MEMORANDUM

TO: Mayor, City Council & Local Contract Review Board

FROM: Faye Stewart, Public Works & Development Director

SUBJECT: PUBLIC HEARING EXEMPTING PUBLIC IMPROVEMENT PROJECT FROM COMPETITIVE BIDDING REQUIREMENTS FOR THE BIO SOLIDS DRYING EQUIPMENT

DATE: January 4, 2023

Background

The Joint Public Hearing by City Council and the Contract Review Board is to receive testimony regarding exempting competitive bidding requirements for a sole source procurement of bio solid drying equipment at the City's Water Reclamation Facility. The equipment is under consideration is a solids dewatering centrifuge produced by Centrisys CNP and a bio solids dryer manufactured by Bio Force Tech. City staff has spent the last 4 years touring operating bio solid dryers and believes Centrisys and Bio Force Tech equipment is superior to other bio solid equipment. In 2019 Ameresco prepared an energy audit for the Water Reclamation Facility highlighting the opportunity to reduce plant operating costs by installing bio solid drying equipment including recommending Centrisys and Bio Force Tech's equipment. In 2019 the City received a price quote of $795,100 for the equipment less design, installation, and additional support equipment for operation.

Currently the City generates approximately 175 dry tons of bio solids each year and pays approximately $80,000 to Heard Farms Inc. for additional processing of the bio solids. The proposed new equipment will replace the current solids belt press, chemical thickener, and digesters allowing the solids to go directly from the clarifiers into the new drying equipment. The new bio solid drying equipment will reduce energy consumption and chemical use. The dried solids will be used at Middlefield Golf Course, City Parks and Facilities reducing the purchase of fertilizer. The proposed dryer is a large composter that utilizes heat from the composting process for 75% of the drying process and Natural Gas to generate the final amount of heat necessary to dry the solids to a Class "A" product.

Ameresco's 2019 energy audit projected that the City could reduce operating costs by drying the bio solids with the proposed Centrisys and Bio Force Tech equipment. Actual cost savings will be known upon competition of the 30% project design documents. The projected savings could service the debt for the facility improvement.

City Legal Counsel prepared the Joint Resolution. The Joint Public Hearing was advertised in the Daily Journal of Commerce on December 26, 2022. To date City staff has received one inquiry regarding the proposed public improvement project exemption from the Competitive bidding requirements.

Recommendation

Staff recommends holding the joint public hearing.

Cost

Costs to date Legal Counsel assistance and placing the Joint Hearing Notice in the Daily Journal of Commerce.

Richard Meyers, City Manager

Faye Stewart, Public Works & Development Director

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that the Cottage Grove City Council and Local Contract Review Board will hold a joint hearing 7:00 p.m. on January 9, 2023, regarding adoption of an exemption for the City's Water Reclamation Facility Improvement Project. The hearing will be held at 400 E. Main Street, Cottage Grove, Oregon. To attend the hearing virtually or for questions, contact Public Works and Development Director Faye Stewart at 541-767-4120 or pwdirector@cottagegrove.org.

The public hearing will be held pursuant to ORS 279C.335 and City Rule 137-049-0630 to take comments on the draft findings supporting the proposed exemption to the competitive bidding process. Copies of the draft findings are available for public review on the City's website at https://www.cottagegroveor.gov/rfps and at the Public Works & Development office located at the above address.

BIOFORCETECH
Corporation

Advanced solutions to upcycle organic waste,
into renewable energy and valuable by-products.

www.bioforcetech.com

BIOFORCETECH
Corporation

We are all part of nature.

Yet, man's mere existence stresses nature, stretching her resources and polluting her environment. Now nature needs us as much as we need her.

Founded in 2012 by a team of passionate engineers who understand this principle, Bioforcetech recognized immediately that mankind needed technology that worked symbiotically with nature, rather than against it. Focusing specifically on waste management, we learned that we could deal with waste by imitating nature's own systems, but with elegant technology used to accelerate her process and improve her outcome.

After four years of research and pilot testing, our team has created a system that converts multiple categories of biomass (including biosolids) to biochar, an earth-friendly soil amendment, with technology that is as close as possible to being zero-energy and carbon negative.

At Bioforcetech, we believe that our technology revolutionizes the way we all manage organic waste. Please read through this brochure to understand how you can transform your organic waste into value.

Sincerely ,

Dario Presezzi, CEO
Bioforcetech Corporation
d.presezzi@bioforcetech.com

MISSION

To create systems that can dispose of and enhance on-site organic waste products such as biosolids, green waste and biomass

Bioforcetech aims to dramatically reduce the energy consumption, labor cost, emission and greenhouse gas production in treating biosolids, green waste and biomass by developing elegant and efficient technologies with maximum automation. We have accomplished this in the following ways:

ENERGY FROM WASTE:

When we think about waste, we see an opportunity to generate clean, renewable energy. Although bio-waste can be difficult to manage, we focused our resources on designing technologies that run on energy generated by the waste itself, so that no external energy is needed.

REDUCE TRUCKS:

In the USA, millions of trucks every day transport bio-waste from its treatment source to landfill, often for hundreds of miles. A side benefit of our technology is that we dramatically reduce traffic and fossil fuels consumption by designing systems that can be installed at the waste source, and that can generate the energy needed to fuel the process from the waste itself; importation of additives or other fuel is not necessary.

GENERATE VALUABLE BY-PRODUCTS:

Organic waste is mostly made of carbon, hydrogen, oxygen and nitrogen. All these elements, if properly processed, can become a valuable product. Our technology transforms organic waste into an environmentally-beneficial by-product (a process known as UpCycling.)

COMPLETE AUTOMATION, LOW O&M:

All our systems are designed to run 24/7 and to be fully automated. The combination of smart in-house developed software, remote monitoring, cloud powered maintenance and reporting, and high quality sensors and materials ensure that the system will require the minimum amount of maintenance and no operator at the facility.

BIOSOLIDS IN USA

A potentially useful product and a disposal challenge.

Biosolids are sewage sludge treated to remove pathogens. Even after conventional treatment, biosolids remain both a potentially useful product and a disposal challenge.

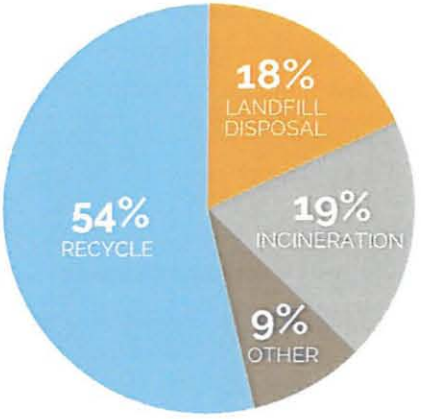
Wastewater effluent standards are tightening every year, and places to dispose of biosolids are disappearing.
The pressure on the global waste management industry to develop more efficient, cost-effective and environmentally sound solutions for biosolids processing has never been greater.

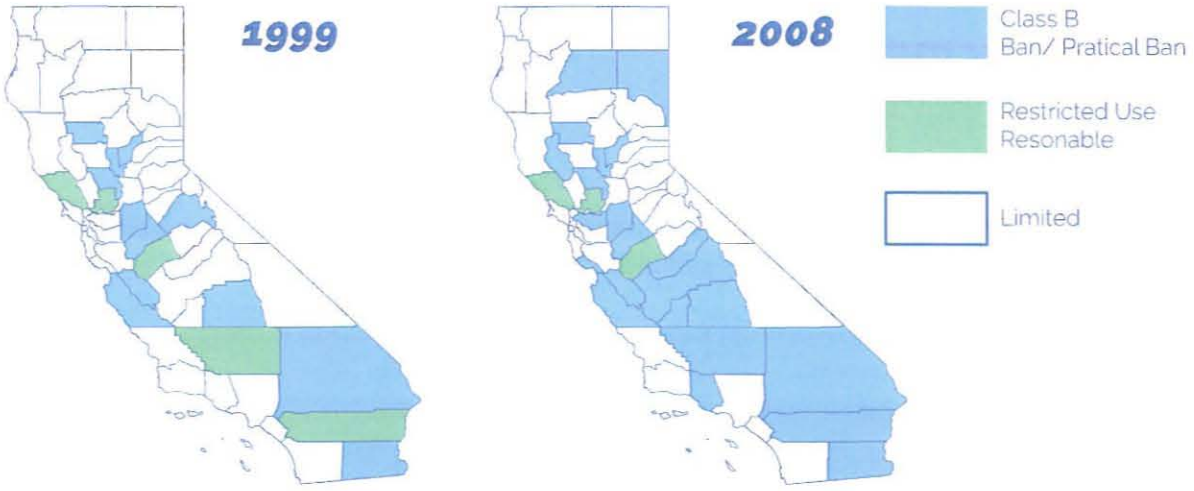
Approximately 7,100,000 dry tons of biosolids are generated each year at approximately 16,500 municipal wastewater treatment facilities in the U.S. (2004 U.S. EPA data)

About 50% of biosolids produced in the USA (Elliott, 2003) and about 40% of that produced in the EU is sent to land to be used as a fertilizer; the rest is incinerated or landfilled.
Beyond the classical environmental issues, such as the environmentally-friendly disposal of biosolids, we now have other concerns.

Carbon dioxide - a main component of greenhouse gasses - is released in huge quantities during the traditional treatment and disposal of biosolids. Concerns about climate change now play a key role in shaping environmental policy.

As world-wide biosolids production inexorably increases the production of biosolids does so as well. The challenges will only grow in the future.



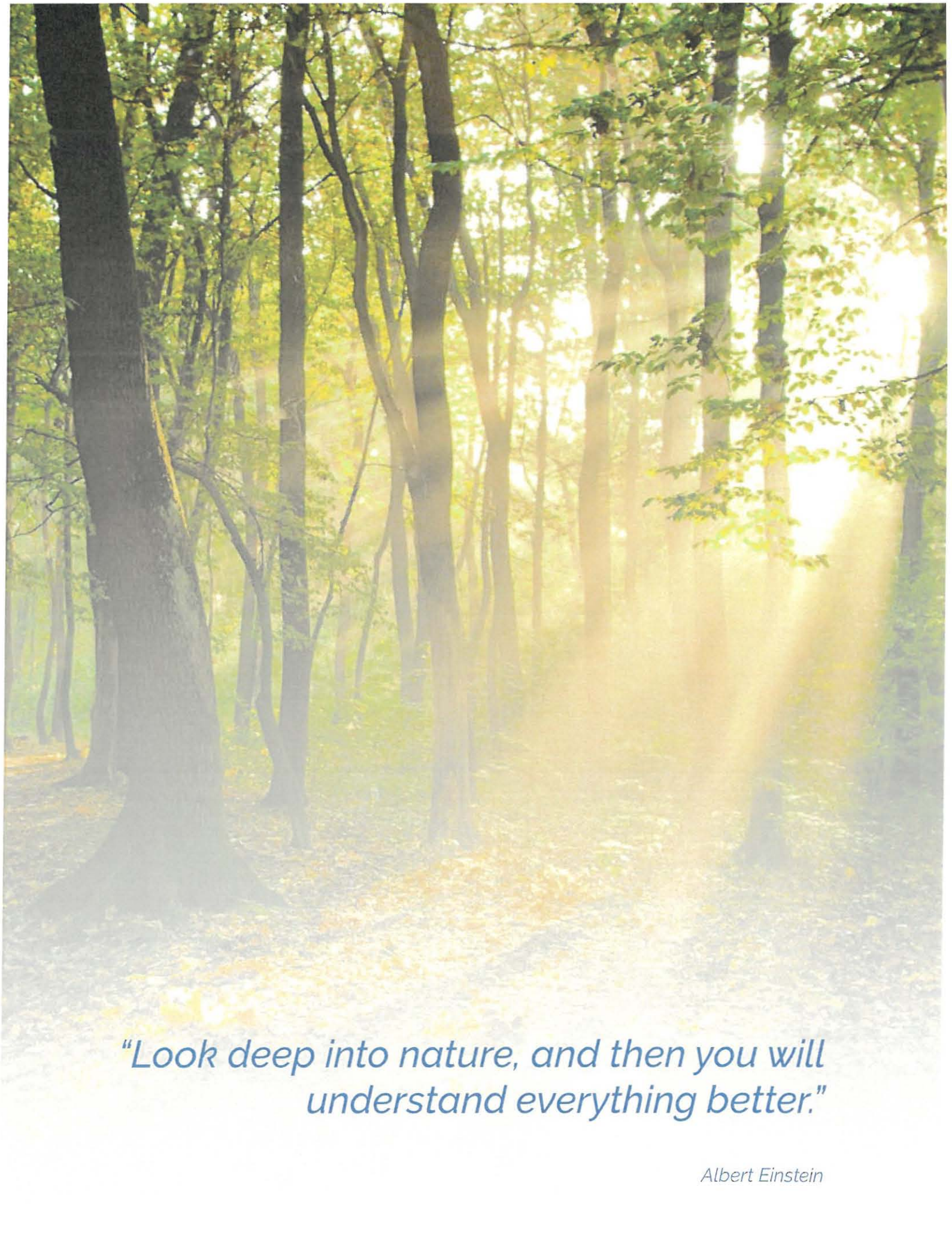


Bioforcetech has the right technology and vision to solve these challenges. We have developed, built and tested technology that is a viable alternative to traditional disposal methods. Our goal is to disrupt current thinking around biosolids processing, and in five years have our technology be the dominant emerging solution to the challenge. To achieve this goal, Bioforcetech's team has designed a revolutionary system that addresses both biosolids management challenges and climate change issues.

