:
  - Fuel screens (Vibration, disc or others).
  - Fuel hogging, chipping or shredding.
  - Inline fuel weighing sensors.
- All of our fuel handling equipment can be automated and linked to other plant controls if required for easy and centralized operation.

VARIOUS FUEL STORAGE & HANDLING SYSTEM AROUND THE WORLD



Above: Section view & picture of a moving floor system. Moving floor can be designed to be used as a fuel daybin or an infeed system to transfer the fuel to a different location. They can be designed:

- Raised and fed via a front end loader.
- On the ground and fed via a truck reversing in and tipping the fuel.



Above: A flat horizontal belt conveyor with a diverting arm being tested at our factory.

Above: Silo metering discharge screw.

Above: A trough belt conveyor being fabricated and set up at our factory.

Above: A troughed horizontal and inclined belt conveyor being set up at our factory.

FUEL STORAGE & HANDLING SYSTEMS

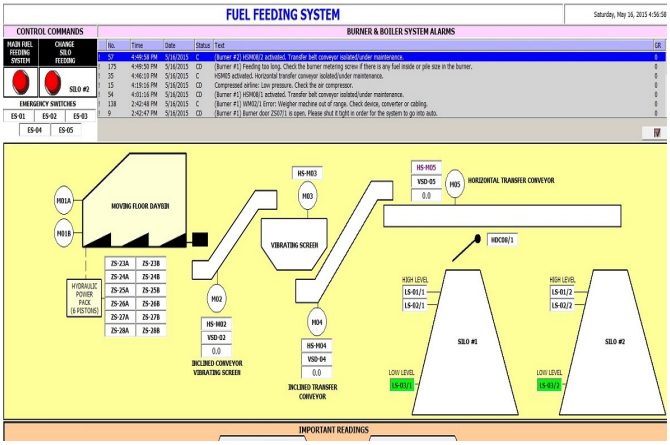
VARIOUS FUEL STORAGE & HANDLING SYSTEM AROUND THE WORLD

Above: 400m3 Silos being installed layer by layer in New Zealand.

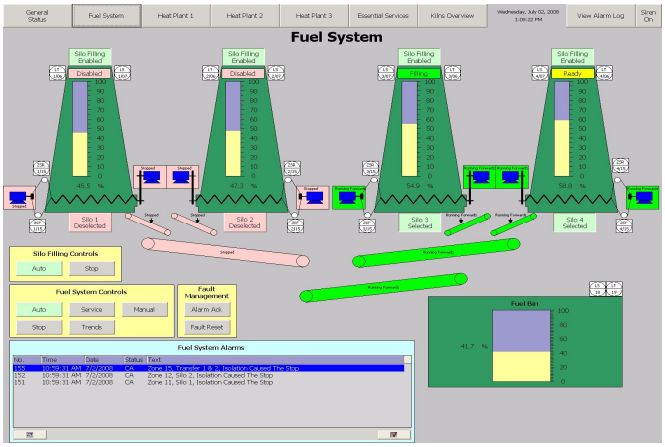
Above: 1250m3 Bunker fuel storage system being installed.

Above: Small fuel daybins and complete fuel infeed system.

Above: Silo metering discharge screw.



Above: A complete fuel infeed, handling and storage automated control system all in one.



Above: Fuel system automated controls for both silo storage and fuel handling system.

