



The **Onix** Corporation

Solid Fuel Burner Systems

The Onix Corporation

Rotary Drum Dryers

Alternative Fuel Systems

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This solid fuel system is designed for a wood fuel having a "normal size distribution" with 1/4" being the maximum particle size; a heating value of 7,500 Btu/lb or greater, an ash content of 6% or less, a moisture content of 12% or less and a consistent density of 6-25 pounds per cubic foot. These physical conditions are required for the fuel to combust in our cyclonic reactor. The chemical conditions are addressed by the phrase "wood fuel" or the chemical equivalent of wood.

Many solid fuel alternatives exist other than 100% wood. Through careful testing and thorough analysis we have qualified and permitted alternative solid fuels such as OSB, MDF (fiberboard with medium densification), charcoal, spent horse bedding and nutshells, corncobs, acrylic resins, plastics, papers,. Each

case must be addressed on an individual basis. If two companies are producing MDF as a co-product of manufacturing furniture, analysis may yield different chemical compositions relative to each industry's co-product.



This analysis should contain both a *proximate* (refers to moisture percentage, ash percentage, and as-received btu/lb heating value) and *ultimate analysis* (refers to carbon percentage hydrogen percentage, nitrogen percentage and oxygen percentage on a oven-dried sample) and should be conducted on all fuel used. Additionally, *chlorine percentage* should be included in this complete fuel analysis.

Particle size and fuel moisture can be controlled through add on equipment to the Solid Fuel System.

The Solid Fuel Burner

The **Onix** Corporation is on the cutting edge of technology with its research on solid fuel. This research resulted in the development of The **ONIX** Series Solid Fuel Burners.

These burners operate primarily on reclaimed wood, bringing the fuel cost to a minimum. Depending on the availability of in-house waste such as poly tailings, sawdust, etc., consumers may experience a negative fuel cost.

These burners are capable of delivering between 0.5 MM and 150 MM Btu's per hour and can achieve temperatures of 2,000 degrees Fahrenheit while saving money on every Btu used.

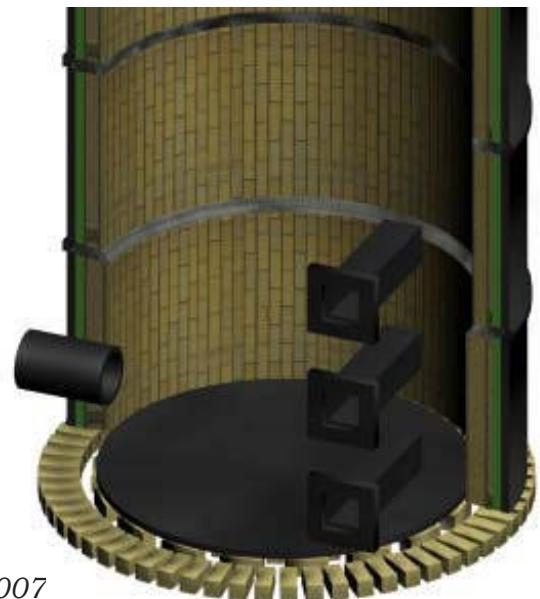
The **Onix** Corporation's **ONIX** Series solid fuel burners have many industrial applications including replacing outmoded burners, dryer heat source, heat for kilns, heat source for boilers, as well as winter space heating.

The **Onix** Corporation prides itself on meeting or exceeding local, state, and federal air quality standards. Our emissions contain virtually no sulfur, NO_x, or CO.

There are over 100 **ONIX** Series solid fuel burners presently in operation world wide providing millions of Btu's for a fraction of previous fuel costs. These burners can be operated on a number of recovered co-products of manufacturing, which represent an additional expenses to a company currently discarding the co-products.