Imagine a solution that is scalable, efficient, affordable to implement and operate, and produces only environmentally-friendly end products while generating its own operating power. Our system generates renewable energy, and UpCycles organic waste into a natural soil amendment using a 2 step process:

- A drying system (The BioDryer) that achieves a high degree of drying (from 20% dry matter to 80%) by recycling the metabolic waste energy generated by bacteria already present in biosolids, as heat.

- An energy recovery system (The P-FIVE Pyrolysis Reactor) converts the dried biosolids into gas, which is used to generate power for the system, and biochar, a valuable byproduct.



"Look deep into nature, and then you will understand everything better."

Albert Einstein

BIODRYER

Innovative and efficient drying machine, designed to remove moisture from organic materials with 70% less energy.

Biodegradable waste is rapidly heated through initial stages of composting by a process called Biodrying, which removes moisture from the waste stream to reduce its overall weight. In this process, the drying rates are augmented by biological heat in addition to forced aeration. Heat is a natural by-product of the aerobic degradation of organic matter, and is used to evaporate surface and bound water associated with the mixed sludge

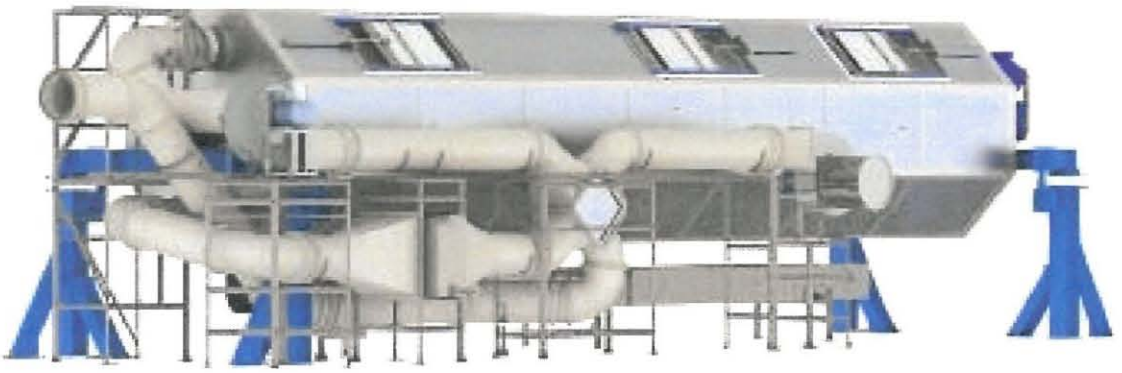
Yard waste, food waste and biosolids contain a fairly high amount of organic carbon, but in most cases the water content of these materials will not allow energy generating systems to work. In order to generate energy, it is necessary to reduce the water content of organic waste to less than 30% by mass. After years of research and pilot testing, our team designed a machine called BioDryer, **a patented technology which is able to reduce the water content of organic waste from the usual 80% to 20% using the metabolic energy of bacteria, instead of fossil fuel energy.**
The BioDryer controls oxygen and temperature levels for proliferation of specific microbial populations. These microbes release heat into the surrounding environment, thus mediating the drying process.

These metabolic reactions alone can significantly increase the temperature inside the reactor in a few hours. **(From room temperature to above 150°F in 10 hours)**
In a system optimized for this purpose, this temperature - together with optimal air flow - is used as the means to evaporate the water held by the biosolids, thus yielding a highly concentrated solid.

Biosolids example:

INPUT Class B Biosolids (20% solid content)

OUTPUT Class A Biosolids (75% volume reduction at 80% solid content)



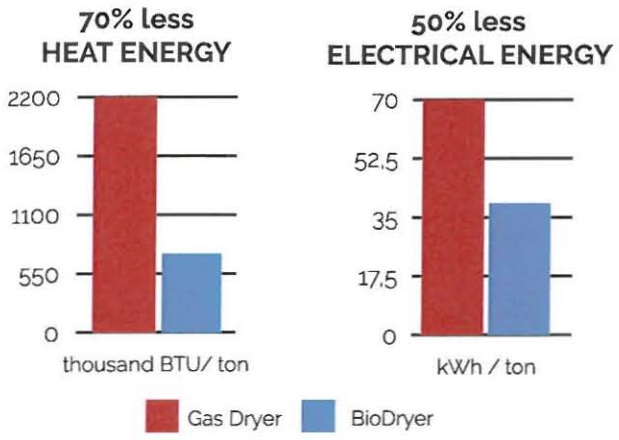
BIODRYER *Innovative and efficient drying machine, designed to remove moisture from organic materials with 70% less energy.*

LIFE = ENERGY

Energy Saving:

Thanks to Bioforcetech's drying system, the biosolids' drying process requires up to **70% less electricity and 50% less thermal energy** compared to conventional drying methods.

The low energy consumption used for the drying makes it finally possible to use the biosolids for electrical and thermal energy production.



24/7 Autonomus operation:

One of the biggest challenges is automation of organic waste management. By integrating Inspike's PLEXUS technology, our team was able to build an Artificial Intelligence system, capable of independently managing and treating biosolids. This technology, combined with low requirements for maintenance, helps to reduce the environmental impact and to keep ongoing operating costs as low as possible for years.

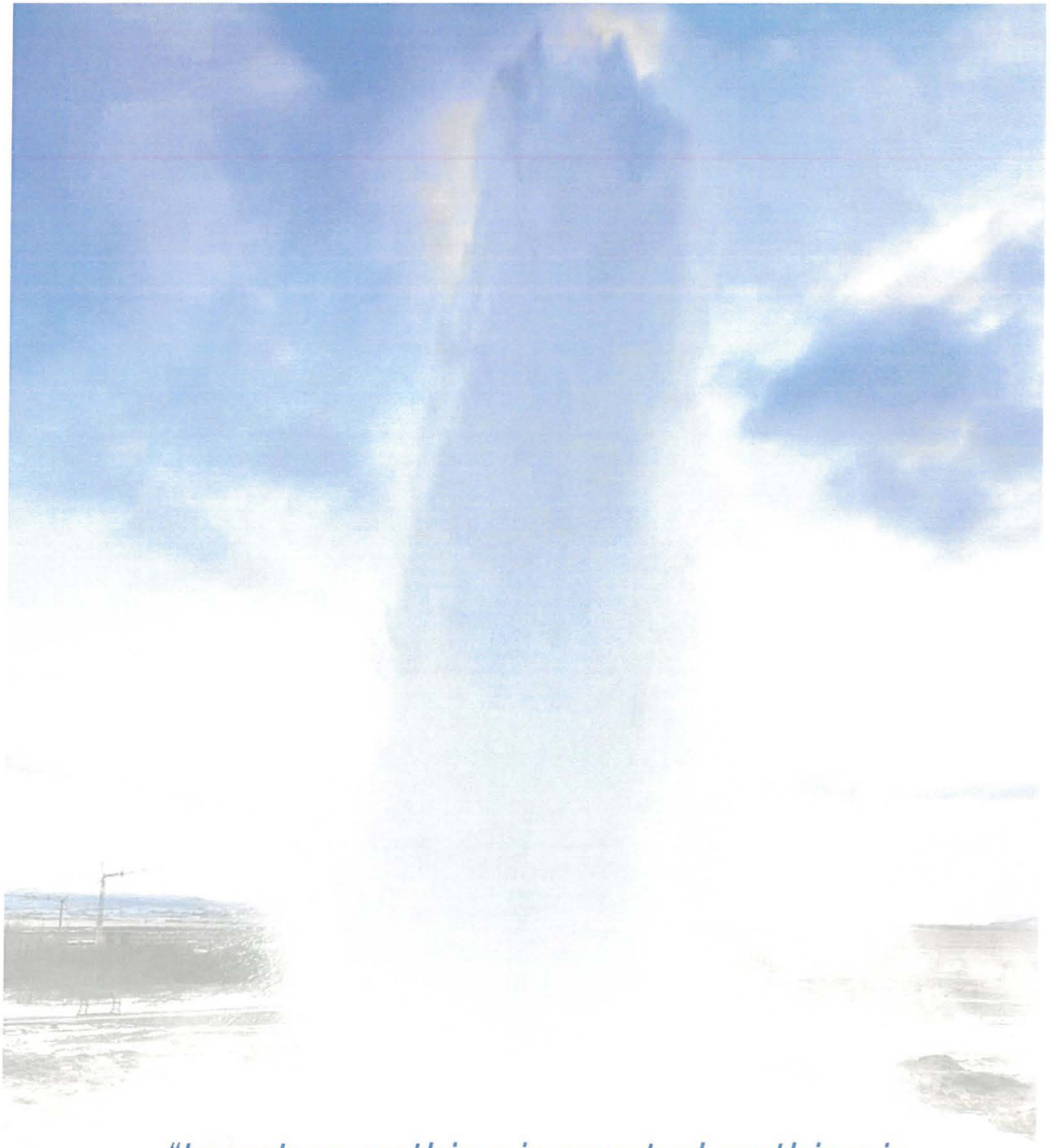
The BioDryer is composed of an external structure that is made with painted steel, and internal parts that are **made of AISI 304L**. The reactor looks like an octagonal rotating drum and is moved by a motor reducer to ensure material mixing every 4 hours.

The air system is composed of two blowers, recyclable polypropylene (PPH) pipes, and two heat exchangers. The first centrifugal fan blows the air inside the reactor and provides oxygen for the drying process. The second blower sucks out the exhaust air and the steam formed during the process. The exhaust air is then treated with a biofilter for odor control and pollution removal.

The fast process and compact design, allows to use up to 20 times less space than solar drying facilities and 5 times less space than a composting facility.

Batch capacity	16,000 lbs
Batch duration	48 to 56 hours
Temperature	up to 160°F
Empty weight	12,000 lbs
Rotating motor	18 kW
Blower power	up to 7.5 kW
Footprint	10' x 40'

The BioDryer requires only a flat cement pad for installation. It is designed to be located outside, without the need of a cover from the weather. The machine is delivered to the construction site partially assembled, so that installation time and costs are kept at a minimum.



"In nature nothing is created, nothing is lost, everything changes."