GENERAL & CUSTOM ENGINEERING

ENGINEERING WORKS

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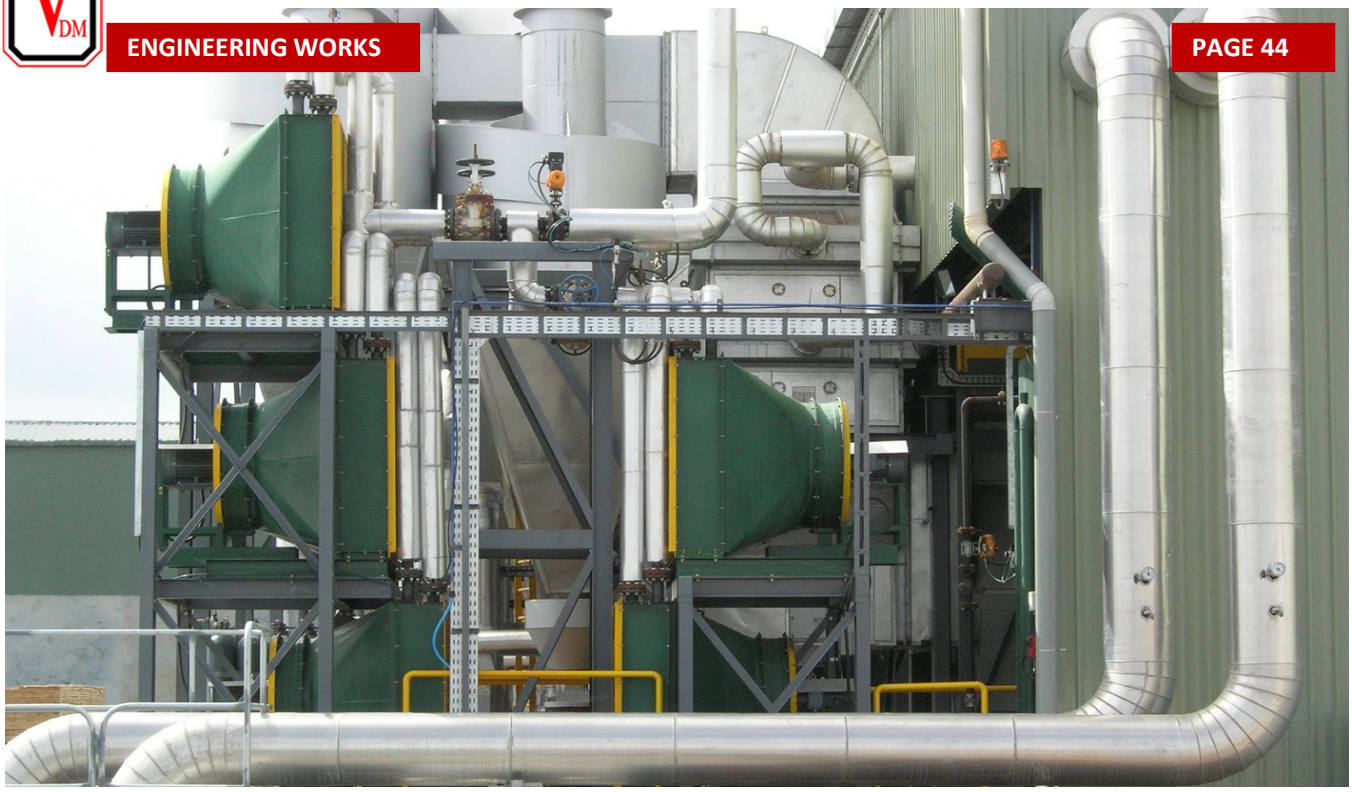

VISDAMAX Malaysia can also supply a wide variety of general and custom made engineering products to complement our core business to deliver a single turnkey supply to the end user. Such turnkey projects will benefit the end user by helping to minimize the number of parties involved and miscommunication errors. Common ancillary equipment normally included in our supply can range from boiler house structure and sheds to control rooms to piping & ducting works, heat exchangers for recovery and combustion air fans. Where applicable, necessary design verification and fabrication inspection will be provided. Building structures / sheds can also be design to the respective country codes and requirements to ensure compliance. Apart from S.E.A countries, our custom equipment have also been exported to Australia, Fiji, Japan, New Zealand and Russia.

