



STeP

Sanitation Technology
Platform

INCINERATION AND COMBUSTION TOILETS

A product and patent landscape

APRIL 2017

The Sanitation Technology Platform

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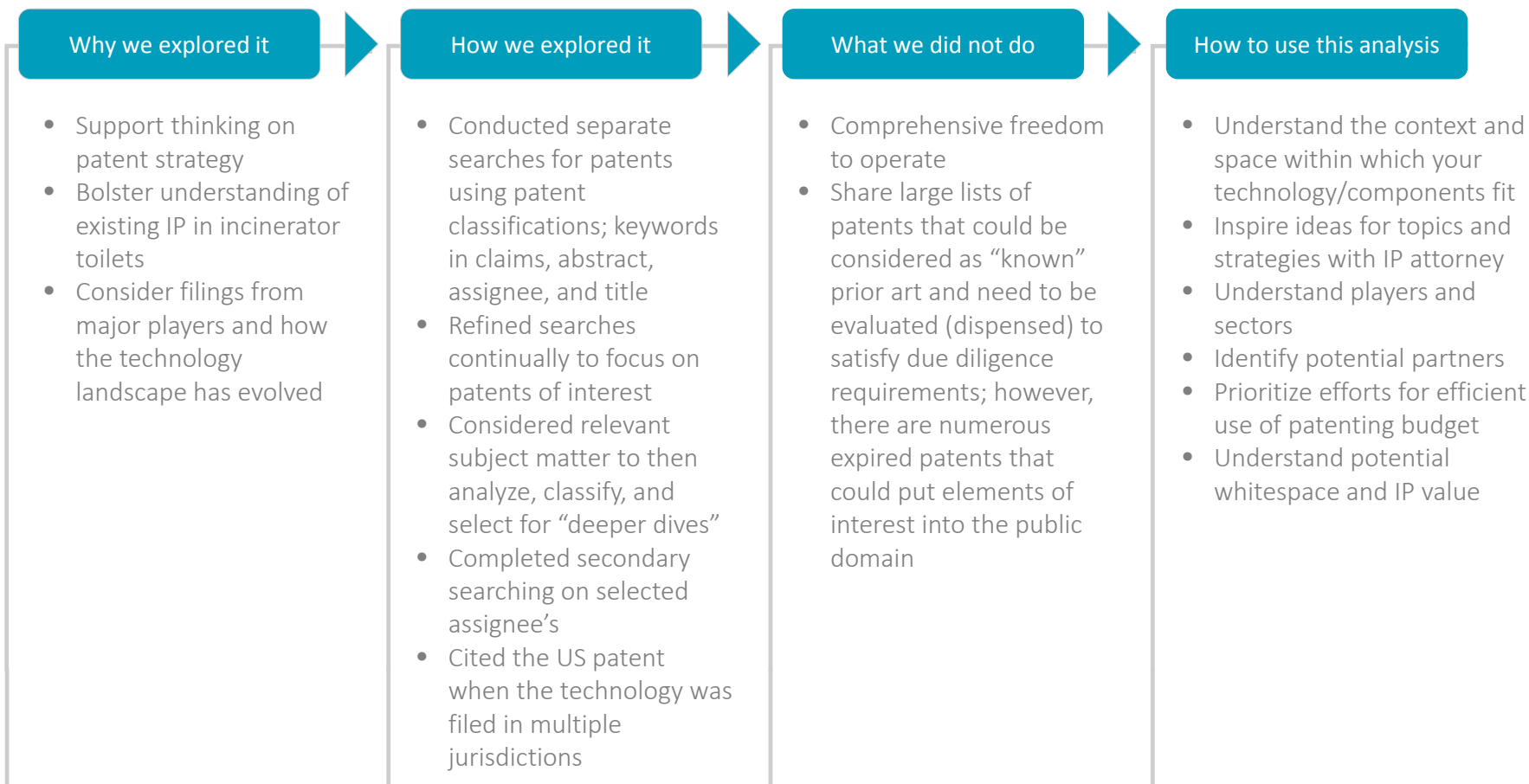
This report provides a patent landscape as a tool for informing and assessing future toilet system designs.

STeP, with the support of the Gates Foundation, aims to support commercialization and market entry of novel sanitation technologies. When assessing the value proposition of technologies under development, the team should recognize, take inventory, and assess current and future systems.

This task is designed to bring focus to the current state and provide a resource for the Gates Foundation and partners. Specific objectives were to:

- Provide example patents related to incineration and combustion toilets.
- Understand key technology areas that are now in the public domain where older patents may have expired.
- Identify dominant patents that need to be considered.
- Profile selected technologies, assignees, and products on the market.
- Highlight example patents to inform claim filing strategy.

This patent landscape informs on trends, existing patents, and major players.



Toilet systems have common elements to consider within the IP landscape.