Antoine Lavoisier

P-FIVE PYROLISIS SYSTEM

Clean, renewable energy and biochar from organic waste and biosolids

Pyrolysis is the thermochemical decomposition of organic material through the application of heat without the addition of extra oxygen. Through this process, which takes place at temperatures between 660 and 1,650 degrees F, two products are obtained: syngas and char.
Our P-FIVE Pyrolysis machine utilizes this principle to produce renewable energy from any organic waste.

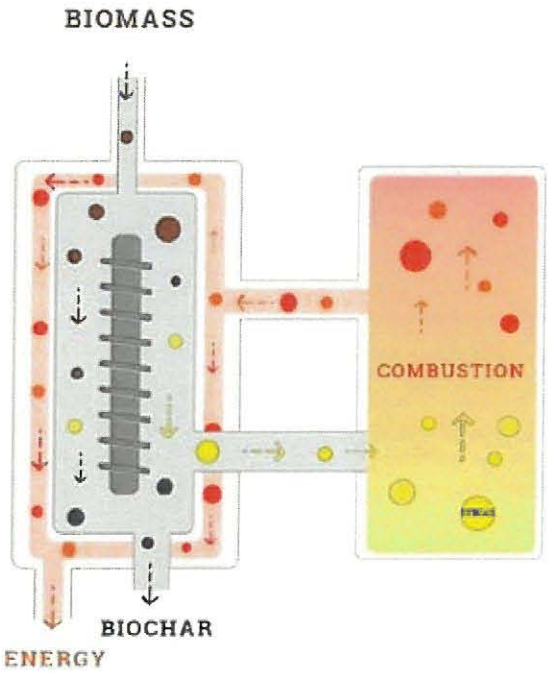
Sustainable biochar production

The only by-product of our pyrolysis system, is biochar. Biochar is charcoal used as a soil amendment. Biochar is a stable solid, rich in carbon, and can endure in soil for thousands of years. Biochar thus has the potential to help mitigate climate change via carbon sequestration. Independently, biochar can **increase soil fertility, increase agricultural productivity, water retention and drastically reduce nutrients run-off.**

Bioforcetech P-FIVE PYROLYSIS
An energy recovery system (pyrolysis reactor) makes the process sustainable and efficient.

Self-sustained pyrolysis

Once the pyrolysis process operating temperature is reached, the exhaust gases from the combustion chamber are passed through the annular space between the central tube and the outer casing of the pyro-reactor, ensuring the temperatures required to perpetuate the pyrolysis process. **The 24/7 process becomes self-sustained.**



ONE MACHINE, MULTIPLE FEEDSTOCK:

The P-FIVE pyrolysis machine was designed for biosolids treatment, but this reactor is also able to treat a wide range of materials or mix. **The P-FIVE pyrolysis can process biosolids, manure, green waste, green waste/biosolids mix, food waste and most organic waste.**

Burning without flame, Environment Benefits

The P-FIVE Pyrolysis machine has been designed to achieve the maximum production of gaseous material. The gas is immediately burnt in a special flameless reactor. Burning the produced syngas without flame allows a lower combustion temperature, **resulting in lower NOx emissions.** Thanks to this special technology, the **P-FIVE Pyrolysis system has been approved by EPA as a non-incineration process.** The P-FIVE has been the first pyrolysis process for biosolids that has been approved by EPA and that meets the emission requirements for EPA and California regulations.

Equipment:

The P-FIVE pyrolysis system is preinstalled inside "container like" structure, easy to transport and ready to be installed outdoor. The system requires only a flat cement pad to be placed on. **The structure contains all the required parts:** pyrolysis reactors, flameless burner, char discharge conveyor, 2 heat exchangers, blowers, electrical panel and automation with safety UPS system, heat dissipation radiators, wet scrubber for SO2 removal, activated carbon filter, 2 dust removing cyclones and a chimney with sample ports for analysis.

Processing capacity	500 lb/h
Burner power	990,000 BTU
Input material solid content	>= 70%
Operating Temperature	750 to 1,300°F
Empty weight	46,000 lbs


BIOFORCETECH

BIOCHAR
Natural Soil Amendment

Biochar is charcoal residue that is produced through modern pyrolysis process, which is the direct thermal decomposition of biomass in the absence of oxygen. This prevents combustion to obtain an array of solid (biochar), and gas (syngas) products.

When biochar is used as soil amendment, its structure and composition may significantly improve:

- texture, structure, porosity, and consistency of the soil
- pore-size distribution
- particle-size distribution
- density and packing
- pH, electrical conductibility
- nutrient availability
- water retention

Biosolids Derived Briochar (BDB)

BDB has most of the same characteristics as biochar obtained from typical biochar feedstocks, like wood chips or waste crops, although BDB has received attention from dozens of universities worldwide because of its ability to acquire several new characteristics.

Compared with a "regular" wood biochar, **BDB has a nitrogen concentration up to 6 times higher and phosphorus up to 10 times higher**, a lower organic carbon concentration, a higher density.

Thanks to the high level of nutrients, using BDB helps to decrease the amount of fertilizer needed.

The surface area of the **BDB creates good water and nutrients retention in the soil,** which reduces water and fertilizer use, especially in sandy soil.

The benefits of Biosolids Derived Biochar (BDB) VS Biosolids:

Biosolids is currently used as fertilizer in the US, although a rising number of countries are regulating or even forbid the use of biosolids as fertilizer.

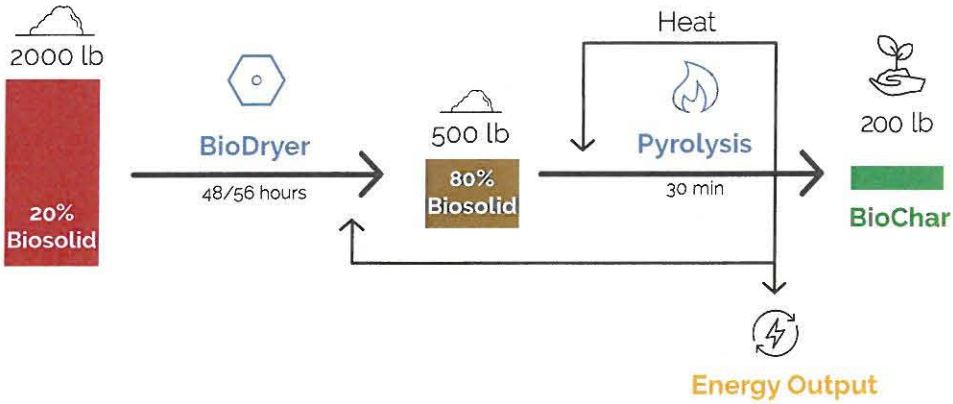
The P-FIVE Pyrolysis system, UpCycles biosolids into a charcoal soil amendment, which is then not considered a waste anymore. Other than becoming a completely different material, the main differences between biosolids and BDB is the **elimination of hormones, reduction of pollutants, and removal of pathogens**. Also, several studies have proven that the biochar obtained from biosolids does not allow the heavy metals to spread into the soil (table 1)

Heavy Metal Leaching (EPA 7420 and EPA 6010)

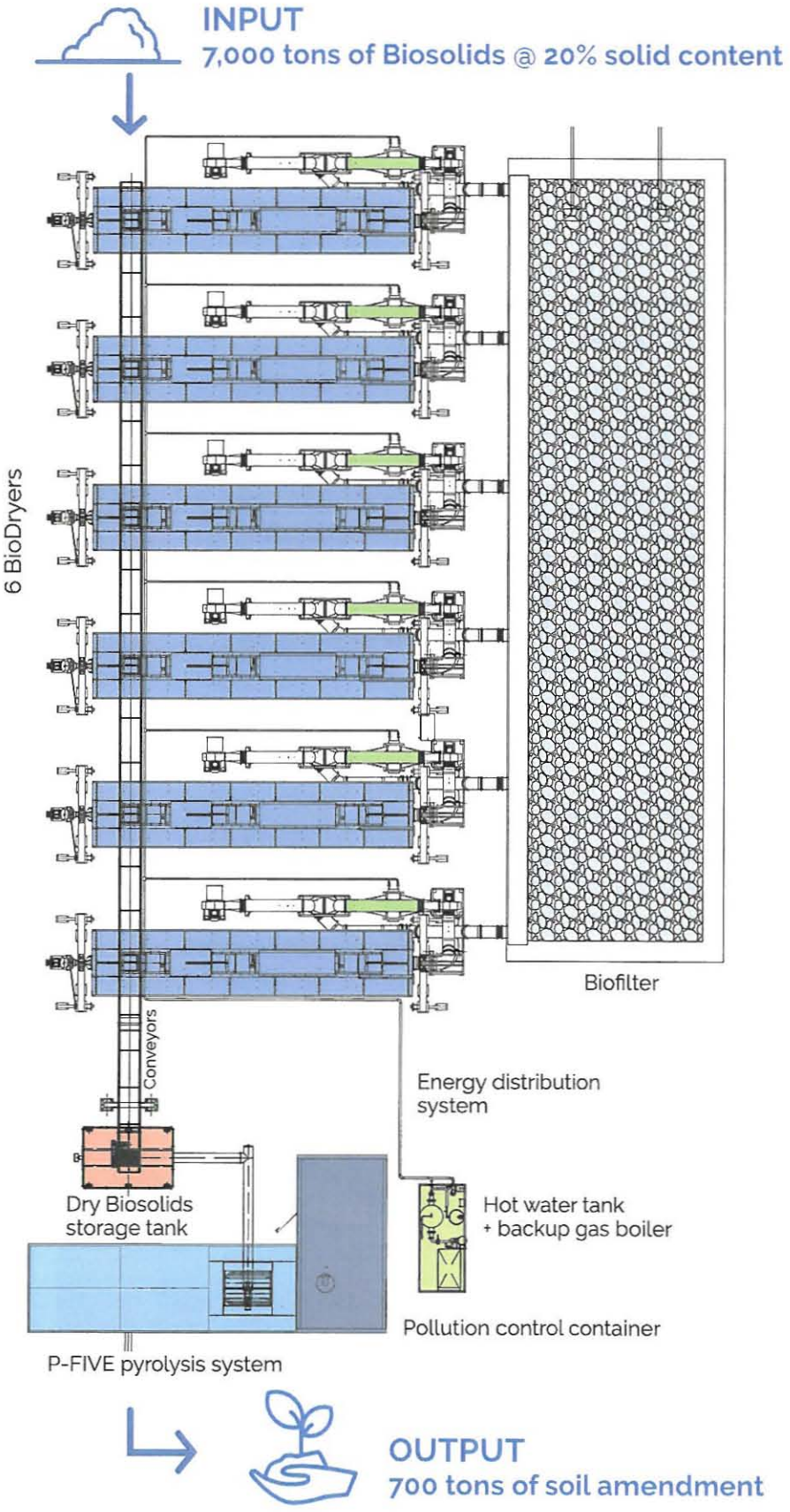
METAL	STLC Detected Value (mg/L)	STLC Limit (mg/L)	TCLP Detected Value (mg/L)	TCLP Limit (mg/L)
Arsenic	ND	5.0	ND	5.0
Barium	4.0	100	ND	100
Beryllium	ND	0.75	--	--
Cadmium	ND	10	ND	1.0
Chromium	0.15	5	ND	5.0
Cobalt	ND	80	--	--
Copper	5.6	25	--	--
Lead	0.23	5.0	ND	5.0
Mercury	ND	0.2	ND	0.2
Molybdenum	0.11	350	--	--
Nickel	0.14	20	--	--
Selenium	ND	1.0	ND	1.0
Silver	ND	5	ND	5
Thallium	ND	7.0	--	--
Vanadium	ND	24	--	--
Zinc	22	250	--	--