PIPING WORKS

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GENERAL & CUSTOM ENGINEERING

VISDAMAX MALAYSIA…..CAN SUPPLY A WIDE VARIETY OF ENGINEERING PRODUCTS ALONG WITH OUR CORE PLANT EQUIPMENT TO FORM A SINGLE TURNKEY SUPPLIER FOR THE BENEFIT OF THE CLIENT. AMONG SOME OF THE GENERAL & CUSTOM EQUIPMENT WE CAN SUPPLY ARE:

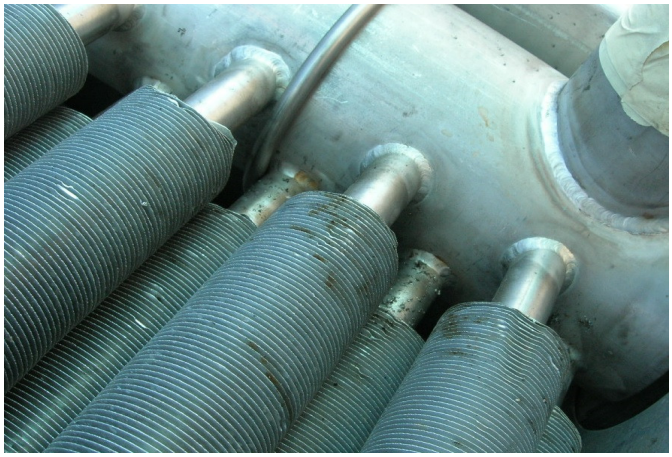
- Complete building structures including roofing and cladding sheets, lighting and power outlets all satisfying local regulations covering:
  - Boiler or heat plant shed / room.
  - Centralized MCC & control room.
- General steel structures, raised stands, platforms, stairs and ladders for equipment.
- Heat exchangers and condensers for both pressurized and unpressurized systems covering:
  - Steam to air and vice versa.
  - Hot water or thermal fluid to air and vice versa.
  - Plate heat exchangers for specific uses.
- Heat recovery systems for:
  - Existing boiler plants. (Air preheaters or water preheaters & economizers)
  - Process plant upgrade. Steam condensate line heat recovery.
- Piping systems:
  - Pressurized & unpressurized pipe works complete with insulation.
  - Headers along with necessary valves.
  - Steam, hot & cold water, pressurized hot water and thermal fluids.
  - With design verification, fabrication inspection and documentation if required.
  - By qualified and licensed welders.
- Steam silencer vents for low pressure applications.
- Tanks or vessels to suit process needs:
  - Water storage, blow down and condensate tanks.
  - Pressure vessels, deaerator and expansion tanks.
- Steel ducting of rectangular or circular shape for combustion air, flue gas or pneumatic transfer.
- Dampers and diverting vanes for air controls or pneumatic systems.
- Forced or induced draft fans along with the necessary ancillaries. (FD or ID fans)
- Refractory lined ducting or ovens.
- Any other specific engineering work on demand.

GENERAL & CUSTOM ENGINEERING

PICTURES OF VARIOUS ENGINEERING PRODUCTS THAT WE CAN SUPPLY

Above: Steam header complete with valves and ancillary instruments.

Above: Heat plant feed water pump station.



Above: Stainless heating battery made out of bi-metallic finned tubes.

Above: A steam vent silencer for low pressure steam systems.

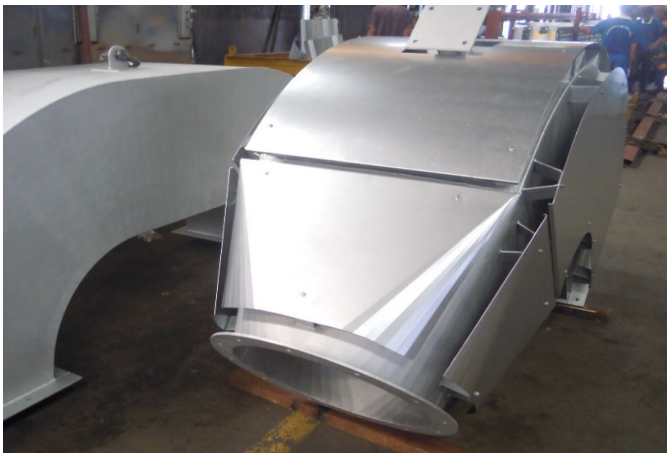
Above: 5MWth heat dump system made out of multiple 1MWth heat dump units.

GENERAL & CUSTOM ENGINEERING

PICTURES OF VARIOUS ENGINEERING PRODUCTS THAT WE CAN SUPPLY

Above: Atmospheric stainless blow down tank.