20 MM Btu/hr solid fuel burner for a drying system. Drying system retains capability of using natural gas as a fuel.



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Cyclonic Combustion

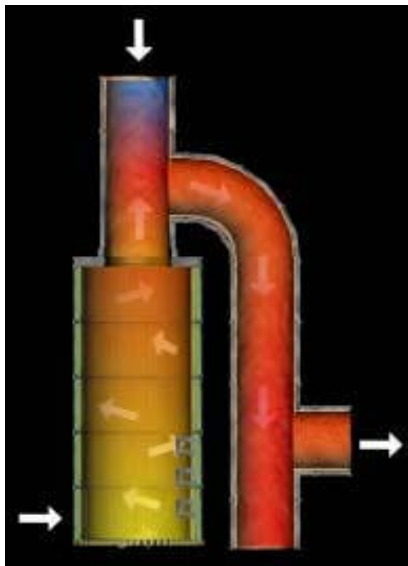
How it works

Cyclonic furnaces have become a major alternative to conventional burners. Applications include both large-scale utility boilers and certain industrial processes where waste heat can be recovered profitably.

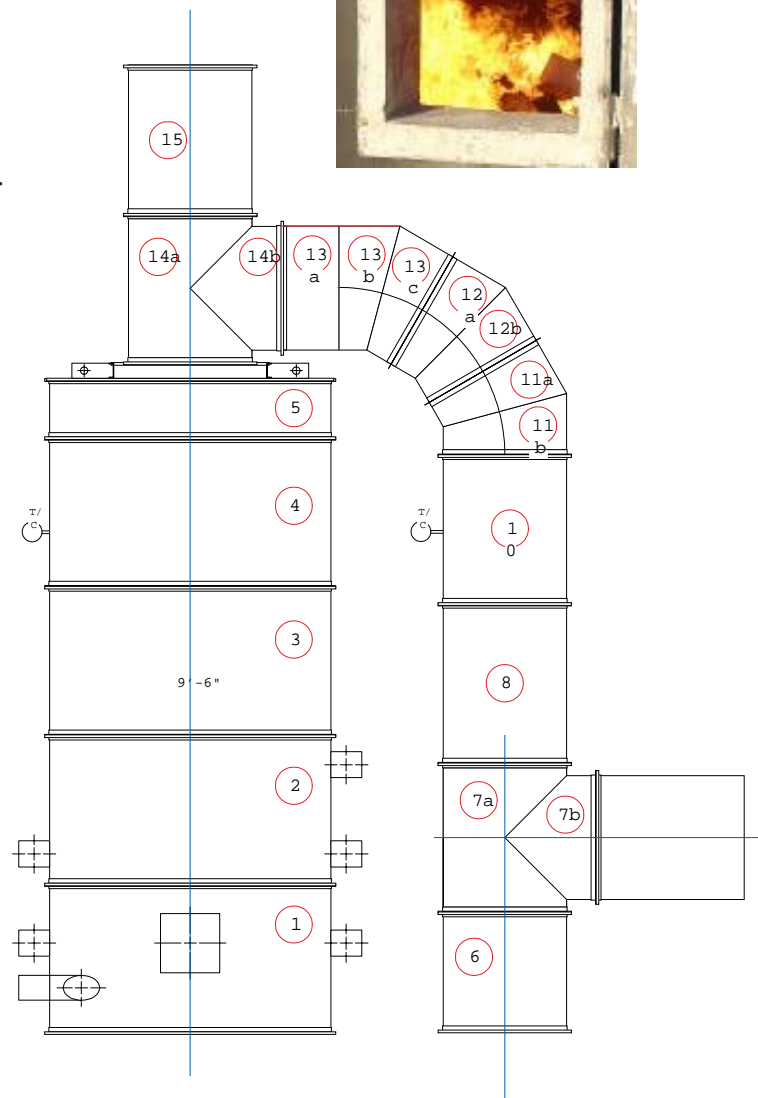
The ONIX Series solid fuel burner is operated by cyclonic combustion. In cyclonic combustion, the burning occurs at a positive pressure, rather than the slight negative pressure associated with most suspension fired wood systems.