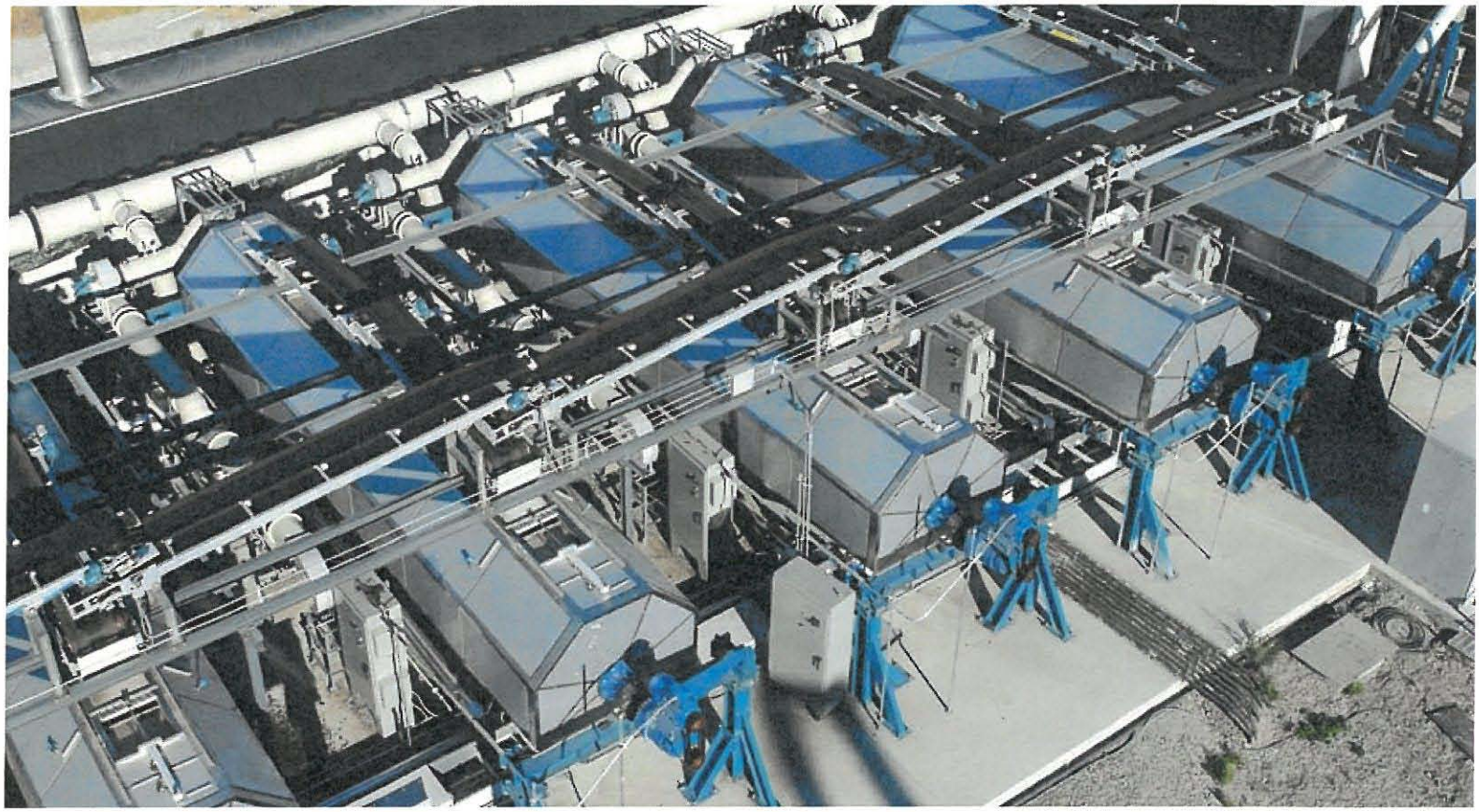
CASE STUDY
Biosolids to energy @ SVCW

In June 2017, the first Bioforcetech's "Biosolids to Energy plant" started its operations to UpCycle 7000 tons (20% solid content) of biosolids into energy and biochar. The Bioforcetech plant is composed of 6 BioDryer units coupled with a P-FIVE pyrolysis system.



BioDryer and Pyrolysis together:
To achieve the final goal of energy production and biosolids transformation, 6 BioDryers are coupled with a P-FIVE pyrolysis system. The BioDryers only require 220 kWh/ton of energy to remove all the moisture from biosolids, and the pyrolysis system produces 150 kW of energy 24/7, which is used to run the facility.
The result is a self-sustained system that autonomously manages biosolids, reducing the total volume by 90% and producing a valuable, nutrient rich soil amendment.


INPUT
7,000 tons of Biosolids @ 20% solid content
6 BioDryers
Biofilter
Conveyors
Energy distribution system
Dry Biosolids storage tank
Hot water tank + backup gas boiler
Pollution control container
P-FIVE pyrolysis system
OUTPUT
700 tons of soil amendment



Fixed price for years:
With a lifespan of 20 years, minimum operation and maintenance requirements, low energy consumption and no disposal fees, the final cost per ton is kept low for years. In addition, the final product can be sold as soil amendment, generating a profit which lowers the cost per ton.

Estimated cost per ton of input material treated

	$/ton
Capital cost (includes 2% interest):	32
Utilities:	7
O&M and spare parts	15
Income from biochar	(30)
Cost per ton	59.2
After biochar sale	**29.2**

Benefits to SVCW and to the community of Redwood City:
We believe it is important to develop technologies that create value for municipalities and the community.
Thanks to the Bioforcetech plant installed at SVCW, **90% fewer trucks** will travel through Bay Area cities, reducing traffic congestion and greenhouse gas emissions. The design and concept of the system will **keep the cost of biosolids management low for decades** and limiting odor produced by the wastewater treatment facility, thus reducing the incentive for more stringent regulations on biosolids management.

Last but not least, the 700 tons of soil amendment produced by the Bioforcetech plant, can be reutilized by public agencies for parks, forests, gardens and flowerbeds, **reducing the use of city water for irrigation and the use of fertilizers.**

CONTACTS
Let's keep in touch

If you are looking for an alternative to manage your biosolids, green waste, food waste and organic waste for your city or company, our team is here to help you.
Contact us to find out how you can transform organic waste into value.

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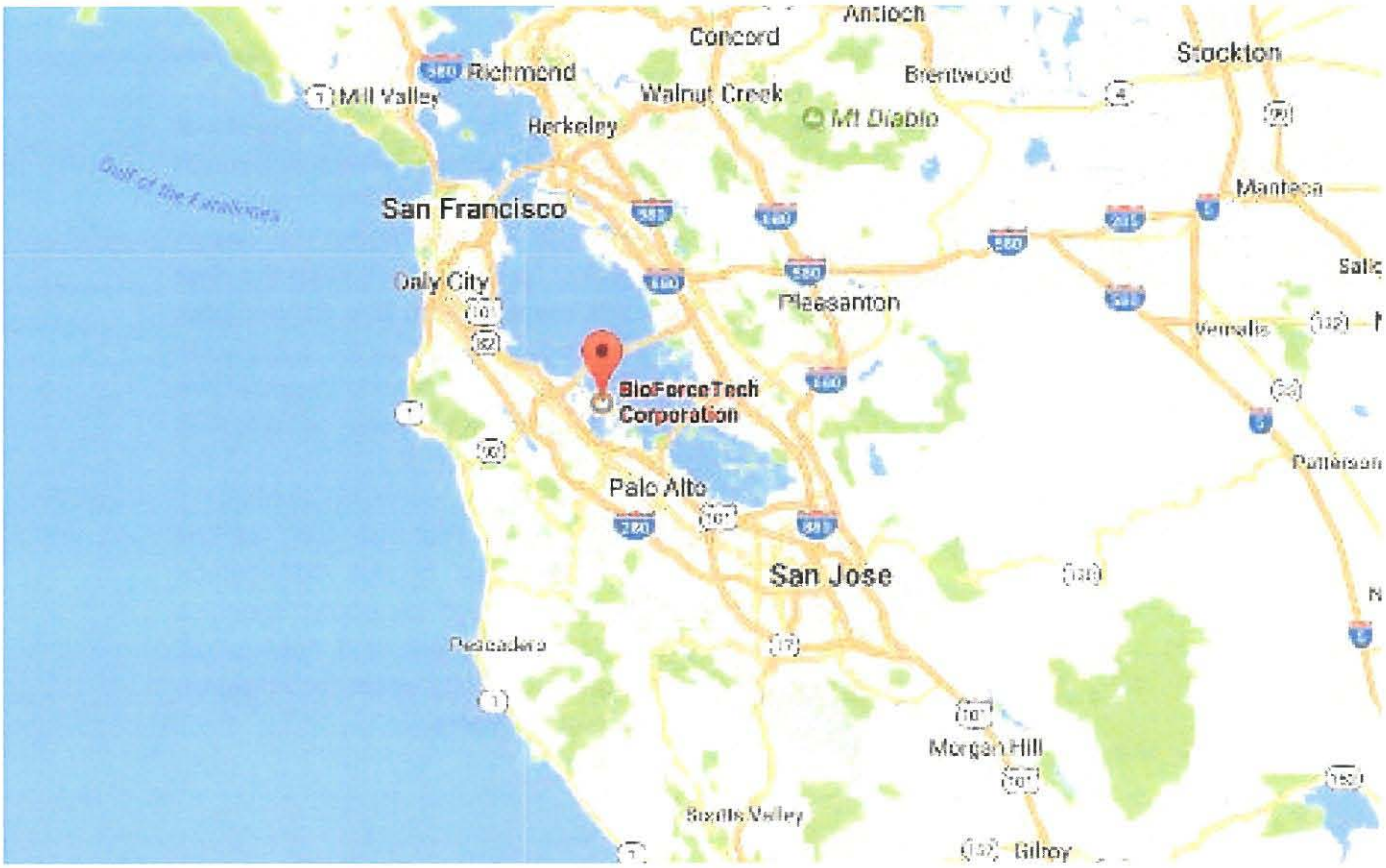

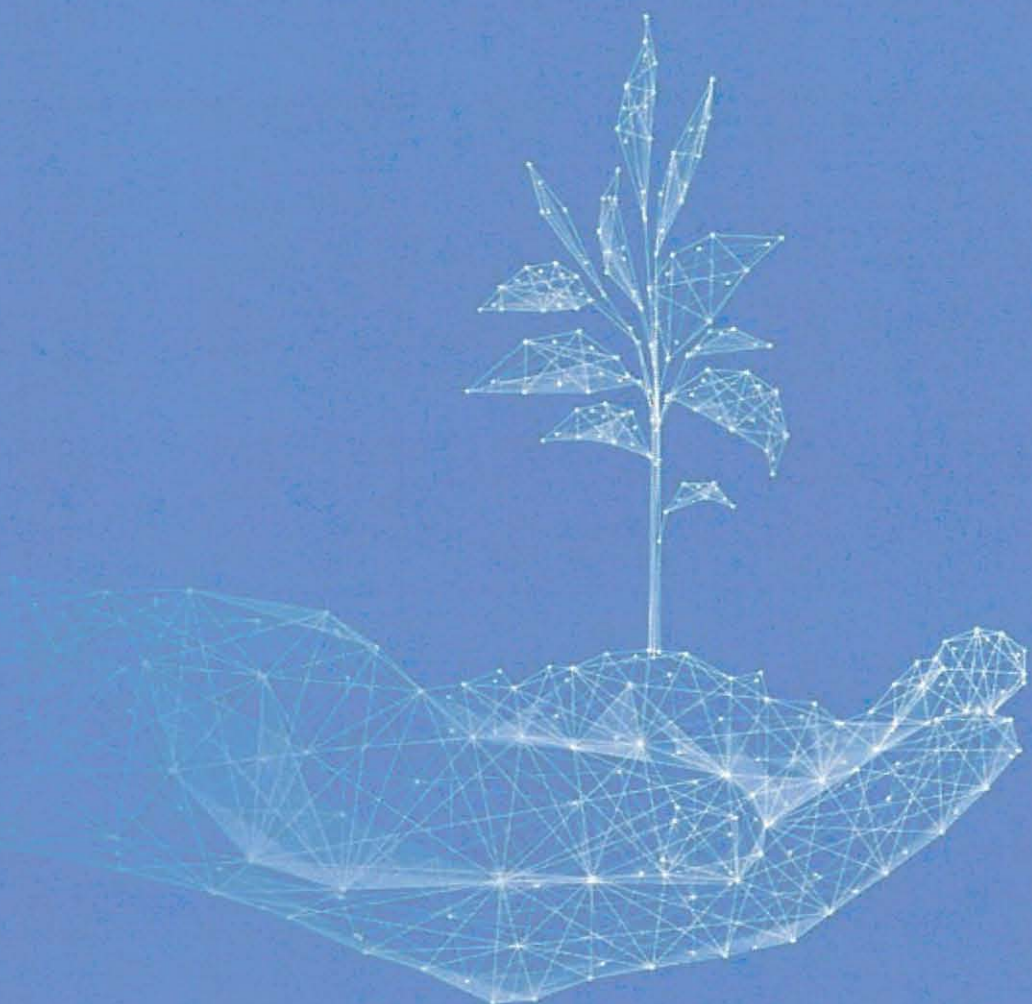

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Centrisys contact details for all countries are available on our website at www.centrisys.com

