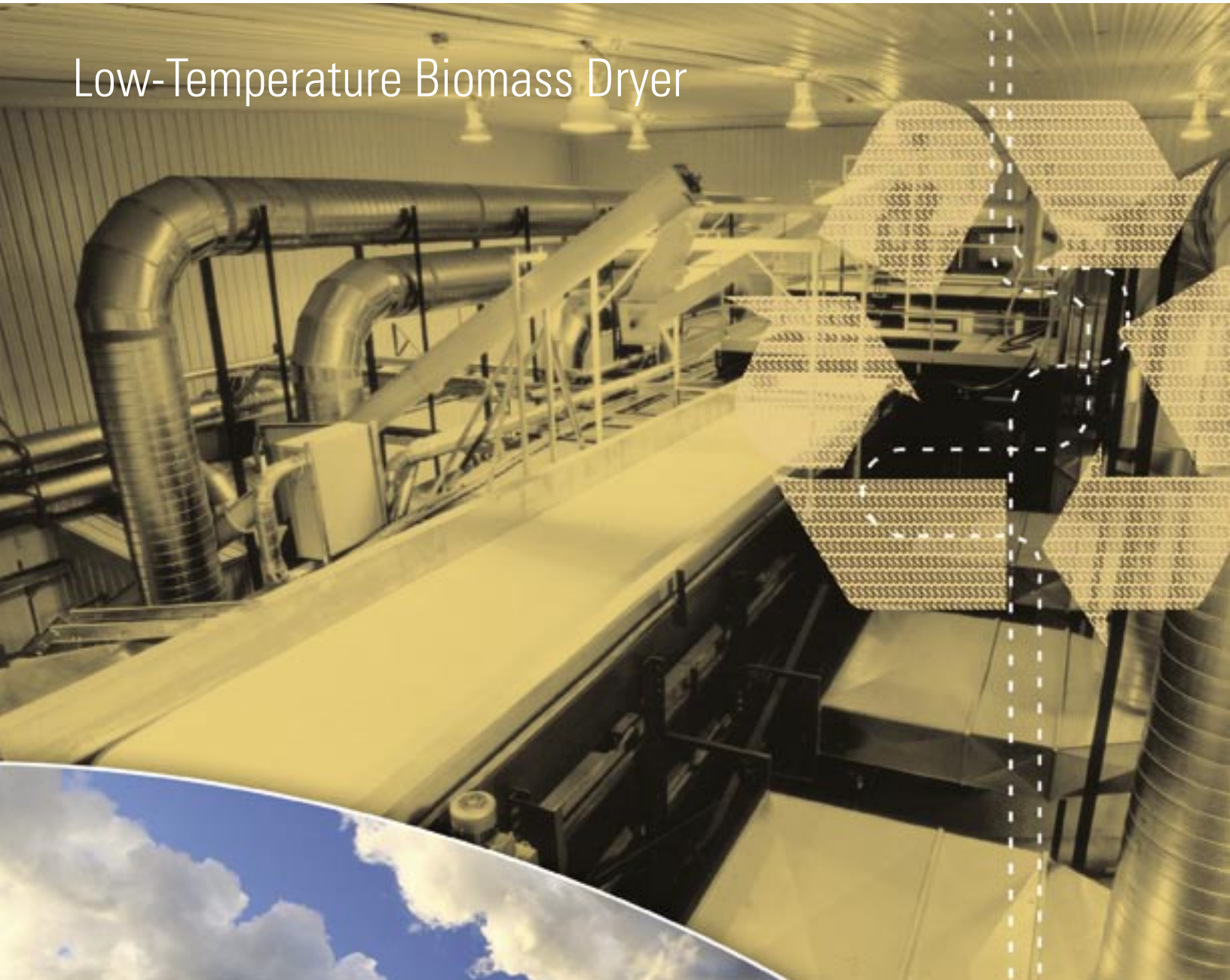


An Innovative Technology Company Providing  
Custom Energy and Emission Reduction Solutions



# DRY-REX™

Low-Temperature Biomass Dryer



Thermal Energy does much more than supply award-winning biomass dryers. With our skills and expertise in heat recovery we provide completely integrated bioenergy solutions that yield returns and long term results to your bottom line.