Above: Stainless pipe work.



Above: Steel ductings with heat shields.

Above: Custom built refractory lined furnace oven for a client.

Above: A FD fan being packed ready to be shipped.

Above: Sample welding quality.

CUSTOM PLANT AUTO CONTROLS & ELECTRICALS

HMI CONTROL STATION

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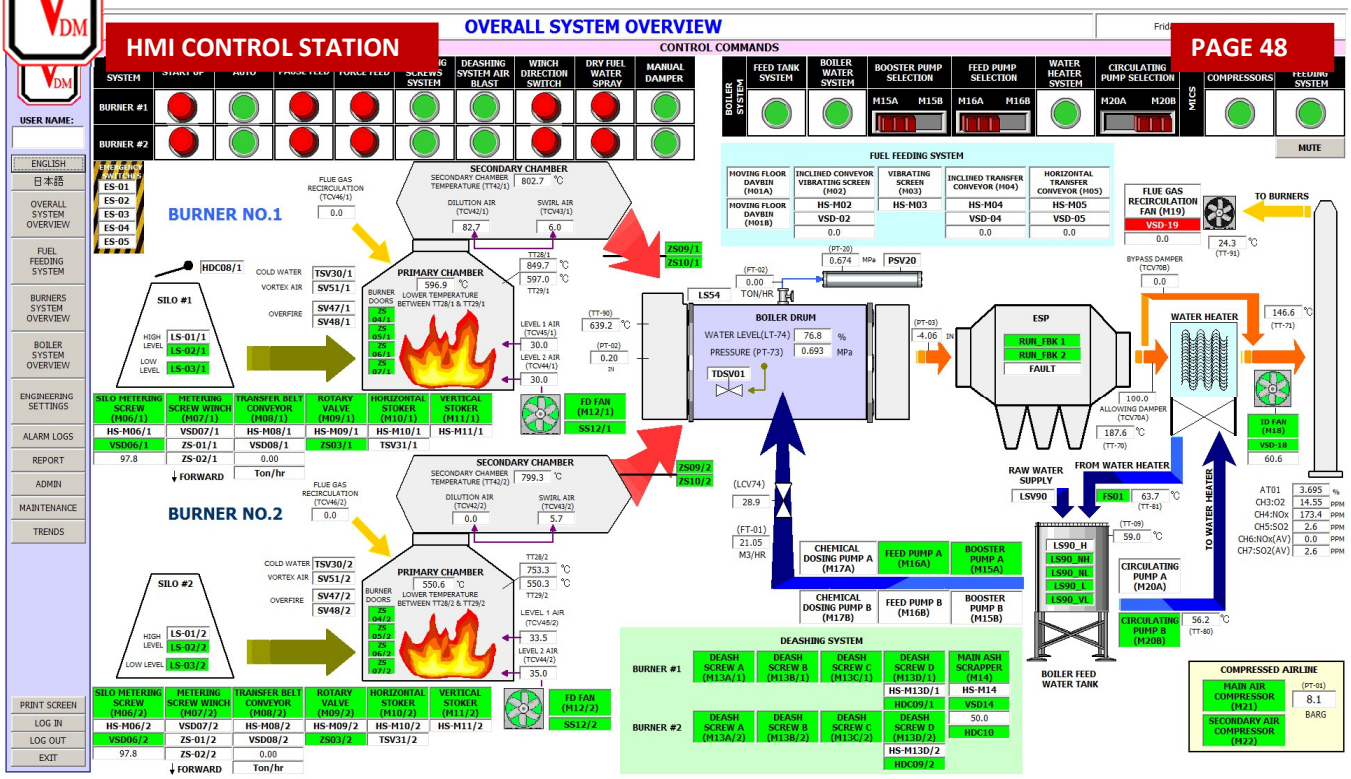

VISDAMAX Malaysia can also supply a wide variety of plant control systems and MCC electrical boards based on end user requirements. Control systems can range from basic PLC automated operation to PLC-SCADA based control for a wide range of data acquisition and controls. Interface with plant controls can be via a PC or HMI touch panel. MCC boards can be designed to suit the requirement and regulation of the country they will be exported to. Both PLC & MCC components can be selected to suit the end users preferred make to help simplify familiarity with the components.