Processing

Processing Urine/Feces
Conveyance
Sanitization
Collection

Management of urine/feces in back end of system
 Mechanical elements including pumps and valves
 Inactivation of pathogens
 Storage of urine or feces for later processing

User Interface

Aesthetics
Portability
Frontend

Relating to design or look
 Design for mobility (e.g., trains, planes)
 Parts including seat, controls and indicators

Power

Energy Supply/Storage

Fuels and energy sources and batteries/capacitors

Control Systems

Monitoring/Control

Sensing to check, record, and associated systems to regulate

Separation & Ventilation

Odor Control
Separation Urine/Feces

Reduction or control of foul smell or emissions
 Segregation of urine from feces

Economics

Efficiency and Cost
Reliability
Maintenance

Performance (work/energy) and cost to produce and operate
 System robustness
 Cleaning and up-keep

This effort followed a 3-step process to explore the IP landscape for incineration toilets.

1

Searched patent databases to create patent dataset(s)

- Cooperative Patent Classification (CPC)—a classification system developed by the United States and European patent offices
- International Patent Classification (IPC)—a classification system developed by the World Intellectual Property Organization (WIPO)
- Key words

2

Analyzed trends and players

- Analyzed patent sets to consider trends over time.
- Considered key players, and technologies.
- Augmented patent analysis with market insight.
- Focused on key features:
 - Fuel Sources
 - Odor Management
 - Portability
 - Control Systems
 - Efficiency

3

Augmented with analysis of key patents and products on the market

- Key assignees and market players
- Illustrative or key patents

Step 1 considered terminology, classifications, and used multiple search tools to identify patents.

1

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Various searches generated sets of patents that were combined, culled, and considered.

1

2

3

Searched patent databases

Set	Combustion Toilet Search	Records	Comments
Searcher 1 in Acclaim IP	1 Class Search: IPCR:A47K11/02 AND APD:([1800-01-01 TO NOW])	1762	A47K11/02 - Dry closets, e.g. incinerator closets 1800 to present
	2 IPCR:A47K11/02 AND APD:([1800-01-01 TO NOW]) and (incin* or burn* or igni* or fire* or combus*)	279	Above classification search with keywords. Non-relevant documents were deleted after a brief analysis.
	3 ((feces or fecal* or poop or shit or toilet* or commode*) near5 (incin* or burn* or igni* or fire* or combus*))	169	Only keyword search
	4 Hits in set 3 not in set 2	0	all the documents in keyword search were present in classification search
Searcher 2 in Lens.org	5 (incineration OR combustion) AND toilet	1696	Very basic keyword search
	6 Toilet AND (incinerat* OR combust*) AND biomass OR feces OR waste	1236	More targeted keyword search
	7 Classification_ipcr:A47K11\02 AND (incineration OR combustion) AND toilet	163	IPC Class and basic keyword search
	8 Sets 3 and 7 were combined and duplicates were deleted	319	Combined and culled set for majority of analysis

Step 2 considered trends on filings, players, and technologies.