### Let DRY-REX™ Fuel Your Profits

#### Bioenergy from biomass with DRY-REX™

- ▶ Increase biomass dryness to 65% or higher;
- ▶ Increase heating value of your biomass;
- ▶ Reduce boiler combustion air requirements;
- ▶ Improve boiler combustion efficiency by 20% or more;
- ▶ Increase biomass combustion rates by up to 30%;
- ▶ Reduce or eliminate supplementary non-renewable fossil fuel combustion;
- ▶ Reduce greenhouse gas emissions.

#### Bioenergy from Residuals (Sludge) with DRY-REX™:

- ▶ Convert waste such as sludge into valuable, high-yield biofuels,
- ▶ Replace or displace costly fossil fuels (oil, gas, etc) with dried residuals;
- ▶ Eliminate environmental impact of landfilling your waste;
- ▶ Eliminate related environmental costs:
  - Transportation;
  - landfill remediation, opening, closing & maintenance costs;
  - long term environmental liabilities.
  - Eliminate landfill emissions.

*DRY-REX™ – Creates free energy from your existing processes and waste*

### DRY-REX™ Features

#### Simple Durable Design

Stacked, modular belt conveyor design allows for greater air contact and increased residence time for a given equipment footprint. Low operating speeds and durable components ensure long equipment life.

#### Low Emissions

Low operating temperatures minimize the amount of volatile organic compounds (VOCs) generated from biomass. Low air velocities and the fixed bed design minimize particulate carry over in the exhaust minimizing investments required to meet emission regulations.

#### Safe and Reliable Operation

Low operating temperatures greatly reduce safety hazards. Ambient air designs allow for safe working environments and reduces dust formation.

#### Low Operating Cost

Low operating temperatures means we can provide an integrated solution using recovered energy from your process. Evaporate moisture for 50-75 kWe/ton.

### Commonly used Waste Heat Sources for DRY-REX™

- ▶ Biomass Boiler Exhaust
- ▶ Recovery Boiler Exhaust
- ▶ Smelt Dissolving Tank Exhaust
- ▶ Pulp Dryer Exhaust
- ▶ Paper Machine Dryer Exhaust
- ▶ Hot Effluent Streams
- ▶ Low-Pressure Steam



A DRY-REX™ system installed at a Western Canadian paper mill is used to dry sludge produced in the paper making process and convert it into a commercial, marketable product. The mill gets the benefit of converting a biowaste product which cost millions of dollars to transport and landfill into a revenue-generating product line.