centrisys
CENTRIFUGE SYSTEMS

Product Overview











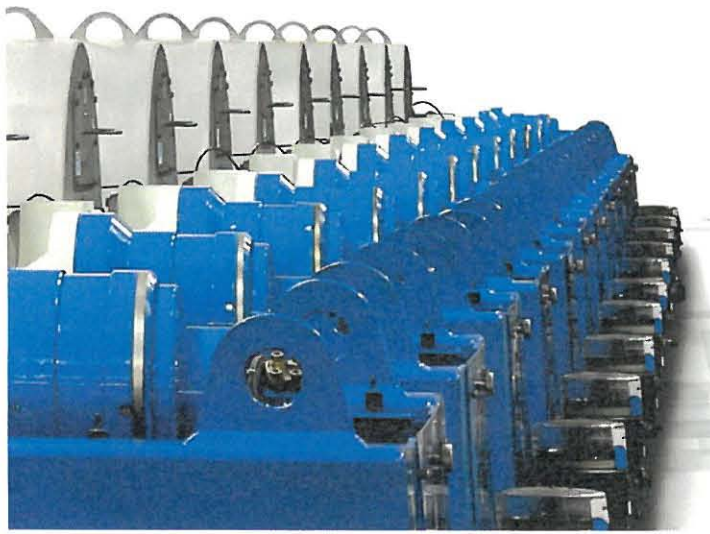


DECANTER CENTRIFUGES


SKID SYSTEMS


TRAILER SYSTEMS


THICKENING CENTRIFUGES


DISC CENTRIFUGES

centrisys
CENTRIFUGE SYSTEMS

The Right Solution; The Fastest Payback

Centrisys' Engineering and Research & Development teams are second to none. The goal is and always has been to maximize customer payback while minimizing customer effort.

Centrisys designs every machine to not only fulfill but go beyond our customers' expectations. This is why a Centrisys centrifuge has more premium standard features than any other decanter manufactured today.

By providing efficient, reliable dewatering/ separation systems, Centrisys gives our customers the results they need:

- Increased solids handling
- Reduced fuel and polymer consumption
- Higher flow rates
- Lower operating and maintenance costs
- Reduced hauling fees
- Lowest energy consumption
- Continuous operation
- Lowest installed horsepower
- The driest cakes

Centrisys Centrifuges can be customized for unique application requirements. For further information about customized centrifuges contact your Centrisys sales representative.

FOCUS.

PERFORMANCE.

AVAILABILITY.

Dewatering Solutions – USA Built, Sold & Serviced Around the World

CS10-4 Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	5-35 gpm	1-8 m³/h
Weight	2,000 lbs	910 kg
Total Installed Power	20 HP	15 kw
LxWxH	89 x 44 x 27 in.	2.3 x 1.1 x 7 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS14-4 Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	20-60 gpm	5-14 m³/h
Weight	3,800 lbs	1,725 kg
Total Installed Power	40 HP	30 kw
LxWxH	122 x 34 x 31 in.	3.1 x 0.9 x 0.8 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS18-3 Centrifuge 2PH

	US	METRIC
Feed Capacity**	35-220 gpm	8-50 m³/h
Weight	3,900 lbs	1,770 kg
Total Installed Power	75 HP	56 kw
LxWxH	110 x 50 x 32 in.	2.8 x 1.3 x 0.8 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

THK SERIES Thickening Centrifuges

	US	METRIC
Feed Capacity*	100-1,000 gpm	20-220 m³/h
Weight	5,000-30,000 lbs	2,920-13,600 kg
Total Installed Power	25-250 HP	20-200 kw
Auto Lube System	yes	yes

CS18-4 Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	50-100 gpm	11-23 m³/h
Weight	6,500 lbs	2,950 kg
Total Installed Power	50 HP	38 kw
LxWxH	151 x 44 x 41 in.	3.8 x 1.3 x 0.8 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS18-4 HC Centrifuge

	US	METRIC
Feed Capacity*	75-125 gpm	17-29 m³/h
Weight	8,200 lbs	3,720 kg
Total Installed Power	60 HP	45 kw
LxWxH	175 x 44 x 47 in.	4.4 x 1.1 x 1.2 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS21-4 Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	100-175 gpm	23-40 m³/h
Weight	8,500 lbs	3,860 kg
Total Installed Power	75 HP	56 kw
LxWxH	175 x 44 x 47 in.	4.4 x 1.1 x 1.2 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS21-4 HC Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	150-225 gpm	34-51 m³/h
Weight	10,000 lbs	4,550 kg
Total Installed Power	90 HP	68 kw
LxWxH	190 x 45 x 53 in.	4.8 x 1.1 x 1.3 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS26-4 EV Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	150-320 gpm	34-73 m³/h
Weight	16,500 lbs	7,490 kg
Total Installed Power	140 HP	105 kw
LxWxH	210 x 56 x 62 in.	5.3 x 1.4 x 1.6 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS26-4 Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	200-400 gpm	45-90 m³/h
Weight	18,500 lbs	8,400 kg
Total Installed Power	165 HP	123 kw
LxWxH	225 x 56 x 62 in.	5.7 x 1.4 x 1.6 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CS30-4 Centrifuge 2PH/3PH

	US	METRIC
Feed Capacity*	300-700 gpm	68-159 m³/h
Weight	30,000 lbs	13,600 kg
Total Installed Power	275 HP	205 kw
LxWxH	258 x 74 x 75 in.	6.6 x 1.9 x 1.9 m
Avail. Shallow Pool/Angle	yes	yes
Auto Lube System	yes	yes

CDC SERIES Disc Centrifuges

	US	METRIC
Bowl Weight	660-1,760 lbs	300-800 kg
Bowl Volume	6-10.5 gallon	15-40 L
G's at Solid Speed	9,650 G's	9,650 G's
Hydraulic Capacity	Up to 220 gpm	Up to 50 m³/h
Sludge Space Volume	6-10.5 gallon	15-40 L

* Feed capacity based on municipal applications. ** Feed capacity based on mineral/industrial applications. Centrisys reserves the right to change specs without prior notification.

TREATMENT EQUIPMENT COMPANY
Water and wastewater treated better

December 20, 2022

Preston Van Meter
Principal Engineer
WEST YOST
503.784.9536

RE: Cottage Grove Sole Source Equipment

Dear Preston,

Thank you for reaching out regarding the above referenced project. The following are a list of points on the Centrisys centrifuge equipment for your review:

I. From a technology standpoint the requested product or service is the only product or service that can satisfy the requirements of the requesting department. Centrisys is the only centrifuge supplier that utilizes a hydraulic backdrive system as the standard scope of supply. The hydraulic backdrive system has numerous advantages and is a more robust system that allows for long-term cost savings and minimizes repair downtime. Benefits include, but not limited to, better control, the ability to run at full torque at any bowl speed, the ability to restart on the fly, and the ability to run a leading or lagging scroll for longer wear life.

II. The requested good, service provider, supplier or manufacturer is the only practicably available source, and the only major centrifuge manufacturer that actually manufactures in the United States. The centrifuge is only available through Centrisys and exclusively represented municipal equipment manufacturer representative TEC. The product cannot be sourced from other areas in North America.

III. The costing consequence of not supplying this equipment is solutions with much higher OPEX, more downtime, and higher repair costs.

IV. The price for this product or service is considered to be reasonable due to previous proposals, lifecycle cost evaluations, and other PNW centrifuge installation comparisons.

Please also reference OAR 125-247-0275 - Sole-Source Procurements — Oregon Administrative Rules (public.law) for more information and guidance on the state requirements.

Please let us know if you require any other information.

Get More from your Centrifuge

Discover Centrisys' Decanter Centrifuge Capabilities and Services

Skid, Mobile and Containerized Systems*

Complete sludge dewatering and/or thickening solutions on a single platform. This modular approach streamlines the installation process and allows for fast and easy placement. Within a few hours, a skid system can be on site and fully operational.

**The Centrisys engineering team starts with a site plan, general specifications and flow diagrams to design a working system. State-of-the-art engineering programs prepare the electric schematics, PID diagrams, process drawings and control programs. All ancillary components are selected for the site specific performance and reliability.*

- *Only power and process connections needed for system start-up*
- *Ranging from 5–700 gpm (1- 90 m3/h)*
- *All parts and components are covered under the Centrisys standard warranty terms and conditions*

Rentals *for Dewatering or Thickening*

Two- and 3-phase rental skid systems are available for seasonal and emergency needs. Short and long term leasing options are also available for dewatering and thickening. Ancillary heating systems are available as an add-on option.

Customized Solutions *a Key Strength*

Centrisys provides a full range of custom engineering and manufacturing services. Our customization process starts with listening to our customers to understand their goals or challenges; analysis and development of a preliminary design; prototyping and testing to the final design – all done by our in-house engineering teams located in Kenosha, Wisconsin. Our custom solutions range in size from as large as a complete mobile system to as small as a wear component or part.

Pilot and Lab Testing

Centrisys invested in trailer and skid mounted centrifuge systems for dewatering and thickening pilot tests. Our dedicated process engineering department conducts pilot and lab testing in the field and also in the process lab, located in Kenosha, Wisconsin.

R&D and Consulting Services

Available for any centrifugal separation process, our fully staffed lab performs services as needed.

- Lab centrifuge for decanter type centrifuge sampling
- Process engineer team available for testing and specification write-ups to insure correct machine sizing and type
- Process optimization consulting available for all decanter centrifuge brands

Designed & Built in the USA

Discover more at **Centrisys-CNP.com**

centrisys cnp

Why Choose Centrisys?

Installation and Start-Up *for All Brands***

Offering on-site assistance with plant personnel ensures they are comfortable with running the equipment and have a thorough mechanical understanding of the centrifuge. Topics include, but are not limited to:

- Testing, set-up and process optimization
- Polymer dosing
- Checking lubrication system
- Adjusting belt tension
- Diagnosing alarms
- Adjusting speed sensors
- Diagnosing differential speed
- Preventive maintenance tips

Centrifuge and Process Training *for All Brands***

On-site or at one of our service facilities, we offer basic and advanced training for mechanics, operators and engineers. Topics include, but are not limited to:

- Centrifuge operation
- Maintenance and troubleshooting
- Polymer and process optimization
- Centrifuge terminology and calculations
- Bearing types, uses, and failures
- Pump repairs
- Purge systems setup and testing
- Diagnosing vibrations, alarms and noise

***Call or email if you have installation or training specific topics needed for your team.*

Service ▪ Repair ▪ Optimization *for All Brands*

Our 30 year foundation in service, combined with our comprehensive knowledge of all brands of decanter centrifuges, makes us the most experienced in the industry. We offer a full range of services from preventive maintenance, rebuild and retrofit of decanter centrifuges.