ELECTRICAL MCC

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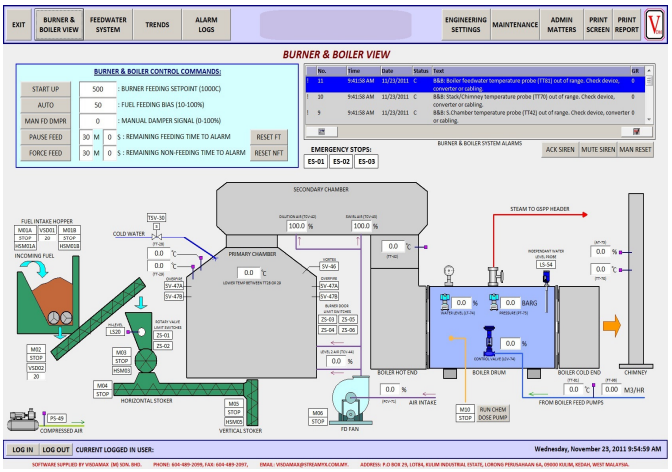
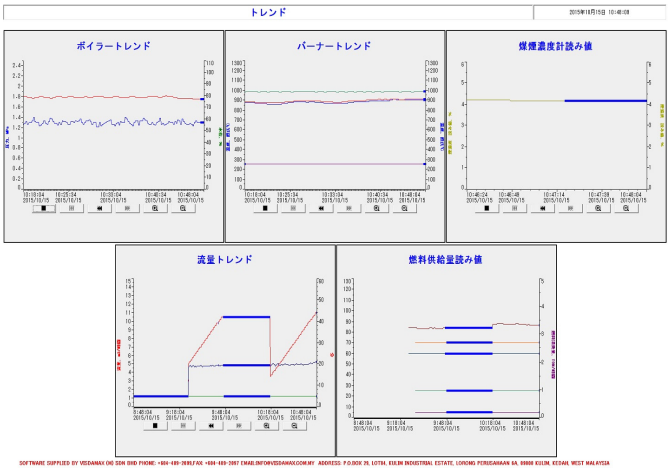
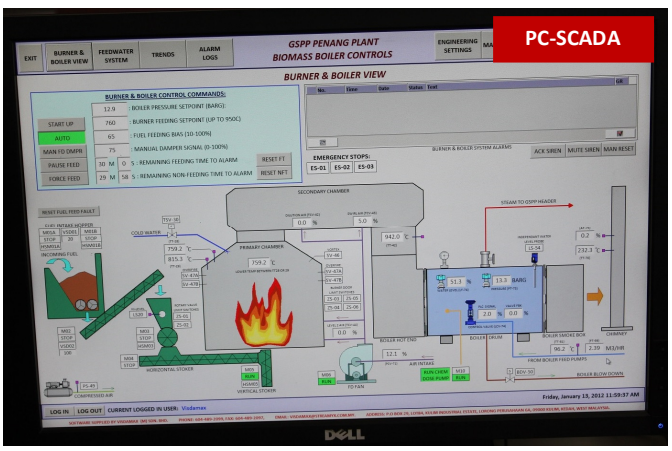
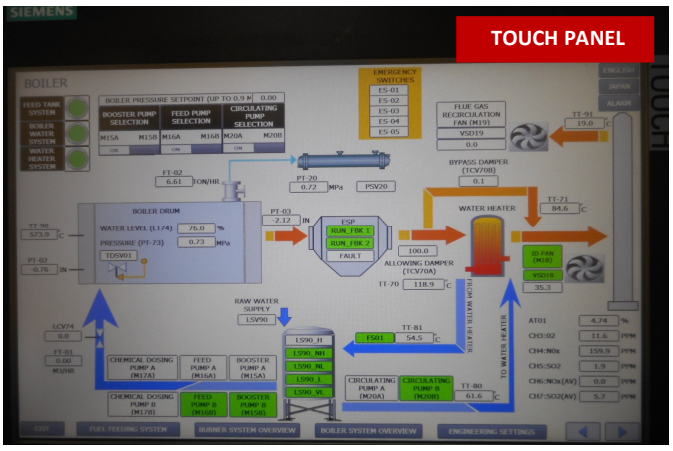
VISDAMAX MALAYSIA…..CAN SUPPLY AUTOMATED PLANTS CONTROLS IN A WIDE VARIETY OF SPECIFICATIONS. AMONG THE MOST COMMON ARE:

- PLC controller for the entire heat, kiln or process plant of the following major brands:
  - Default: Siemens.
  - Others: ABB, Allen Bradley, others on request.
  - Safety PLCs or redundant systems can also be supplied on request.
- Plant controls usually involve a single PLC system mated to a computer with a basic SCADA system installed for monitoring plant information. Optional touch panels are provided in large plant setups for easy access as well as a backup for the PC.
- Default PLC system usually consist of the following features:
  - Display all necessary data on main screen.
  - Trend and data record all key values.
  - Automated safety controls.
  - Alarm record logs.
  - Multi level access accounts for security purposes.
  - Operator set-able alarm & process setpoints.
- With internet access, the following additional services can be supplied on request:
  - Sending alarm emails to mobile phones.
  - Remote access from home or office.
  - VPN access from our office to upgrade or to troubleshoot potential issues.
- Multi language controls with English being the default. (Chinese, Japanese or Other)
- Control system can also be customized to suit a specific client requirement.



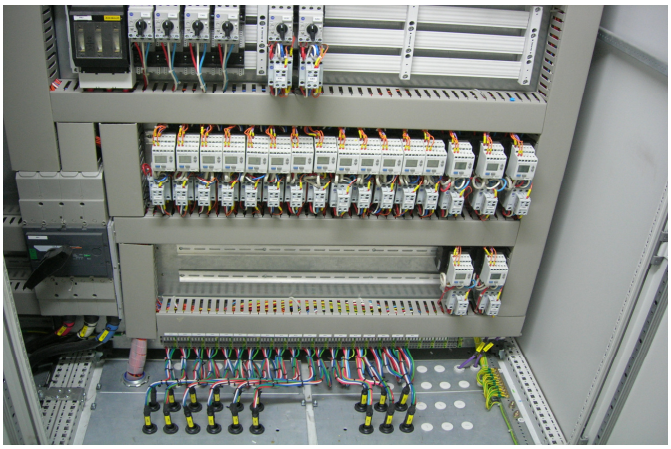






VISDAMAX MALAYSIA….. ALSO SUPPLIES A WIDE RANGE OF MCC BOARD DESIGNS TO SUIT THE NEEDS OF THE PROJECT REQUIREMENT. COMMON HIGHLIGHTS:

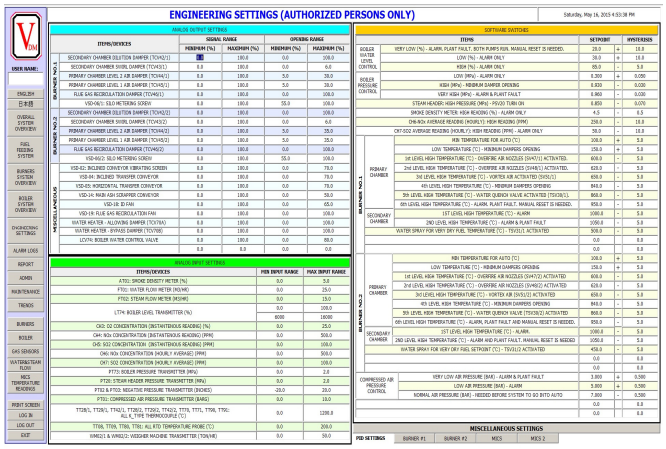
- MCC boards can be designed to suit the end user requirements or to satisfy the country regulation in which the board will be shipped to.
  - Default: Visdamax standard design.
  - Others: Specific to project requirements.
- MCC boards may also include the main PDC board (Power distribution center) if required. Type tested boards can be supplied on request and at an added cost.
- Default MCC board usually consists of the following items:
  - The main cabinet.
  - Amp & voltage meters / displays.
  - Main circuit breakers (MCB, MCCB, VCB, etc)
  - Earth leakage circuit breaker.
  - PLC and the corresponding power supply and IO cards.
  - Motor overload relays.
  - Motor contactors.
  - Variable speed drives.
  - Relays, terminal blocks, etc.
- Components of the MCC board may be selected by the end user for familiarity purposes. If no preference is made, the default components will usually be (Schneider, Omron, Terasaki, Allen Bradley, Moeller, etc.)
- Power distribution boards for a co-generation plant as well as synchronizing boards can also be supplied on a turnkey basis if the plant consists of some co-generation or pure power generation equipment.