The combustion occurs in a specially designed cylindrical reactor which discharges hot gaseous combustion products directly into the boiler or other vessels. Pulverized wood is blown into the cyclonic burner where it oxidizes immediately. Centrifugal action forces the particles toward the cylindrical wall of the burner where char oxidation occurs. Very high turbulence is generated in the cyclonic burner and char oxidation occurs within milliseconds.

Combustion intensity in cyclonic burners is considerably higher than combustion intensity in conventional wood suspension fired furnaces.



The vigor of the cyclonic action forces the wood particles to the burner wall, facilitating not only rapid combustion but also solid product removal. Cyclonic burners typically remove 99% of the solid products of combustion. These solid products of combustion exit the burner then enter the boiler or other vessels and are removed as fly ash by a particulate control system.



SYSTEM FUNCTION

Cyclonic Solid Fuel Burner

—A Type “K” thermocouple at the dryer discharge senses an energy demand. Three things happen simultaneously :

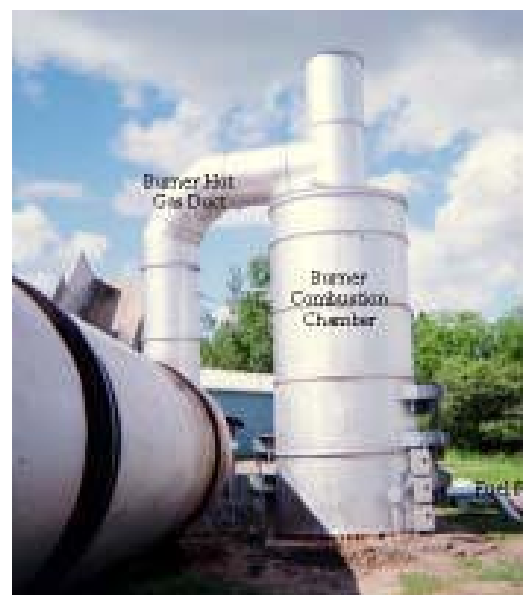
1. Fuel feed rate increases.
2. The additional fuel creates an energy increase in the burner; this energy is drawn into the drum by the dryer i.d. fan.
3. The dryer outlet temperature is increased.



—Wood fuel fires very clean in the burner. If burner emissions from the propane combustion or dried sawdust are exhausted directly from the combustion chamber to atmosphere, only heat waves are visible. There is no smoke, no malodor, and virtually no CO and VOC's. The combustion process is extremely hot and exceptionally clean.

—Dried fuel is delivered to The **Onix** Corporation feeding equipment. This variable speed feeding equipment is capable of delivering material to the burner at continuous rates from 1 to 100 ft.³/hr.

—The entire system is automatic and basically labor free, with 100% automatic fuel feed to exact dryer needs.