1

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- Key words

2

Analyzed trends and players

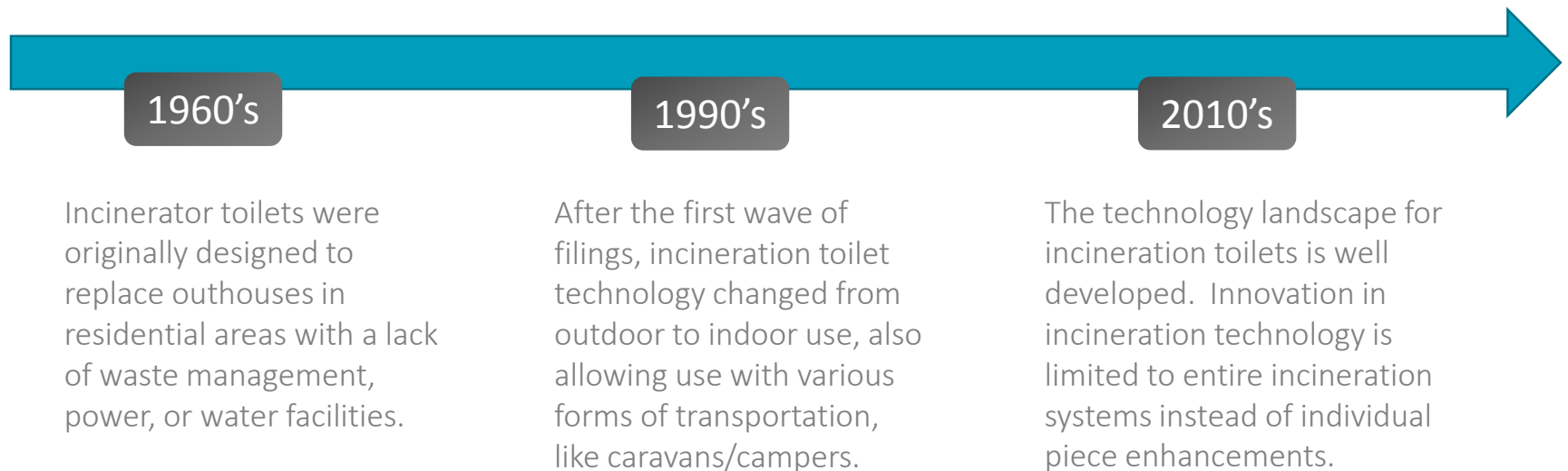
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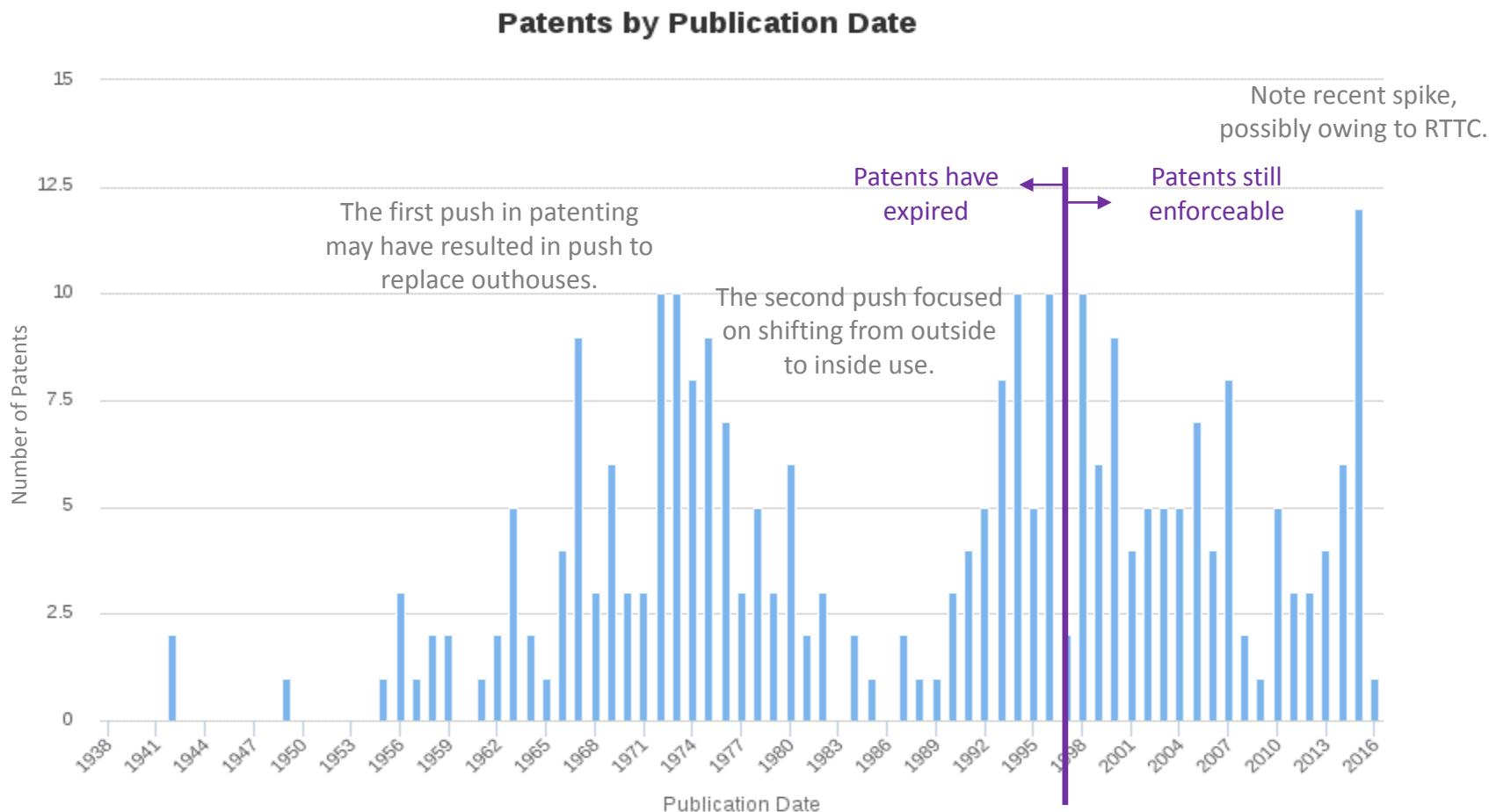
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The IP history and trends illustrates areas of technology focus and key players.