On-Site Field Service *for All Brands*

Centrisys has a field service team of experienced, fully trained centrifuge technicians nationwide and globally, available 24/7.

Service Agreements *for All Brands****

A variety of flexible and competitive service and maintenance agreements are available. We offer several different plans and options and all agreements are customized to fit your needs.

****Service contracts offer discounted parts and labor.*

Rotating Assembly and Scroll Exchange Programs

Our rotating assembly and scroll exchange program for Centrisys centrifuges allows for the fastest service to get your centrifuge back up and running.

Parts *for All Brands*

Along with our own Centrisys OEM parts, we carry the highest quality parts for all brands of centrifuges. Our 20,000 sq. ft. parts distribution center offers the largest in-stock selection of centrifuge parts. Preventative maintenance, critical wear and ancillary parts are all readily available for same day shipment.

- Parts Warranty: All parts and components are covered under the Centrisys standard warranty terms and conditions
- Re-Engineered Aftermarket Parts: We guarantee, high-quality aftermarket parts for all decanter centrifuge brands. Parts are reverse-engineered to work out any weaknesses based on the wear patterns from the original OEM part. This ultimately creates a stronger part for optimized performance.

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CASE STUDY: Dewatering Centrifuge CS26-4

Just the Facts:

Why New York City Chose Centrisys

Rigorous analysis showed a clear winner for one of the largest dewatering upgrade projects in the country

The Wards Island Wastewater Treatment Plant is the second largest of the 14 wastewater treatment facilities in New York City, serving about 1 million people with an average dry-weather flow capacity of 275 MGD.

As part of a series of upgrades to improve pollution control and treatment efficiency, the NYC Department of Environmental Protection set out to evaluate dewatering centrifuge technology to replace the existing centrifuges at Wards Island. After rigorous bidding, NYC choose to install (16) CS26-4 Centrisys decanter centrifuge.

On balance of objective criteria, Centrisys' system deemed superior

Using a matrix incorporating an array of weighted criteria established to seek the greatest overall value, CDM Smith ranked the products and manufacturers by their total scores.

Despite being the second highest in capital cost, the Centrisys CS26-4 came out on top due to facts including:

- Highest G-volume of installed centrifuges
- Highest torque capacity
- Lowest measured power consumption*
- Second-lowest operating costs
- Most installations worldwide for machines of this size and capacity
- The only centrifuge using an advanced hydraulic scroll drive instead of a gearbox
- Minimal structural and mechanical modifications needed for installation

*See chart on back. Bid #5 power consumption was a calculation.

Five Competing Centrifuge Systems of Similar Capacity Considered

The DEP enlisted one of the world's foremost water quality consulting firms for a feasibility study comparing the following models:

- **Alfa Laval G2-115**
- **Andritz CP4-1.2 (a retrofit using the same frame)**
- **Andritz D6LX**
- **Westfalia CF700**
- **Centrisys CS26-4**

All these models were mid-feed or counter-current designs using AC variable-frequency drives (VFDs) for the main drive motors. All evaluated centrifuges, with the exception of Centrisys, used various gear drive configurations – ranging from two- to four-stage planetary or cyclo-gear reducers. The Centrisys CS26-4 operates using its standard back drive system – the Viscotherm hydraulic scroll drive based on Rotodiff® technology, controlled through a VFD.

centrisys cnp

Better than Specification Performance

Performance testing for the Wards Island CS26-4 centrifuge installation demonstrated **better than specification performance results.**

- 50% power reduction compared to old centrifuges
- 25% higher throughput compared to old centrifuges
- 17% lower polymer consumption than specification
- 1% drier cake than specified and guaranteed
- 99% capture at 270 gpm (4% higher than specified and guaranteed)

The Centrisys Advantage: Easy Integration

The Centrisys engineering team integrated a centrifuge stand, diverter gate and interconnecting pipework into the plant design. These design elements created a "drop in place" centrifuge system, allowing for easy integration with only few minor modifications to the existing floor plan.

Centrisys' dewatering centrifuge installations are complete at two New York wastewater treatment plants. Sixteen CS26-4 centrifuges are installed at each location, for a total of 32 centrifuges, to dewater the city's anaerobically digested sludge.

Hunts Point Wastewater Treatment Plant Field Acceptance Test | April 8, 2019

Prior to the field acceptance test, it was agreed to run only one Centrisys CS26-4 decanter centrifuge #5707 to validate previous acceptance testing. The previously installed centrifuge was also operating.

	Flow Rate [GPM]	Cake Solids [% TS]	Polymer Dose [lb/dry ton]	Capture Rate [% w/w]	Total Power [kW]
Bid Specs	**175**	**29%**	**25**	**94%**	**60**
Centrisys 5707	176	30.7%	22.8	98.3%	53.7
Centrisys 5708	175	30.1%	22.5	97.9%	54
Previous Centrifuge	146	27.5%	23.6	92%	102.1

Wards Island Wastewater Treatment Plant Performance Test | July 12-13, 2017

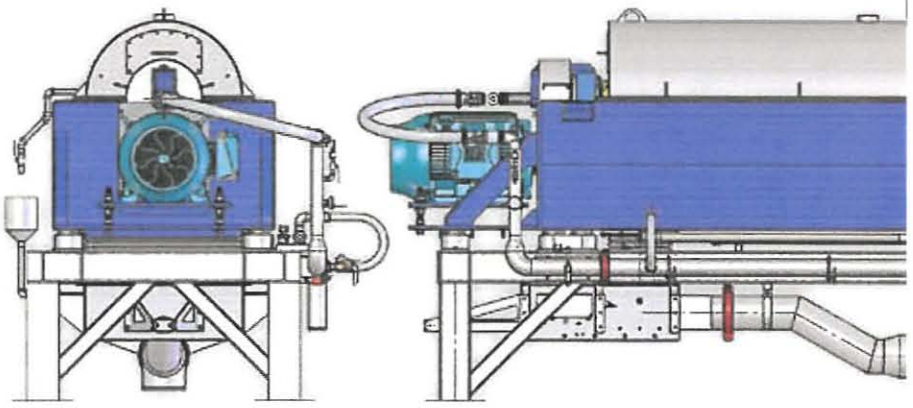
The data acquired below is from the Wards Island Process Control Laboratory. The New York DEP randomly selected two Centrisys CS26-4 decanter centrifuges #5703 and #5705, from the 10 installed centrifuges at the time, to conduct the 48-hour performance test.

	Flow Rate [GPM]	Cake Solids [% TS]	Polymer Dose [lb/dry ton]	Capture Rate [% w/w]	Total Power [kW]
Bid Specs	**250**	**26%**	**36**	**95%**	**67**
Centrisys 5703	252.5	26.7%	29.8	99%	62.53
Centrisys 5705	252.5	27.1%	28.2	99%	62.47
Previous Centrifuge	191.5	25.15%	17.63	0	118.56

Dewatering Specs

Centrisys CS26-4 Centrifuge Wards Island + Hunts Point

Flow Rate – 200-400 GPM
G-Force – 3,000
Torque – 30,000 Nm
Standard Main Motor HP – 100 HP
Scroll HP – 25 HP
Beach Angle – 15 degrees
Bowl Diameter – 26 inches
Bowl Cylinder Length – 90 inches



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ISO 9001:2015

The Centrisys-Viscotherm Scroll Drive is the **Most Efficient** in the Centrifuge Industry

Discover more at **Centrisys-CNP.com**

centrisys cnp

Benefits of the Centrisys Hydraulics

Our hydraulic scroll drive is powerful and precise, achieving the highest torque-to-weight ratio with the best process control. By using hydraulics we eliminate the gearbox, and as a result simplify the design, radically reducing the number of moving parts and wear components. The Centrisys scroll drive delivers unmatched reliability with lower operating costs— a direct benefit to our customers.

1 **Hydraulics is a Trusted Technology:** Whether we realize it or not, hydraulics is a part of our daily lives. It is a reliable and precise technology that delivers maximum power using the smallest footprint. Hydraulic components are a fundamental part of the steering and braking system in every car manufactured today. Hydraulics are used in nearly all forms of daily travel: planes, trains, boats and cars. It is commonly used in manufacturing facilities from heavy lifting to material handling.

2 **Hydraulics is a Versatile Application:** It is used in industrial, military and transportation applications where there is no room for error, and where work is dangerous, dirty or unforgiving. Examples include jet airliners, railways, ships, nuclear submarines, elevators, construction equipment, mining, drilling, and more. This technology is so versatile that it can be used in widely differing environmental conditions – from the most sterile to the dirtiest.

3 **Hydraulic Scroll Drive Increases Capacity:** Precise speed control and the highest torque capabilities allow for increased through-put capacities.

4 **Hydraulic Scroll Drive Maximizes Recovered Energy:** The Centrisys CERS (Centrifuge Energy Recovery System) concept is equivalent to technology used in today's hybrid automobiles, high-performance race cars, and the aerospace industry. The Centrisys system captures energy from the rotating bowl. This recovered energy powers the hydraulic scroll drive at shutdown or power failure, allowing for seamless backup continued operation with controlled scroll speed. Since the scroll continues to unload solids from the bowl, it prevents costly dismantling to free up a blocked centrifuge.

5 **Our Hydraulic Technology Offers the Highest Energy Efficiency:** Hydraulic technology operates independently from the main drive. Gearbox machines generally rely on the main drive; using solids removal mechanisms that apply braking (additional drag) to the bowl and maindrive. (Think of driving a car with the parking brake on.) Unnecessary braking with gearbox technology results in the need for larger main drive motors. Commonly, a centrifuge requires a main drive motor that is 50% larger in comparison to a centrifuge with our hydraulic scroll drive system to accomplish the same job. For every one horsepower needed to move solids out of the machine, one horsepower must be added to the main drive to overcome this braking action. The Centrisys scroll drive uses only the energy needed to drive the scroll; it is independent of the main drive, therefore no energy from the main drive is wasted.