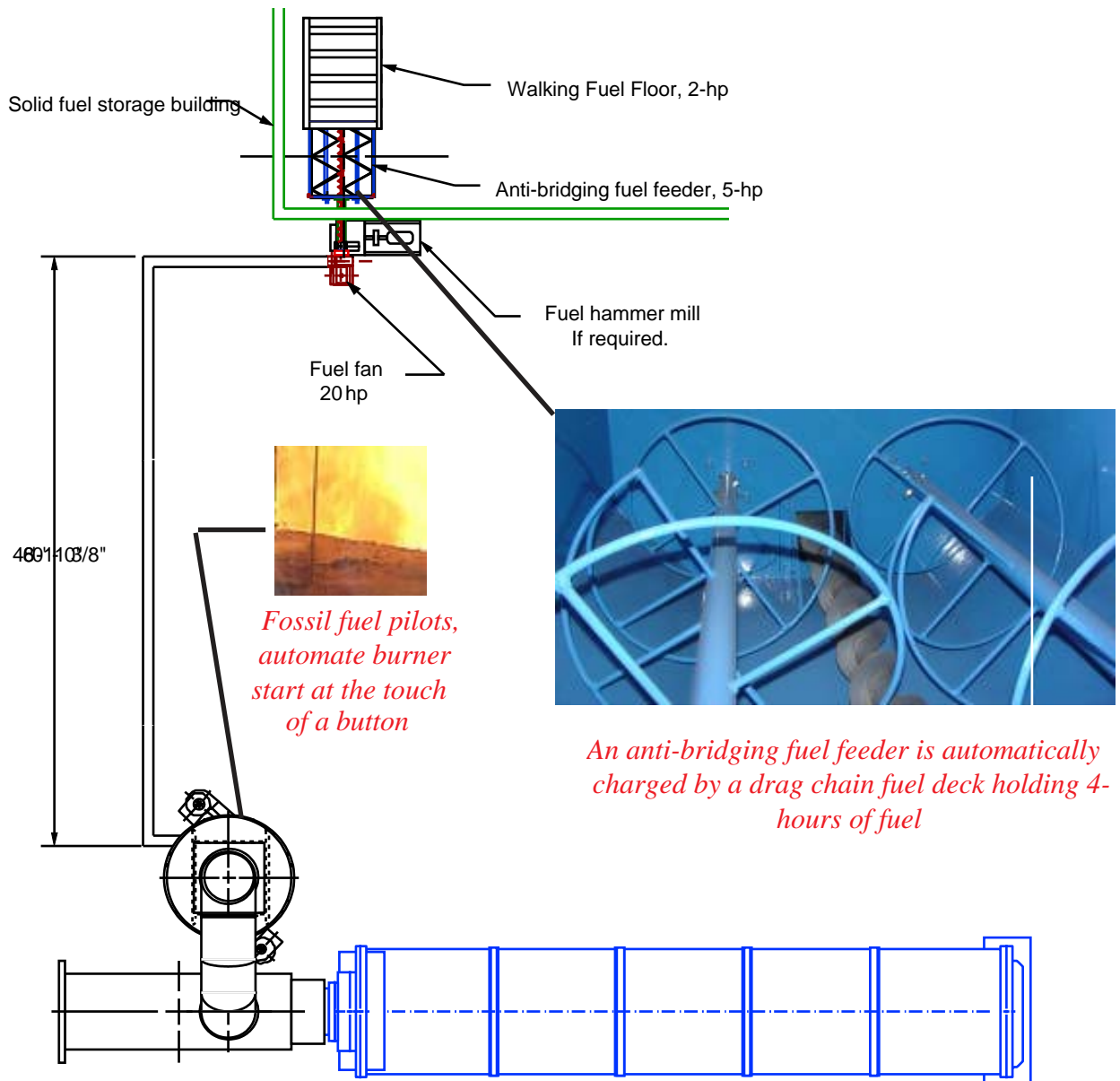
Onix – Fuel Delivery

All units are priced to include 4-hours of fuel storage through incorporation of a top loading fuel deck. Tank feed systems can be substituted.

The Onix Corporation

26 MM Btu/hr Solid Fuel Burner

Typical Feeding Arrangement



Onix Installation

*All units are priced to include installation within the continental US
(excluding fuel piping and motor wiring).*

All pieces are pre-lined with refractory to speed up mechanical installation time to 1-day.

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Onix Controls

Control packages integrated with the Onix-OS®.

Real-time data displayed on a secure web page allows you to view your company's dryer data from your LAN or internet connection. Integrated security cameras will allow you to watch the dryer operation from afar.

The Onix-OS® Solid Fuel Burner Overview Screen

Solid Fuel Burner Data Burner System Faulted

Control -- Burner Loop

Burner Temperature	1,540	Burner Temperature	1,540
Burner Set point	1,540	Combustion Air Ratio	10.0
Burner Fuel Valve Output %	20	Combustion Air Output %	16

Auto Manual
Auto/Man

Burner Ignition Failure

M-1 CAF#1	M-2 CAF#2	M-3 CAF#3	M-4 CAF#4	M-5 CAF#5	M-6 Fuel Fan	M-7 Fuel Hammer mill	M-8 Fuel Auger VFD
●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●