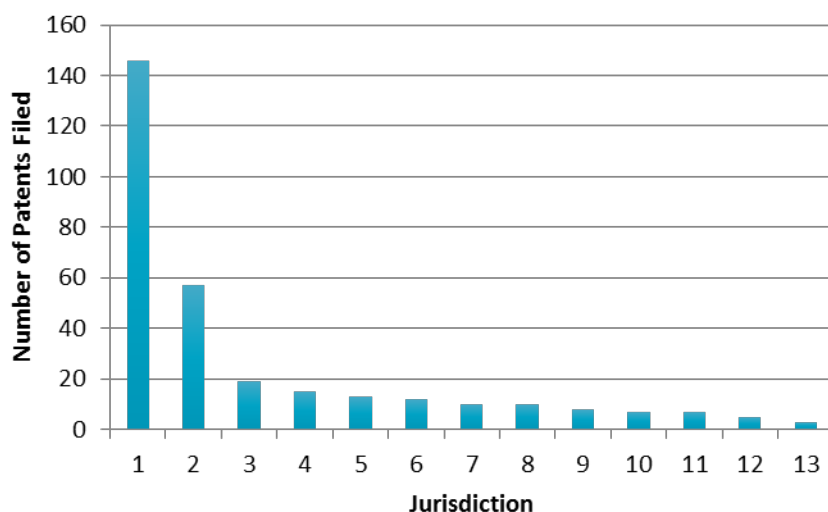
Incineration toilets were patented as early as 1940 and still have significant activity.



This graph was created using set 1 – see page 9.

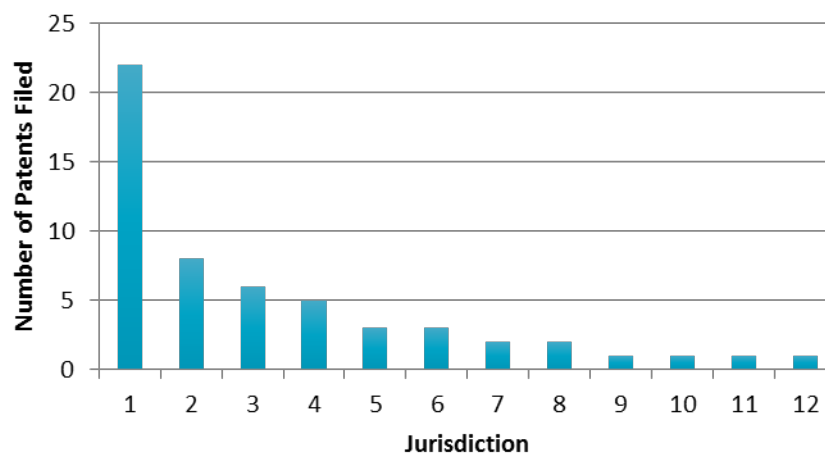
The US is the dominant jurisdiction for filing patents related to incineration toilets.