Centrisys-Viscotherm Hydraulic Scroll Drive Based on ROTODIFF Technology **Outperforms** Our Competitors' Gearbox Drive

	Centrisys-Viscotherm Hydraulic Scroll Drive	Competitors' Gearbox Drive	Centrisys Hydraulic Advantage
1	Highest torque-to-weight ratio; allows for proper balance to handle solids and hydraulic flow capacity	Lower torque-to-weight ratio; limits loading of solids, requiring larger or multiple machines	Powerful and Efficient Operation
2	Simple, compact, lightweight design	Complex, heavy design	Lower Maintenance
3	No gears, uses only slow-moving parts; creates less friction	Multiple gears and moving parts at higher speeds; creates more friction and higher power consumption	Long-term Reliability
4	Robust and reliable; process control with direct torque reading. The direct measurement of scroll torque and speed allows immediate response to process changes	Complicated calculations of different speeds through multiple gear reductions/ increases error/ dramatically slows response to process changes	Lower Maintenance, Energy Efficient
5	Simple and accurate measurement of scroll speed; provides precise control of differential with unlimited bowl speed options *Differential = speed of ROTODIFF*	Complicated, indirect measurement of scroll speed; calculated from bowl and pinion speed, gearbox ratio and control error *Differential = (bowl speed – pinion speed) / gearbox ratio*	Precise Measurement and Control
6	One set of V-belts	Multiple sets and types of belts	Precise Measurement and Control Lower Maintenance Cost
7	Lower overhung weight reduces load on main bearings; reduces machine vibration; *Less weight means less horsepower needed to operate*	Heavy overhung gear increases load and heat on main bearings, causing reduced bearing life *More weight means more horsepower needed to operate*	Lower Maintenance
8	Versatile design for multiple applications	Limited design requires different units for each application	Lower Maintenance, Energy Efficient, Versatile
9	Low energy consumption; power is not lost or wasted. Scroll drive operates independently from the main drive motor	Increased energy cost; gearbox design steals energy from the main drive.	Versatile, Energy Efficient, Lower Operating Cost
10	State-of-the-art technology CERS (Centrifuge Energy Recovery System) allows the hydraulic scroll drive to recover energy at shut down	All energy is lost at shut-down; no power recovered	Energy Efficient
11	100% torque at all speeds, including standstill	Limited torque at maximum differential speed and standstill	More Powerful at All Speeds
12	Full range of differential speeds at all bowl speeds, including zero RPM, startup, shutdown and standstill	Limited range of differential speeds at lower bowl speeds and standstill	More Powerful at All Speeds
13	Low maintenance; continuous cleaning and cooling in a closed, 100% filtered system (filtered to 10 microns)	Unfiltered, uncooled closed system; retains all wear debris possibly shortening the gearbox life	Lower Maintenance, More Reliable
14	Pressure relief valves prevent high shock load, protecting the hydraulic system AND centrifuge; system does not transfer impact force to the shafting	Claims to have high shock load capability, but repeated high shock loads will damage and destroy in-line components and cause premature failure	Lower Maintenance, More Reliable
15	Standard on a Centrisys centrifuge	Standard on competitors' machines; if higher torque is required, hydraulic technology is offered as an upgrade	Lower Cost, Energy Efficient
16	No drag or parasitic loss on the main drive; uses only the energy required to convey solids	Robs energy from main drive; torque adds braking horsepower; increases drag on main drive motor	Efficient Operation
17	Capacity to run leading or lagging (optimized performance)	Limited to a one-direction process	Lower Maintenance, More Powerful and Efficient
18	No overheating of the hydraulic motor due to automatic, continuous heat dissipation through the oil conditioning system	External cooling often required; overheating is a common problem	Lower Maintenance, Longer Life

The **Truth** About Hydraulic Scroll Drives

The Centrisys-Viscotherm hydraulic scroll drive system with ROTODIFF technology is the best in the industry. Check the facts below to clear up any misconceptions about our system.

Misconception: **Hydraulic drives are not efficient.**
Fact: With ROTODIFF technology our hydraulic system is the most capable in the industry. Fewer (slow-moving) parts create less friction, and energy loss is minimized. Precise control of the scroll at any speed increases centrifuge capabilities and efficiency, even when loading conditions fluctuate. Hydraulics do not put a drag or load on the main motor and use only the power needed to turn the scroll.

Misconception: **A hydraulic system is not effective in messy, dirty or hazardous environments.**
Fact: Hydraulic technology is commonly used in rugged environments with high levels of shock, vibration, dust, water, corrosive chemicals and other potential hazards. Industries using hydraulic technology include construction, agriculture, marine, military, mining, paper production, drilling and tunneling. Hydraulic systems are used in mines, chemical plants, near explosives and in paint applications, because they are inherently spark-free and can tolerate high temperatures. Hydraulics have the strength and reliability for jobs requiring the best, most durable heavy equipment.

Misconception: **Hydraulic systems are noisy.**
Fact: Our hydraulic scroll drive is quieter than a gearbox. It has been shown to reduce ambient noise by 15 dB over the older electric scroll drives.

Misconception: **Hydraulic systems are messy and leak.**
Fact: Because fluids are enclosed in a contained system, there is virtually no leakage in modern hydraulics. Advanced sealing techniques and materials and state-of-the-art electronics are so efficient that today's manufacturers can raise the operating pressures of their pumps. It is not unusual to find hydraulic systems operating without leakage at pressures 2,000-3,000 psi higher than just a few years ago.

Misconception: **A hydraulic drive is difficult to repair, requiring specialized technicians with hydraulic experience.**
Fact: With fewer slow-moving parts and a less complicated design, hydraulic drives are easier to repair than a standard gearbox. Maintenance technicians with the skills to fix gearbox drives are more than capable of repair and maintenance with hydraulics.

Misconception: **Hydraulic systems are more maintenance-intense than a typical gearbox.**
Fact: On average, hydraulics need only simple oil and filter preventive maintenance, just like a car.

Misconception: **Parts for the hydraulic drive are difficult to source.**
Fact: Centrisys has distribution centers across the United States and around the world for all hydraulic components. In fact, many parts can be shipped express overnight delivery.

Misconception: **Hydraulic technology is old and abandoned by other centrifuge manufacturers.**
Fact: Hydraulic technology remains a dominant system in modern industrial manufacturing. No other system is as efficient and effective in transferring energy through small tubes or hoses and other hard-to-reach parts. Hydraulic innovation is progressing at an astonishing rate – so quickly that some experts cite more progress in the last ten years than in the 50 preceding years combined. Competitive centrifuge suppliers have not abandoned a hydraulic scroll drive, since most will offer it as an upgrade to the gearbox.

The Choice is Clear

When you compare the Centrisys hydraulic scroll drive to a gearbox drive, the better choice is the Centrisys system. Centrisys is the only USA repair facility (besides Viscotherm affiliates) authorized by Viscotherm AG to repair, service, and perform warranty work on Viscotherm hydraulic components in North America. Contact Centrisys for more information on products, hydraulic scroll drive, service, parts or any other questions

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The Centrisys Centrifuge Advantage:

In 1987 Centrisys started as a centrifuge service company, providing top quality service and repair for all brands of centrifuges. We continue in that tradition to this day, and that service expertise, along with the early addition of advanced design and manufacturing techniques, quickly translated into the development and fabrication of one of the top-quality centrifuge lines in the industry and have proven so with projects such as New York City, Denver Metro, Inland Empire, as well as many others.

Centrisys focuses strictly on biosolids equipment, and complete solids handling processes and solutions. That focus has resulted in unmatched biosolids handling process, application, equipment, and service expertise. Throughout the years, Centrisys has provided centrifuge solutions for multiple different treatment types and capacities in both municipal and industrial dewatering applications. Centrisys stands out as the top-quality centrifuge manufacturer in the industry, building and supporting your equipment right here in the United States. We build equipment to last the test of time and to ensure the best performance at the lowest lifetime cost.

Centrisys continues to grow our process and service knowledge base, and have expanded our solids handling portfolio with the extension of the CNP biosolids processes. We now not only have innovative solutions for biosolids thickening and dewatering, but Centrisys/CNP is now able provide complete process systems for Drying, Digestion, Phosphorus removal, and Thermal Chemical Hydrolysis (TCHP) to further meet your solids processing and handling needs. The incorporation and development of these processes has not only expanded our overall offerings and capabilities, but it has also further strengthened the Centrisys dewatering process knowledge base even more.

As mentioned above, Centrisys continues to provide the best service in the industry, no matter the brand of centrifuge. With a service center in Stockton, CA, and our headquarters in Kenosha, WI, our expert technicians are only a phone call and few hours away. We can also ship just about any part over night as well. Centrisys not only provides the top-quality centrifuge, but our service is unmatched anywhere in the market.

Please see the key points below that make Centrisys and our solids processing equipment the leader in the industry.

Key Points That Make Centrisys Centrifuges The Top Centrifuge In The Industry:

Hydraulic Drive:

- The Hydraulic scroll drive is the most efficient drive on the market while also providing the best control of any of the drive types as well.
- Today's hydraulic drives are significantly different from the hydraulic drives of old. A basic overview can be seen in this video: https://www.youtube.com/watch?v=xrZjETgSqs0&t=15s
- The hydraulic Rotodiff scroll drive provides the lowest Installed HP for similar size machines as well as lower energy consumption during operation (power is not lost or wasted)
    - Other manufacturers use the main motor to drive the bowl and scroll together, and then use another motor, reducing it through a gear box, to back off, or break, the required rpm in order to achieve the differential speed. Some have tried to capture some of this lost energy, but a significant amount of energy is still wasted.
    - Centrisys uses the main motor to drive the bowl only. The Rotodiff hydraulic scroll drive operates independent of the main motor, and drives the scroll only at the low rpm to achieve the required differential speed which is typically only 1-2 rpm for municipal applications.
- Highest Torque Rating - Increased solids loading capacity.
    - The hydraulic scroll drive provides 100% of the torque, 100% of the time. 100% torque at all speeds, including stand-still.
    - Gear boxes are 0% torque at 0 rpm, then build torque as the rpm increases and tops off at a "sweet spot" rpm range, then falls off again above that.
    - Hydraulics scroll drives provide a significantly higher torque to weight ratio.
    - Increased weight of a gear box also requires more energy to spin, and more overhung load on the bearings.
    - Rotodiffs provide more torque yet are small enough to ship overnight if any service is needed. The weight of gear boxes requires overland truck freight.
- Lower speed, less parts, simple and robust construction.
    - The Rotodiff spins only at the scroll speed of typically 1-2 rpm.
    - Gear boxes are spinning at 1800 or 3600 rpm to reduce down to the 1-2 rpm scroll speed.
    - A gear box is similar to an automatic transmission, multiple parts, extremely complicated design and construction. Very few people can describe how they work and even fewer are qualified to work on them.
    - The Rotodiff is similar to hydraulic drives on heavy machinery wheel drives. Robust and simple.

- Continuous cooling and filtering of hydraulic fluid
    - The Rotodiff system continuously sends the hydraulic fluid through a heat exchanger and a filter. Any wear or contamination is instantly removed.
    - Gear boxes do not filter nor cool the oil. Wear particles stay in the gear box causing further wear.
- Simple and accurate process control
    - Hydraulic drives provide torque reading directly from the hydraulic pressure.

    - Gear boxes require conversion calculations and averaging in the programming. After a short time, these calculations are incorrect do to wear in the gear box.

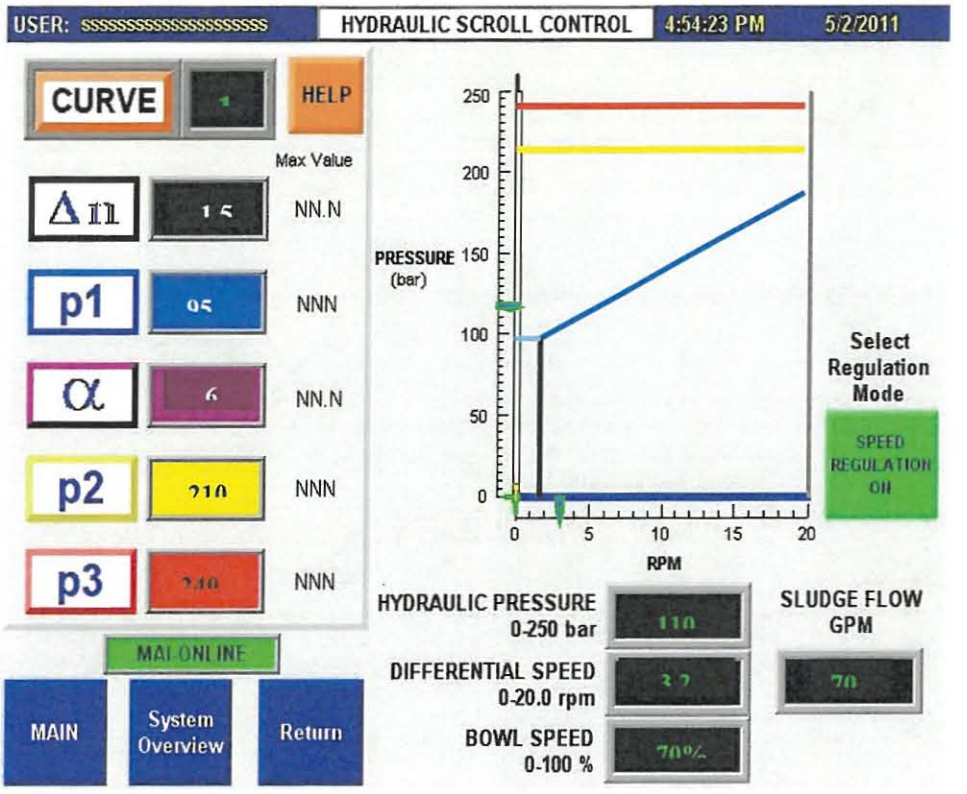
    - How the differential speed works. The scroll inside the bowl runs at a differential speed in relation to the bowl. This differential speed, or Δn, controls how fast the solids are conveyed out of the machine. The higher the Δn, the faster the solids will be conveyed out and the wetter the solids will be. The slower the Δn, the solids will stay in the machine longer, build up more torque, and become dryer before they are conveyed out. There is a point where too high of a Δn will not allow the solids to build up enough in the in the beach area and therefore you will not get any torque built up, and you will not get dry solids. If you run the Δn too slow, the solids can build up in the machine and cause the torque to increase and eventually cause carryover of solids into the centrate.