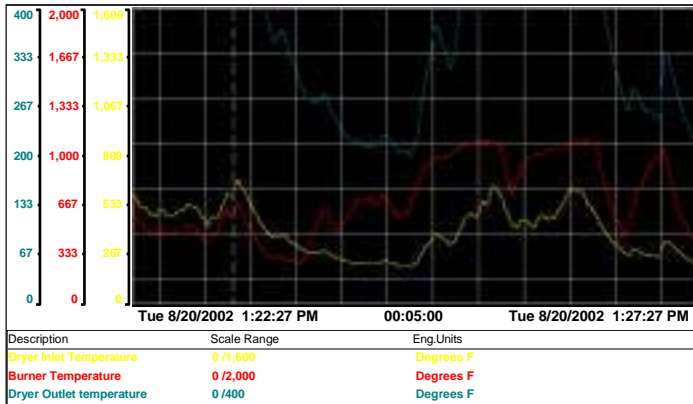
Burner 30 Second Stop

Burner Immediate Stop

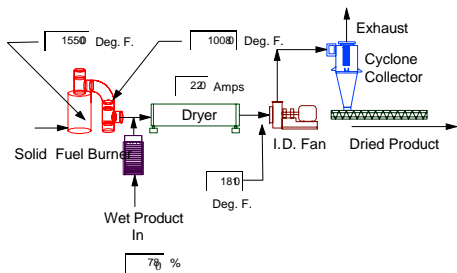
Burner Auto Start

System E-Stop Pressed

Dryer System Overview



Drying Process Screen



Rotary Dryer Data

Dryer Amps	220
Dryer Inlet Temperature	1000
Dryer Outlet Temperature	180
Dryer Outlet Set point	180
Fuel Valve Output %	60

Auto Manual
Auto/Man

Wet Product Feeder VFD Output % 78

Wet Product Feeder VFD Start/Stop

Dryer Feed Directed to Dryer Stockpile

Dryer Outlet Temp.	Dryer Inlet	Burner Temp.
500 416 333 250 166 83 0	1800 1500 1200 900 600 300 0	2000 1666 1333 1000 666 333 0
PV SP	PV SP	PV SP
AUTO ALARM	AUTO ALARM	AUTO ALARM