Patents Filed Based on Geography



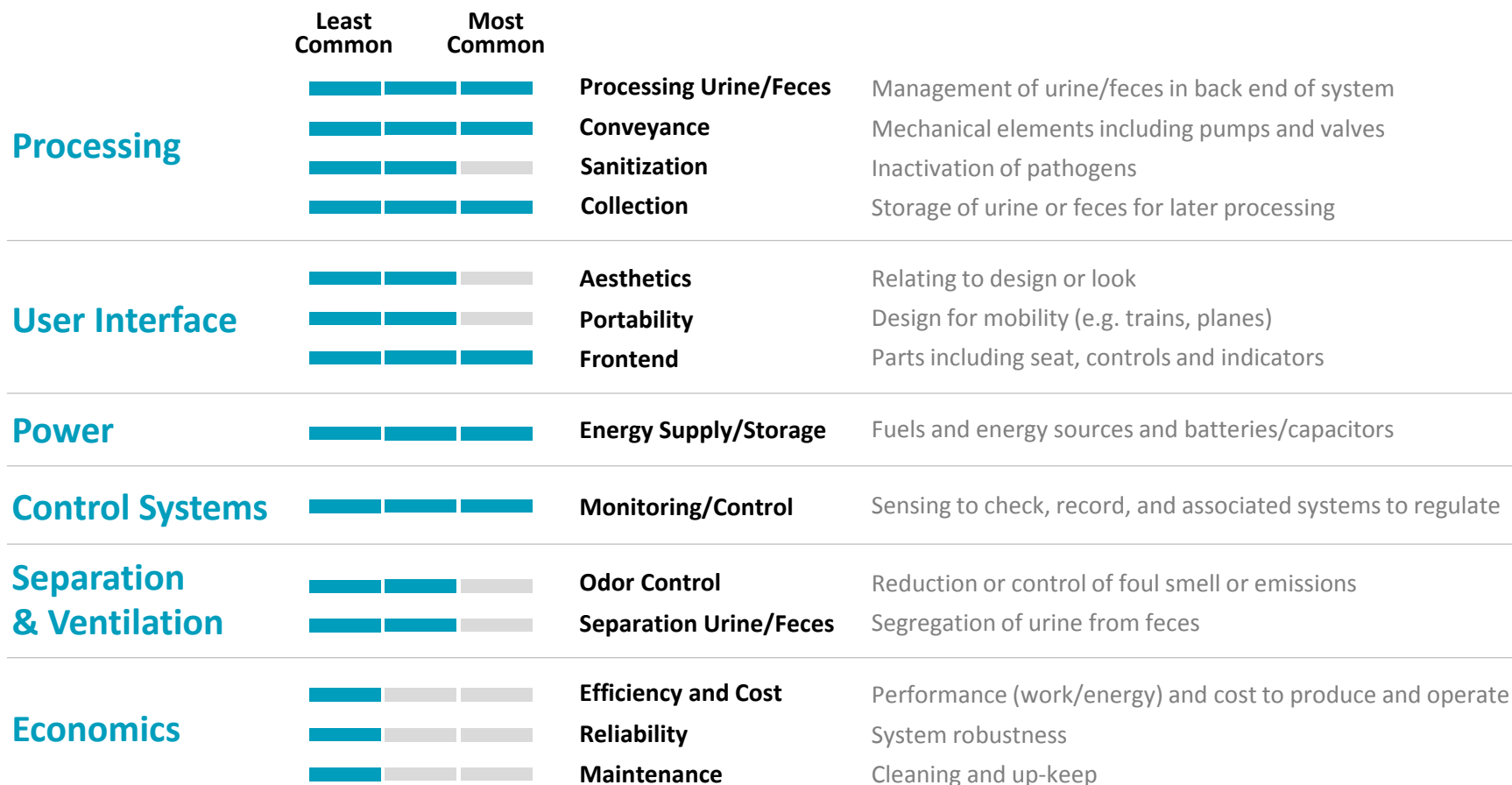
For the patents and patent application set most focused on incineration toilets, the US was the dominant filing jurisdiction with more than twice the filing rate than the next most common, Japan.