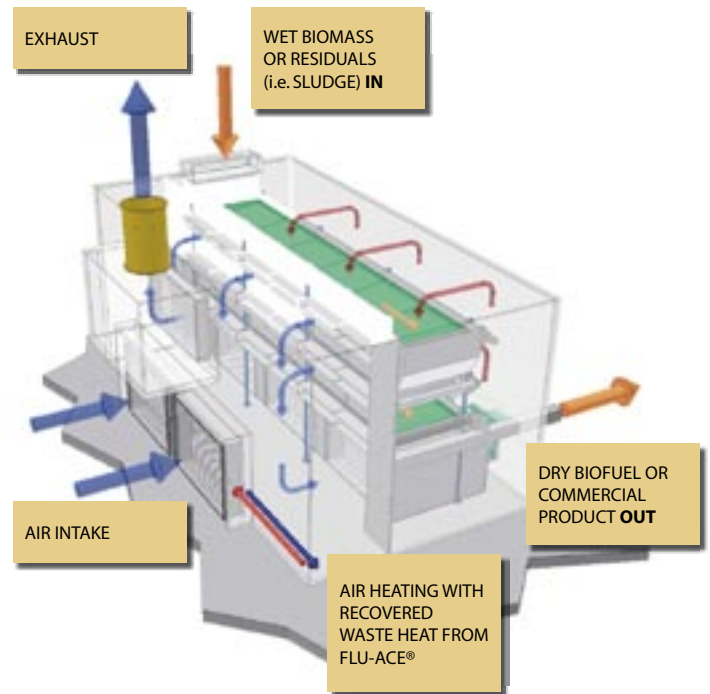
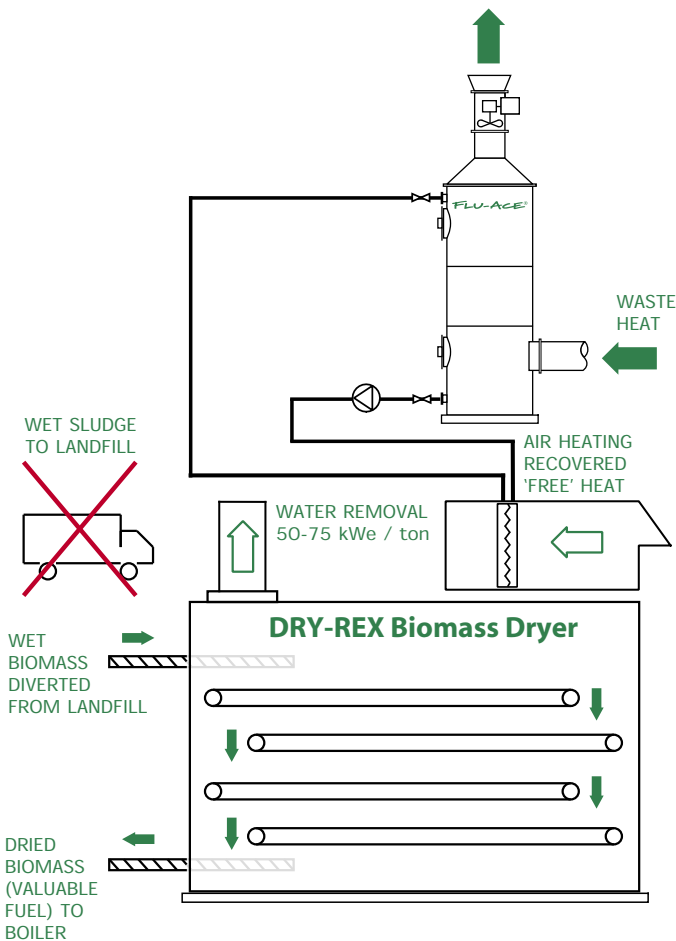
As an integrated solution with our FLU-ACE® energy recovery, the DRY-REX™ delivers an optimum return allowing recovered waste energy from your processes to supply DRY-REX™ heating systems as well as displace expensive process steam heating.

*DRY-REX™ provides significant benefits and improvements in boiler and plant operations. In cases where biomass is already in use as a fuel source, DRY-REX™ can completely eliminate the need to use expensive non-renewable fossil fuels*

Using the DRY-REX™ system also means:

- ▶ Tons of water removed can now be replaced with more biofuels to displace non-renewable fossil fuels or increase steam production;
- ▶ Energy previously used to evaporate water now instead produces valuable steam;
- ▶ Significant reduction in combustion air requirements;
- ▶ Boilers topped in capacity can produce much more steam;
- ▶ More biomass can be fed to the same boiler increasing steam generation;
- ▶ Improved combustion efficiency;
- ▶ Considerable stabilization of boiler operations.

Some of the biggest benefits from DRY-REX™ land right on your bottom line – reduced production costs, sharply lower energy costs, increased profitability, reduced environmental impact and more. DRY-REX™ also optimizes your production of green power and with reduced greenhouse gas and other emissions opening access to a source of certifiable CO2 and other emission trading credits.



**DRY-REX Biomass Dryer**

## Thermal Energy: Supplying Innovative Award-Winning Energy Recovery, Conservation, Bioenergy and Emission Reduction Solutions.

TEI is a full service, design-build firm with engineering accreditation, established in 1986. We have designed and built many energy and emission reduction solutions on a design-build basis for our customers.