Start Stop Dryer Out SP PID Tuning Alm Setpoints Alarms

Stop 0 PID Setpoints Trends Motors

Dryer 30 Second Stop

Dryer Cleanout and Shutdown

Dryer Immediate Stop

Dryer Auto Start

Dryer Trends

Motors

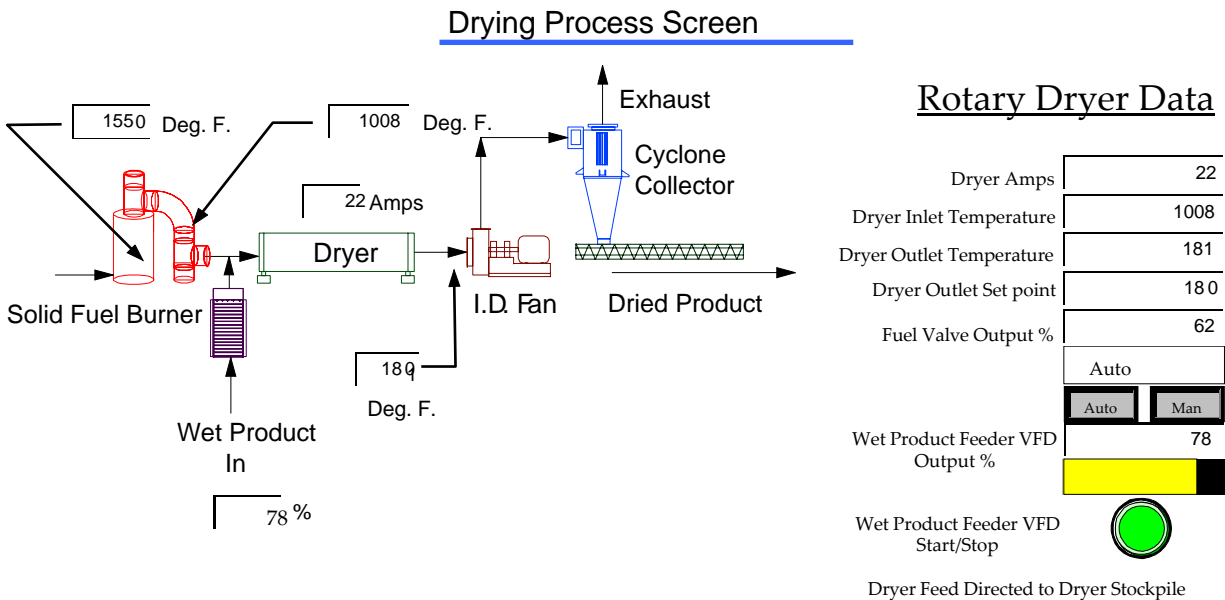
System Overview

Onix OS®

The system features Allen Bradley/Entivity/Automation Direct Touch Screen controls. This degree of control allows for automatic and manual control. Controls will display fuel consumption in pounds per hour. The controls monitor dryer inlet and outlet temperatures and cause system safety shut-down in case of extremes. This level of automation offers burner trial for ignition at the touch of a button and a comprehensive operator 10" touch screen display for all dryer functions controlled. A networked PC will historically track burner and dryer temperatures and all operator settings. An alarm screen on the touch screen will track alarm history. A modem connected to the PLC/PC allows for remote adjustment and troubleshooting of the PLC/PC program via phone or internet. Technical support is only a few mouse clicks away. Future expansion of this program is possible to include all dryer functions.

The graphic below presents an example of what the operator might see during system operation. The Onix-OS® also historically tracks dryer inlet, outlet and burner temperatures indefinitely. The Onix OS® can be upgraded to control all plant functions at anytime in the future or to display integrated existing values present, within the plant. The Onix-OS® can be remotely monitored or accessed via telephone or internet, which then permits interaction with control and trend screens.

Plant operators have a rugged 10" NEMA-4 touch screen interface to access all burner functions. Burner faults and alarms are tracked and recorded with a time and date stamp. This system integrates stopping of the wet product feeder and dryer i.d. fan in an ultimate high alarm condition.



Dryer 30 Second Stop	Dryer Cleanout and Shutdown
Dryer Immediate Stop	Dryer Auto Start