CUSTOM PLANT AUTO CONTROLS & ELECTRICALS

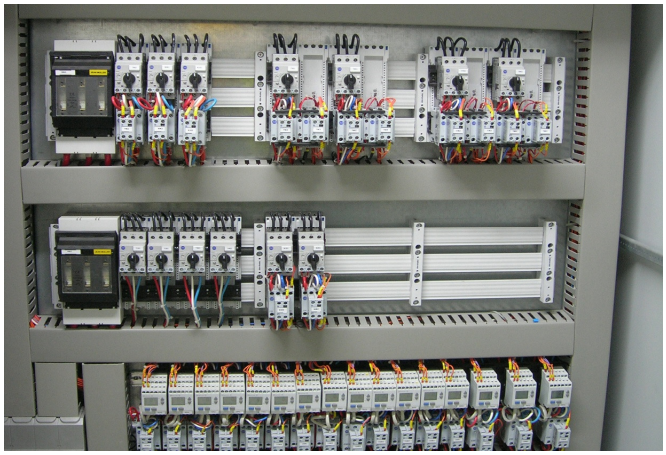
PICTURES & SCREENSHOTS OF VARIOUS PLANT CONTROL & BOARD EQUIPMENT

Above: Local board with a HMI touch panel for easier viewing.



Above: Engineering settings page.

Above: Dual language ability on the SCADA system allowing for easy operator understanding.



Above: MCC board with double contactor system on an electrical bus bar.

Above: MCC board with variable speed drives shown.

Above: Basic MCC board design.

OTHER WORKS: POWER, CHP & CO-GENERATION

VISDAMAX Malaysia can also team up with a variety of power generation equipment suppliers to deliver turnkey power and co-generation plants ranging from about 200kWe up to about 5MWe. Power generation equipment can range from a variety of Steam Turbines to Organic Rankine Cycle (ORC) systems. The plant equipment can range from medium to high pressure saturated or superheated steam to unpressurized thermal oil depending on client preference and requirements.

STEAM TURBINES

- Can work with any steam turbine company ranging from IBL, Kobelco, Shinco, Siemens, or others etc.
- Condensing or vacuum condensing turbines for pure power generation ranging from 1 to 5MWe gross or more.
- Condensing and extraction turbines for combined heat and power applications. Steam can be extracted at any required pressure for process use.
- Back pressure turbines for pure co-generation with exhaust pressures of 1 to 5 barg with the low pressure exhaust steam for use in any process environment.
- Turbines can run on saturated or superheated steam depending on application and with typical pressures ranging from 9 barg up to 42barg.
- Can be fully integrated with the heat plant SCADA & control system.

ORC SYSTEMS

- Can work with any ORC company such as G-Tet, Turboden or others.
- ORC system carries the advantage of not needing any pressurized heat plant to generate power. Can be done via thermal oil.
- Output gross power can range anywhere from 200kWe to 5MWe.
- Ability to run as a pure power generating plant or to be run as a combined heat and power plant.
- Exhaust heat can be in the form of hot water with temperatures up to 120degC on request for process use. General hot water temperature ranges up to 95degC. Suitable for use in locations that require hot water heating and power.
- Can also be fully integrated with the heat plant SCADA & control system.

Above: Small back pressure turbines in partnership with Kobelco being installed.

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