Patents Filed in the Last 10 Years Based on Geography

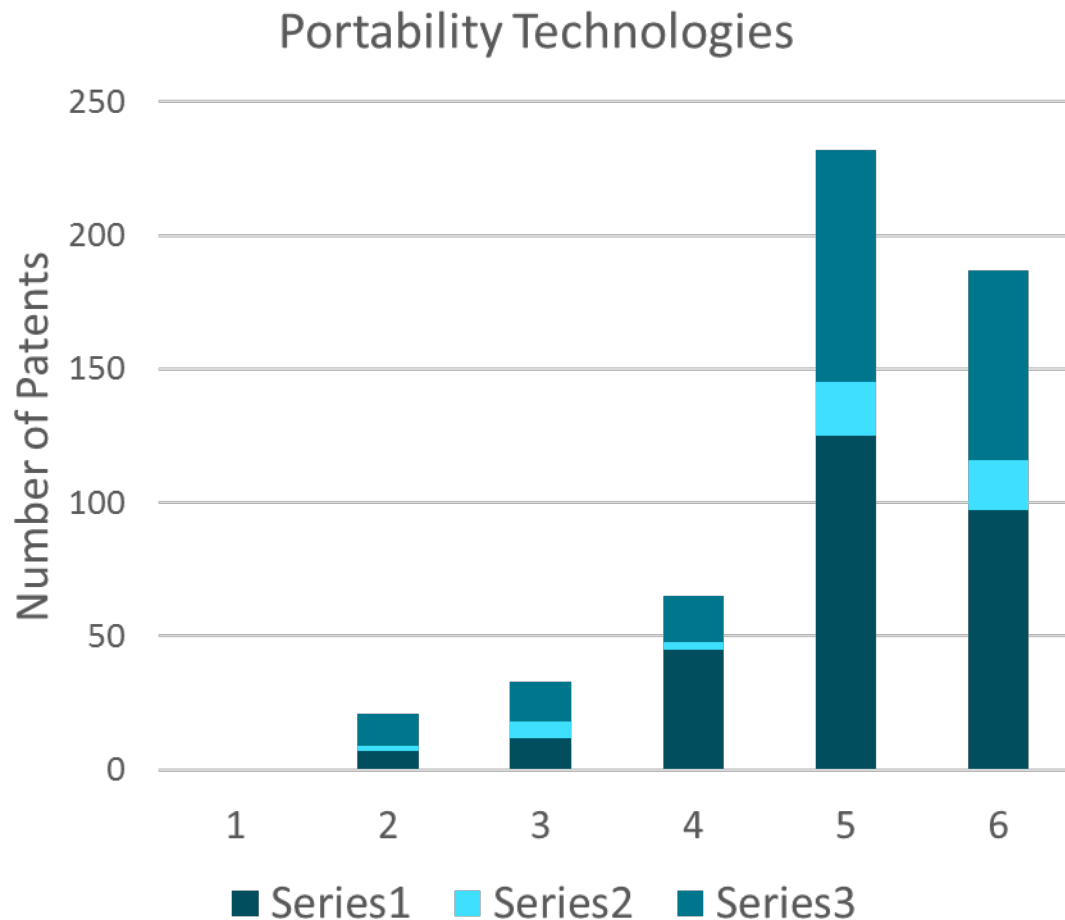


Looking at patent filings and issued patents more recently, Korea, WIPO, and China, have all increased in their relative number of filings versus other geographies.

For incineration systems, processing features were most commonly claimed, with few economic claims.

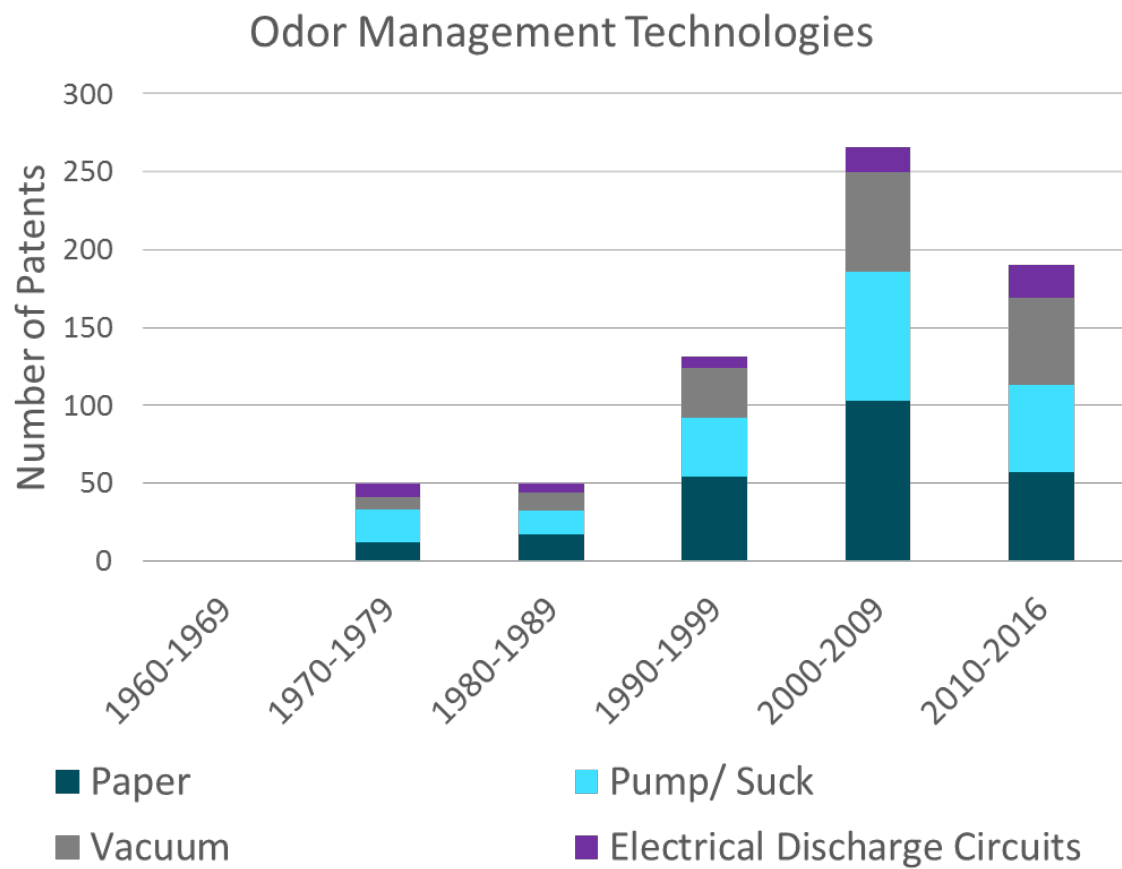


Combustion toilets have historically been used for mobile toilets.



RV, Marine, Trains, and Aircraft applications captured in the Portable category. Portable incinerator claims are dominated by marine and ship uses.