Our team of professionals is highly experienced in plant and process energy efficiency evaluations & innovative solution development. We conceptualize, design, manufacture and deliver custom solutions which reduce your energy costs, improve energy efficiency and reduce the environmental impact of your facility.

We pride ourselves on working with customers to gain an in-depth understanding of their business, corporate, social and fiscal challenges. With this sound footing, our team of professionals provides complete solutions from initial design concept to installation, to financing and servicing of varied technology solutions.

### Typical applications include:

- ▶ Waste energy recovery (FLU-ACE® and other);
- ▶ Biomass and Waste stream Drying solutions (DRY-REX™ and Other)
- ▶ Steam & Condensate System Solutions (GEM® and Other)
- ▶ Ozone systems (THERMALOZOMAX™), and;
- ▶ Burner/Boiler System Improvements.

*STOP delaying energy cost reduction programs and START saving on your company's energy bill today with DRY-REX™.*

*Let us put our experience to work for you. Contact TEI for installation case studies on DRY-REX™ winning solutions, or for a review and feasibility analysis for your company.*

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# FLU-ACE<sup>®</sup>

Boiler Flue Gas Applications



**Win your fight to reduce energy and production costs:**

- ▶ Reduce energy consumption on gas, oil and biomass burners by 15% to 35%;
- ▶ Reduce greenhouse gases and other emissions commensurate to fossil fuel reductions;
- ▶ Enjoy full payback on your FLU-ACE® investment in one to three years... and continued savings throughout the unit's 20 year plus operational life;
- ▶ Achieve typical water temperatures of up to 63°C/145°F (up to 82°C/ 180°F) with alternate design);

- ▶ Recover 200% to 300% more heat than conventional recuperator and economizer systems . . . heat readily usable for process water and air heating;
- ▶ Recover and condense between 70% and 90% of the water vapor normally vented in the exhaust gas... providing water for recycling to process;
- ▶ Achieve both efficient heat recovery and effective pollution control with one cost-effective FLU-ACE® unit.

Contact Thermal Energy's experts to learn how you can apply FLU-ACE® to recover and utilize your valuable waste heat.

Read further to learn how FLU-ACE® works

## *Thermal Energy International Inc. offers industry a winning solution to escalating energy costs*

FLU-ACE® provides an excellent source of heat at ideal temperatures for Thermal Energy's low temperature DRY-REX™ biomass drying systems.

In many cases, with clean fuels, the hot water can also be used directly in the process or boiler plant without any need for additional heat exchangers.

Electronic controls give FLU-ACE® optimum automated performance and "fail-safe" operation.

As a side effect of valuable heat recovery, FLU-ACE® provides you with a substantial environmental bonus... it reduces pollutant emissions by an amount equal to or greater than the percentage of energy saved.

FLU-ACE®, Thermal Energy's winning solution for your bottom line and the environment.