Dryer Trends	Motors	System Overview
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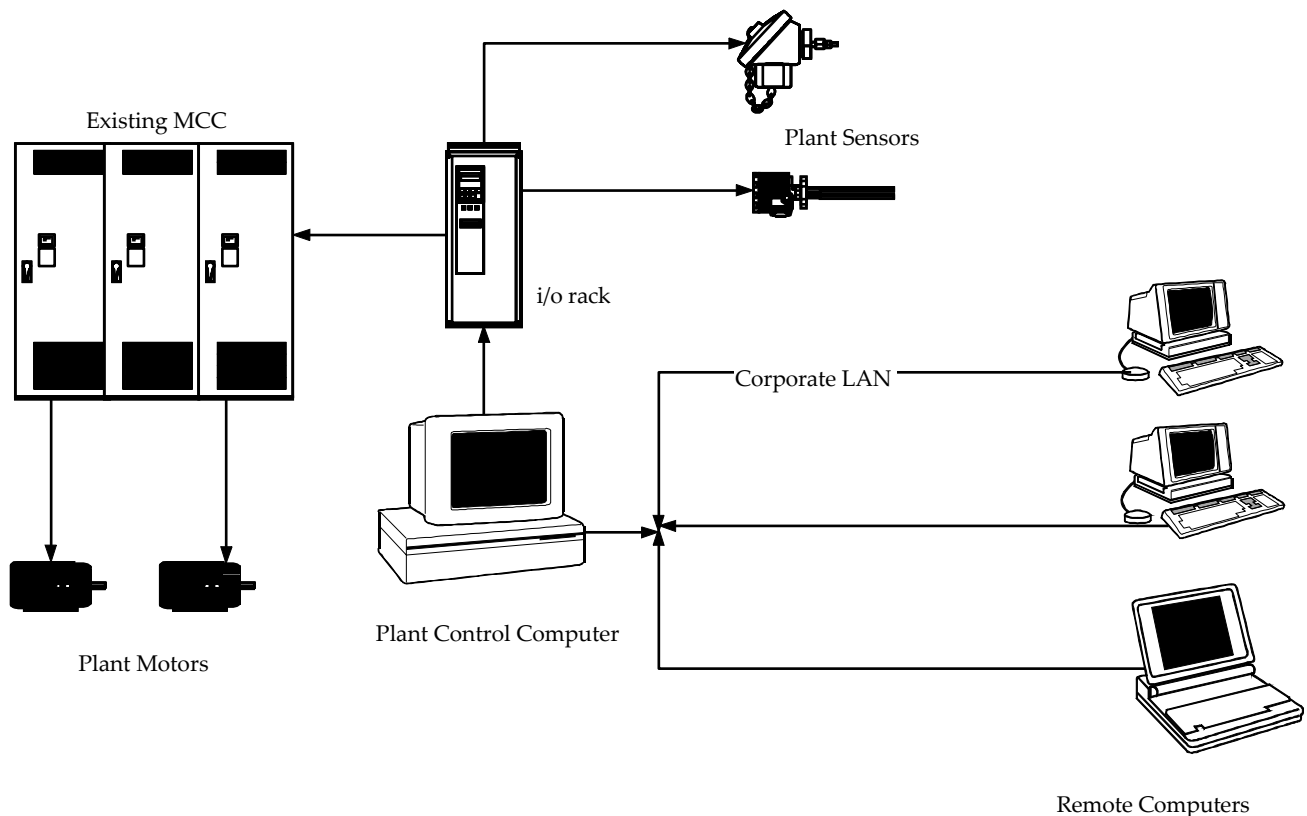
Onix OS ©

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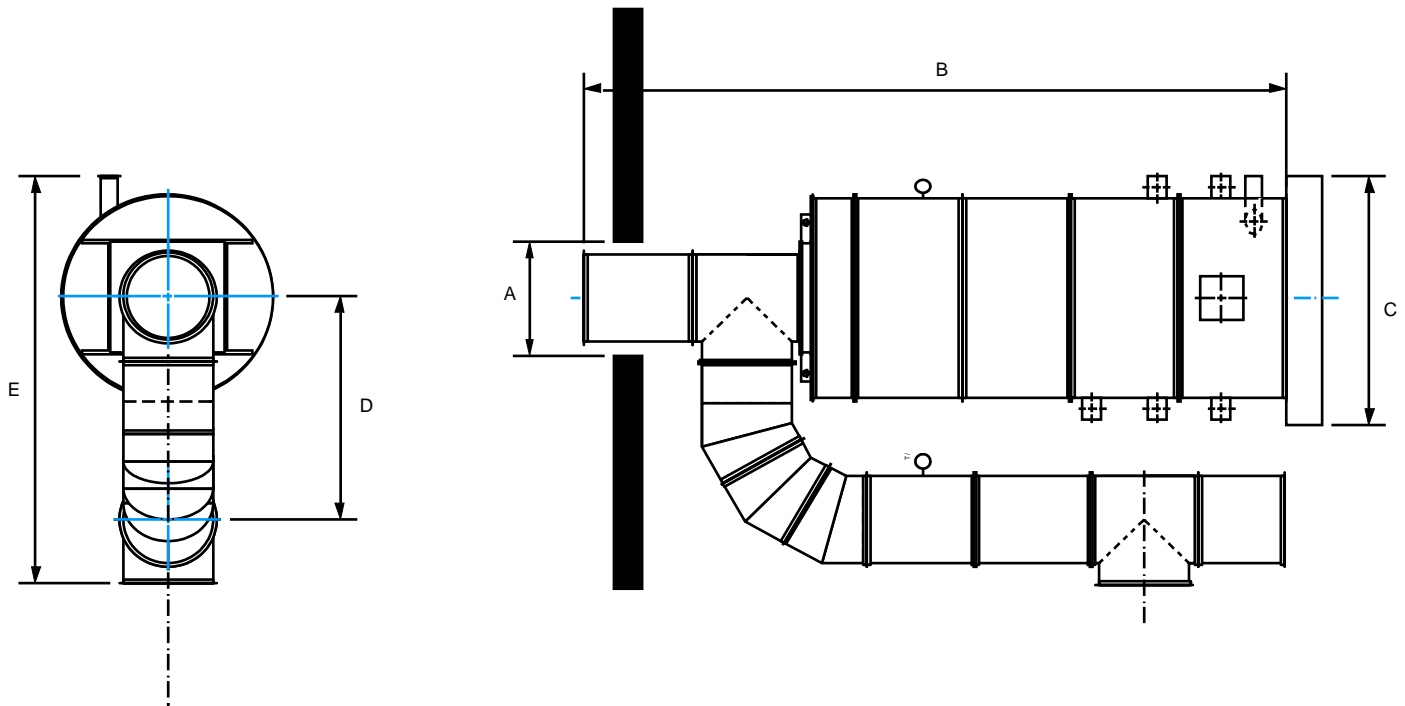
The Onix-OS© boasts up to 64 PID loops having, for all practical purposes, no limit to the number of burners or system components which it can control. This system has touch-screen control and is capable of automatically tracking historical trends and data archiving. The Onix-OS© can start and control all the motors at your plant, not just the dryer motors. The Onix-OS© allows authorized plant personnel to dial into the system to retrieve data on