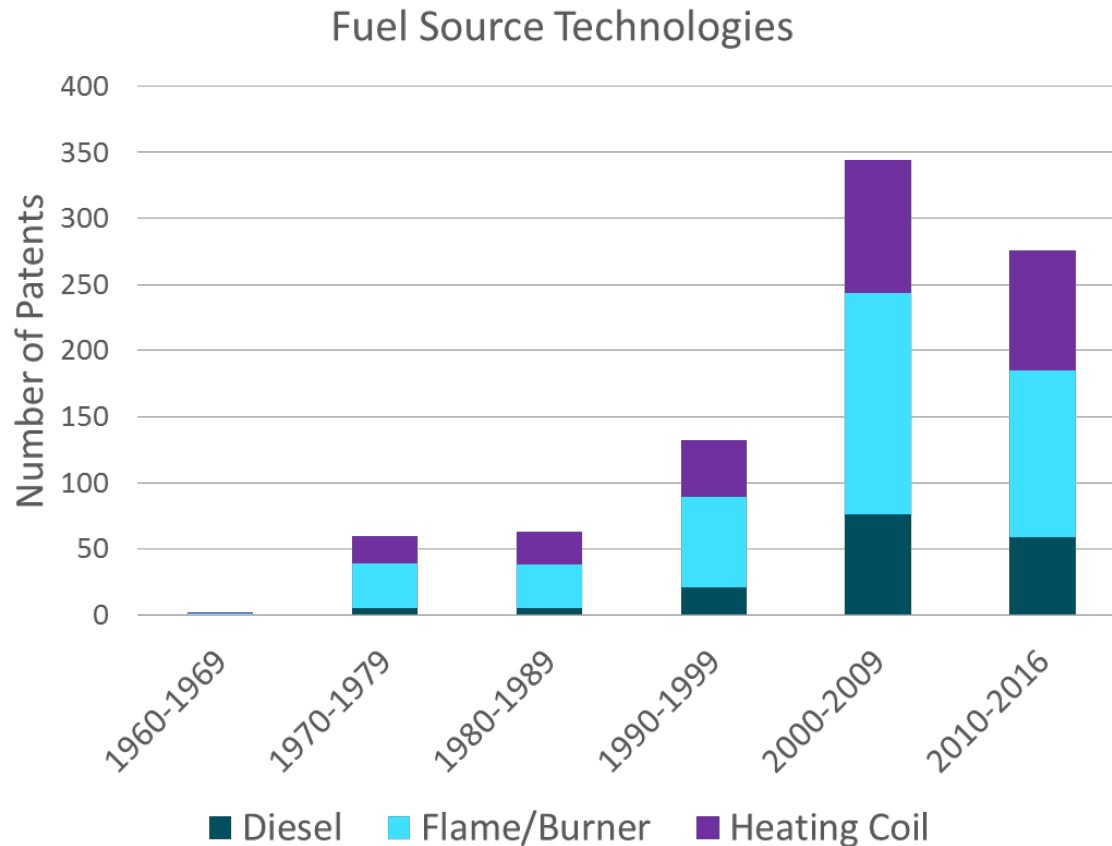
Odor management increased when incineration toilets entered the home.



Odor mitigation was not as commonly claimed in patents until incineration toilets began to see commercial success inside of a residence.

Odor management claims refer to the use of paper bags for containment, vacuum strategies, air flow, and ignition via electricity.

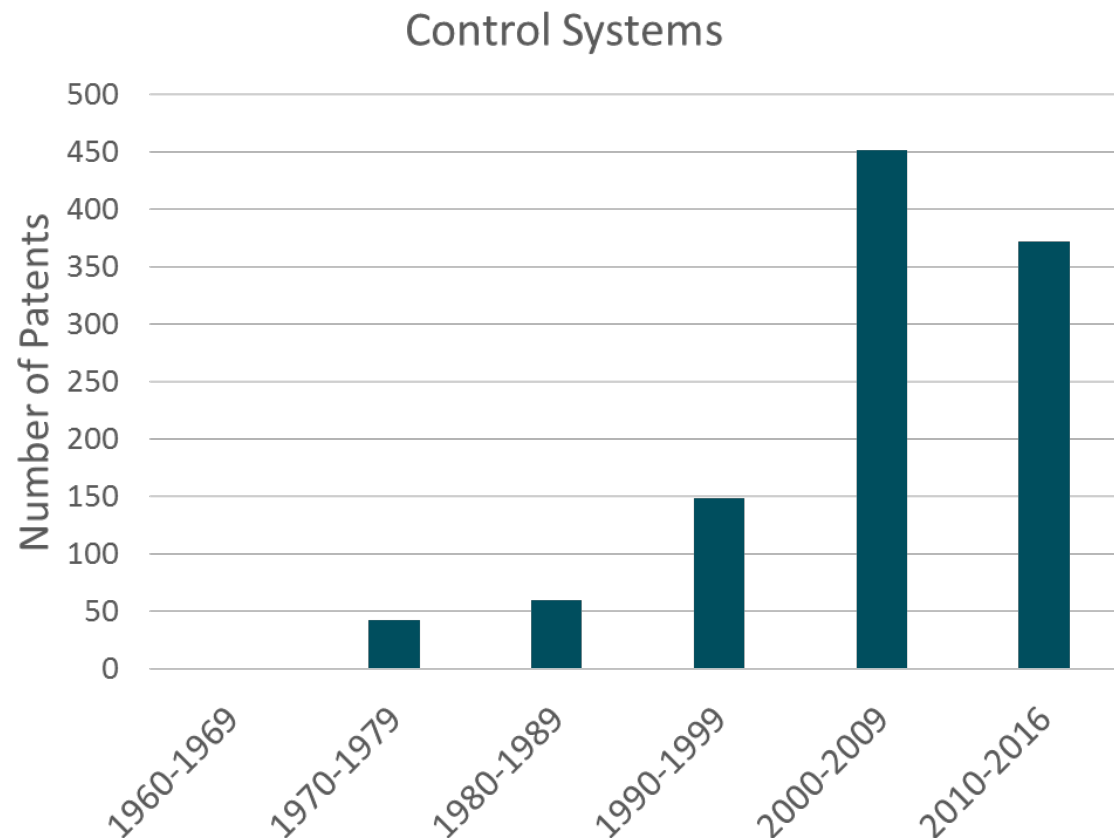
Natural gas (flame/burner) has been claimed more since 2000.