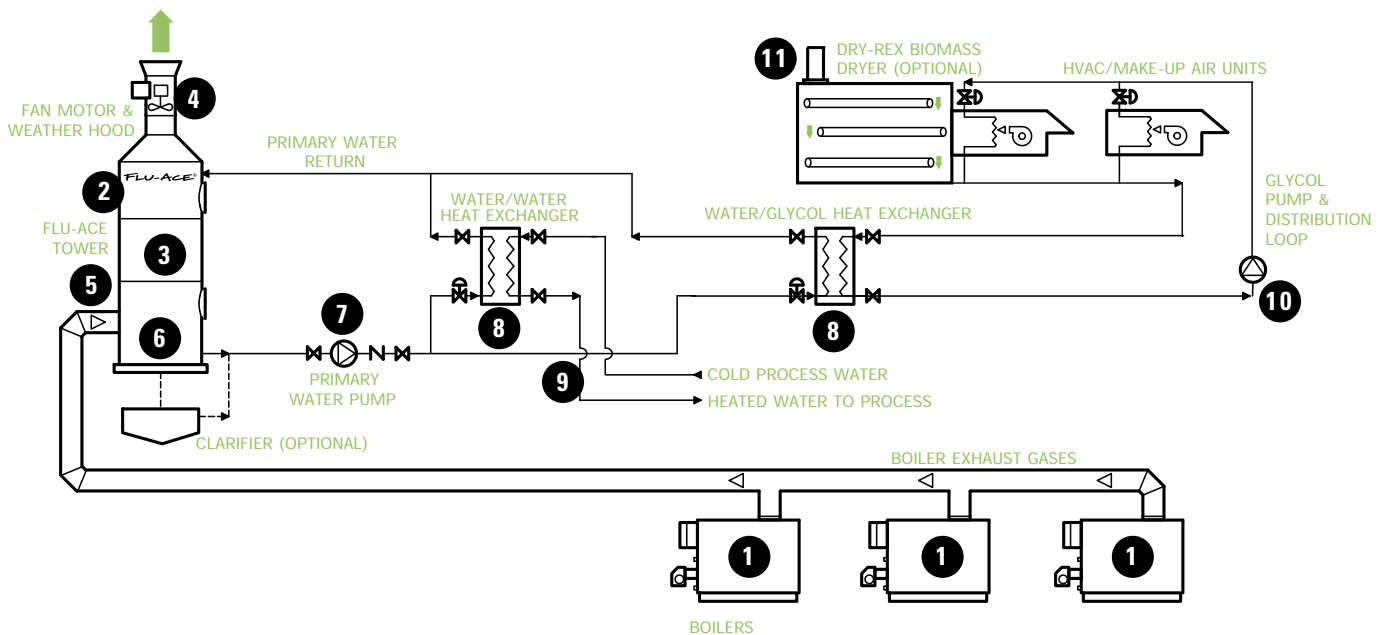
Thermal Energy was contracted by Johnson Controls to design and implement a FLU-ACE® heat recovery system for CAMCO's new dryer manufacturing facility in Montreal. It recovers heat from the "E-coat" system for building and process heating. It also benefits the environment by significantly reducing pollutants such as carbon dioxide and volatile organic compounds (VOCs).

FLU-ACE® technology greatly improves the fuel efficiency of boiler operations, provides a significant return on investment, and reduces environmental emissions. Up to 90% of the heat normally lost through boiler flue gas stack emissions is recycled by FLU-ACE®. This is possible because the FLU-ACE® unit's unique direct contact (gas/liquid) design enables optimal recovery of both sensible and latent heat, even in widely varying operating conditions.

- 1 Conventional heat recovery technologies require a dedicated piece of equipment for each boiler exhaust – not with FLU-ACE.
- 2 The varying flow of flue gases emitted from multiple boilers can be efficiently processed by a single FLU-ACE®. This means a lower initial investment, lower operating costs and a higher return on investment with FLU-ACE®. FLU-ACE® will have an ongoing positive effect on your bottom line throughout its long operating life (20+years in most applications).
- 3 The FLU-ACE® unit's unique internal structure ensures maximum condensing heat and mass transfer. It also enables an unobstructed flow of liquids and gases through the tower, guaranteeing virtually continuous operation with limited downtime.

## Achieve energy consumption savings of up to 35%

- 4 FLU-ACE® is equipped with a variable speed, induced draft fan at the tower outlet. The fan automatically maintains the optimum flue gas static pressure set point at the tower inlet preventing interference with upstream processes.
- 5 Hot water is produced when boiler flue gases are cooled and water vapor is condensed in the FLU-ACE®.



- 6 The hot water (at up to 63°C/145°F) accumulates in the receiver where it is chemically treated to neutralize acids and remove suspended solids if required.
- 7 FLU-ACE® uses variable speed pumps to keep the temperature of the hot primary water leaving the receiver at the desired level.
- 8 Control valves regulate distribution of the primary water to the heat exchangers.
- 9 Heat can be transferred to secondary water for direct process water heating or boiler make-up heating
- 10 Heat can be transferred to secondary glycol fluid for direct plant makeup air heating, boiler combustion air preheating.
- 11 FLU-ACE® can also be used to provide heat to Thermal energy's low temperature DRY-REX™ biomass dryer for turning biomass feed stock into high-efficiency biofuel.

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