plant operation during the night, the past week or years back. It can track any parameter and inform when and why the system shuts down due to any alarm extreme. Reports can be generated to outline plant wide production during any selected time interval. The Onix-OS© can be modified to add motors or data items from a remote computer. This system will require the presence of an operator at start-up and



Solid Fuel System Dimensions



Model Number	A	B	C	D	E	HP
ON-02	24	125	64	68	109	20 hp
ON-04	24	152	75	68	120	40 hp
ON-05	26	162	79	71	127	40 hp
ON-10	33	198	93	81	152	45 hp
ON-12	45	213	98	100	175	50 hp
ON-20	59	248	112	122	210	55 hp
ON-26	59	268	122	123	220	55 hp
ON-30	59	280	127	123	224	55 hp
ON-45	82	330	142	158	274	75 hp
ON-52	82	344	148	158	280	80 hp
ON-60	82	359	154	158	286	85 hp
ON-75	91	384	166	173	310	100 hp

All dimensions are in inches and are approximations contingent on approval drawing release
 The number after the ON- indicates the burner maximum output in Millions of Btu/hr

Model Number	App. Horsepower	Maximum Energy Output
ON 02	20hp	2 MM Btu/hr
ON-04	40hp	4 MM Btu/hr
ON-05	40hp	5 MM Btu/hr
ON-10	45hp	10 MM Btu/hr
ON-12	50hp	12 MM Btu/hr
ON-20	55hp	20 MM Btu/hr
ON-26	55hp	26 MM Btu/hr
ON-30	55hp	30 MM Btu/hr
ON-45	75hp	45 MM Btu/hr
ON-52	85hp	52 MM Btu/hr
ON-60	90hp	60 MM Btu/hr
ON-75	100hp	75 MM Btu/hr

- Complete solid fuel burner packages included anti-bridging fuel feeder with 4 hours of fuel storage for top loading, tank feed system may be substituted.
- All solid fuel burners have customer choice of gas, propane or #2 fuel oil fossil fuel pilot
- All programs must undergo a thermodynamic analysis by The **Onix** Corporation to assure program viability and price.
- All system components have a three-year warranty full replacement.
- Horsepower requirements are approximations. Price includes a fuel hammer mill for on line size reduction for 1" maximum lump size.
- All systems include PLC/ PC for system control interface, data tracking and network wide control. Internet viewing of system is available with applicable internet connection.
- All prices are in U.S. Dollars