    - Hydraulics allow for precise simple control. With the hydraulic controls we can directly measure the torque on the scroll as it conveys the solids out of the centrifuge. After determining the pressure set point that provides the desired cake dryness and capture rate, we can set the controls to control the Δn to maintain that pressure or torque. As the solids in the feed stream fluctuate, the controls will directly monitor the torque and instantaneously adjust the Δn accordingly to maintain the proper pressure around the set point so that you get consistent cake and capture rate. If higher solids concentrations enter in the feed, the torque/bar pressure will increase, and the controls will automatically increase the Δn to move the solids out faster and maintain the pressure around the set point while still maintain performance.

    - The speed at which the system reacts is controlled by the slope of a curve, or α. That slope can be adjusted so that the rate at which the Δn reacts can be either slower or quicker depending on the operation and response time required for a specific sludge.

    - These set points and controls are all displayed and controlled by a simple HMI and once the set points are determined the system automatically adjusts

accordingly and little to no interaction or supervision is required. HMI screen below shows the controls for this operation.



- An animation of this can be seen in the following link: https://www.youtube.com/watch?v=_spsLXFCcDU

- The hydraulic Rotodiff and controls help to prevent plugging, but if plugging does occur, the hydraulically driven scroll can be run in reverse in order to help clear the bowl without complete disassembly.

- Since the Hydraulic scroll drive can be run in reverse, the scroll can be also be run as lagging or leading, which can be beneficial in different applications. This also allows for reversing the scroll such that the flow wear can be directed to the opposite side of feed and solid ports, doubling the life of these wear inserts.

- Some gear box manufacturers claim to be able to handle up to 4-5 time the operating torque. If the torque increases 4-5 times the desired torque, something inside the machine is severely wrong and something is likely to break. With hydraulics, if the pressure increase too high for some reason, a valve is opened and the pressure is instantly relieved, so no damage occurs. The controls will also stop the feed and flush the system if the high pressure set point is exceeded, preventing damage and plugging.

- With the hydraulic drive should anything occur to cause an automatic shutdown, once the condition has been cleared it can be started back up on the fly and you do not have to wait for the centrifuge to shut down completely to get back up and running.

- Gear boxes cannot be reversed or started on the fly.

Beach Angle, bowl length, and G-volume:

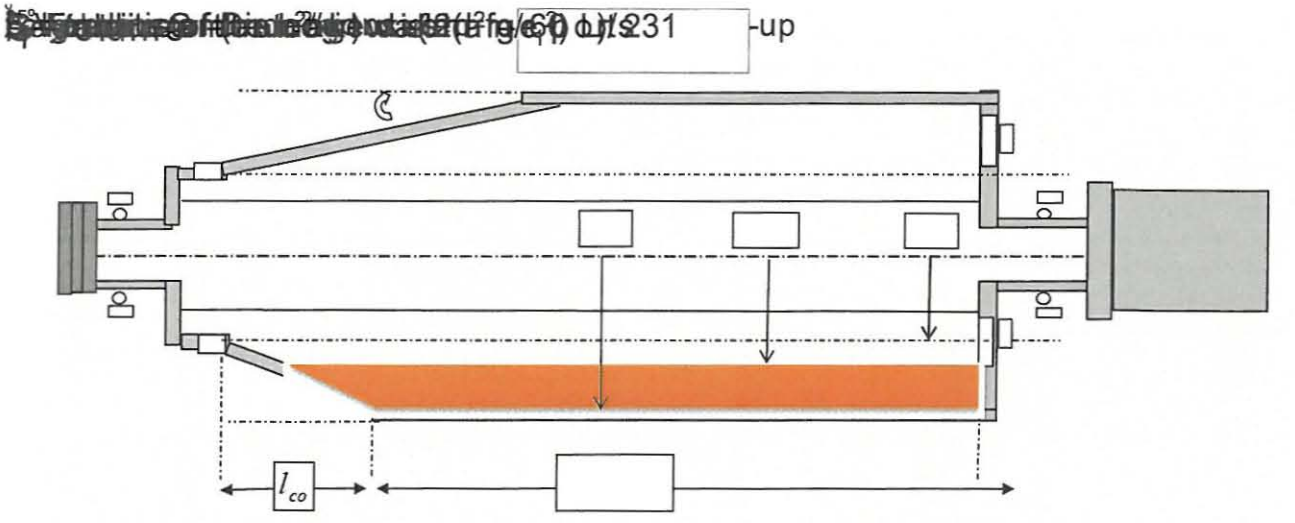
- Cake dryness:
  - The beach angle helps to determine the cake dryness. A steeper beach angle can provide dryer cake as it is pressed with the g-force (up to 3000G) as it is conveyed up the beach. There is a point where too steep of a beach will make it too difficult to convey the solids out of the machine.
  - Centrisys has done extensive testing to determine the optimal beach angle. We determined that the optimal angle is 15 degrees. We can utilize this steep of a beach angle as a result of the extra torque that we can provide with the hydraulic drive.
  - Steeper beach angles than 15 degrees make it difficult to get grit and heavier solids out of the centrifuge.

- Capture rate:
  - The steeper beach angle also extends the length of the clarification area of the bowl. This translates to more clarification volume for the same size machine, which results in a better capture rate. This is depicted below.

15 Degree

12 Degree

- G-Volume:
  - G-volume is the clarification volume multiplied times the G-force, and this is what determines the sizing and throughput of the centrifuge. Any increase in the clarification volume significantly increases the G-volume, since it is up to 3000G. The G-volume is described below.
  - Centrisys has the deepest pond depth and the largest g-volume for the same size machine.

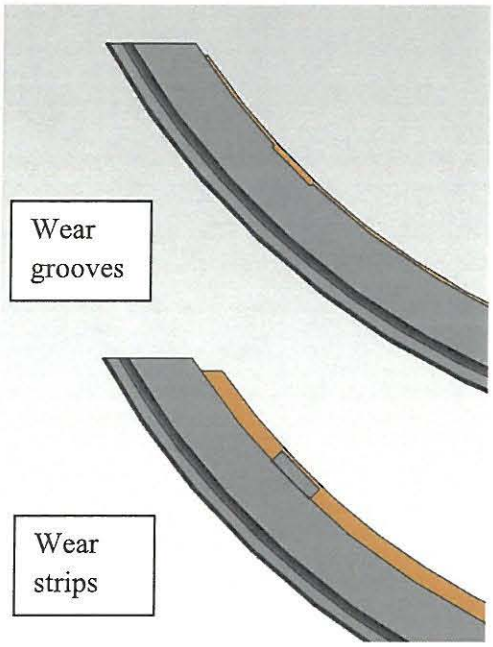


Energy Consumption:

- Centrisys has the lowest installed and operating power in the industry.
- The beach angle, pond depth, and solids discharge, and hydraulic back drive all play a role in energy consumption as well. The closer that the solids are discharged to the centerline of the machine, the lower the energy it takes due to the centrifugal forces.
- Centrisys has the deepest pond and the closest to the center discharge point.
- Other manufacturers continue to try to duplicate this feature as an "energy saving" measure over their older designs, but still do not compare to Centrisys. This was proven in recent testing at our installation in Wards Island NYC.

Top quality design generated from service:

- Centrisys started as a service company for all of the centrifuge brands, and we continue to service any machine in the market to this day.
- By servicing other brands of centrifuges, Centrisys has learned over the years what is the best design as far as quality, performance, longevity, cost of ownership, ease of operation, and serviceability.
- The Centrisys design features that provide the longest lasting machine on the market and the best serviceability are too many to list, but a few of the main items include the location and type of the bearings, the use of top quality seals instead of cheaper O-rings, utilizing wear strips vs wear grooves for less wear and better conveyance, and the type and design of wear components.
- Centrisys centrifuges are built to last in order to provide the lowest life cycle cost in the market.



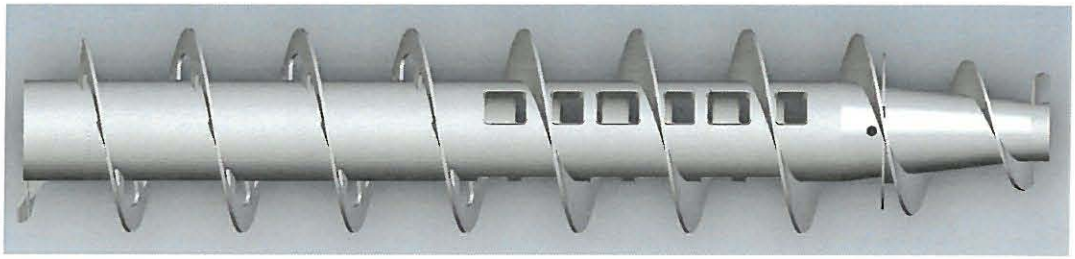
Centrisys uses wear strips instead of wear grooves.

Wall cake is represented in brown. The wall cake becomes the wear layer to prevent bowl wear.

Thin wall cake has a tendency to slip. This causes lack of solids transportation and buildup of solids in machine. High torque and poor centrate follow.

Strips can be replaced when worn. Grooves wear the actual bowl, a much more costly replacement.

- Centrisys uses large and multiple feed ports. This allows for less wear in the feed chamber and feed ports and less and turbulence in the solids end of the machine.



Centrisys Scroll

Competition Scroll

- Centrisys uses the latest 3D modeling design tools and can provide drawings and models to engineering firms to provide ease of design and system integration.

- Centrisys can provide complete systems including controls, feed pumps, conveyor systems, stands, ladders, and walkways, making design and installation as simple as possible.
- The design features and materials used ensure that Centrisys has the lowest cost of ownership in the industry.

Process Expertise:

- Centrisys is a Centrifuge and Biosolids company. Our expertise is centrifuges and biosolids process.
- We have some of the top centrifuge dewatering and thickening process people in the industry. We put that knowledge and expertise to use for you by providing the best possible process support available.
- Centrisys was grown from of a service business, and we have grown to become the most innovative and advance centrifuge manufacturer in the industry by continuing to expand our knowledge base as well as our innovative product offerings.
- Centrisys can provide full lab testing including polymer testing, as well as onsite pilot testing.
- The addition of our sister company, CNP, with advanced biosolids processes has continued to expand and strengthen our biosolids dewatering knowledge and proven expertise in the handling and treatment of biosolids that no one else in the industry can match.

Designed, manufactured, serviced, and supported locally:

- Headquartered out of Kenosha, WI provides a local technical and manufacturing presence that no other centrifuge manufacturer can match.
- Centrisys has the top service support and lead times in the industry. Having service centers in multiple locations in the US, and having the entire engineering and service team readily available in Kenosha, WI provides unmatched support and service.
- Centrisys carries millions of dollars of parts inventory at the headquarters in WI, and almost any part can be shipped over night, with onsite tech support available in 24-48 hours anywhere in the US.
- Centrisys major overhaul lead times are typically 3-4 weeks, instead of the 3-6 months typical of other manufacturers.