Combustion toilets use fuel to initiate the reaction. Fuels include diesel, natural gas, and electricity.

The current IP landscape continues to have all of the various fuels keeping in balance, versus one starting to dominate.

Incineration control system technology is claimed in the majority of patents.



Claims related to sensing and control have increased as combustion toilets have grown in sophistication, likely enabled by the reduction in cost of the electronics associated with sensors and control elements.

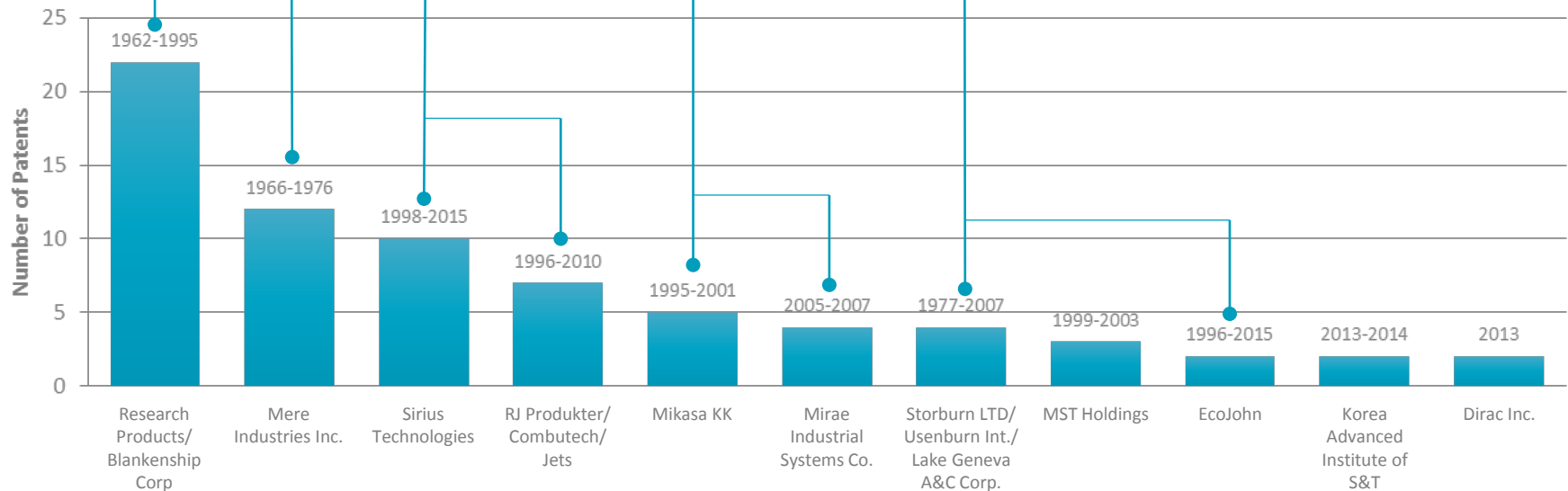
Sirius is a current market leader with strong IP.

While Blankenship Research and Mere Industries own the most toilet patents, Mere is out of business and Blankenship has not patented in more than 20 years.

Sirius Technology and RJ Produkter (Jets) appear to be the current market leaders within the group of companies identified as having larger IP portfolios.

Mikasa and Mirae may be out of business based on limited web activity. Mirae's patent fees have lapsed.

EcoJohn was reportedly sold by Storburn, but Storburn may be out of business.



These graphs were created using set 8 – see page 9. The dates indicate the range of patent filings for each company.

Step 3 down selected to highlight players and patent that are illustrative or of specific interest.

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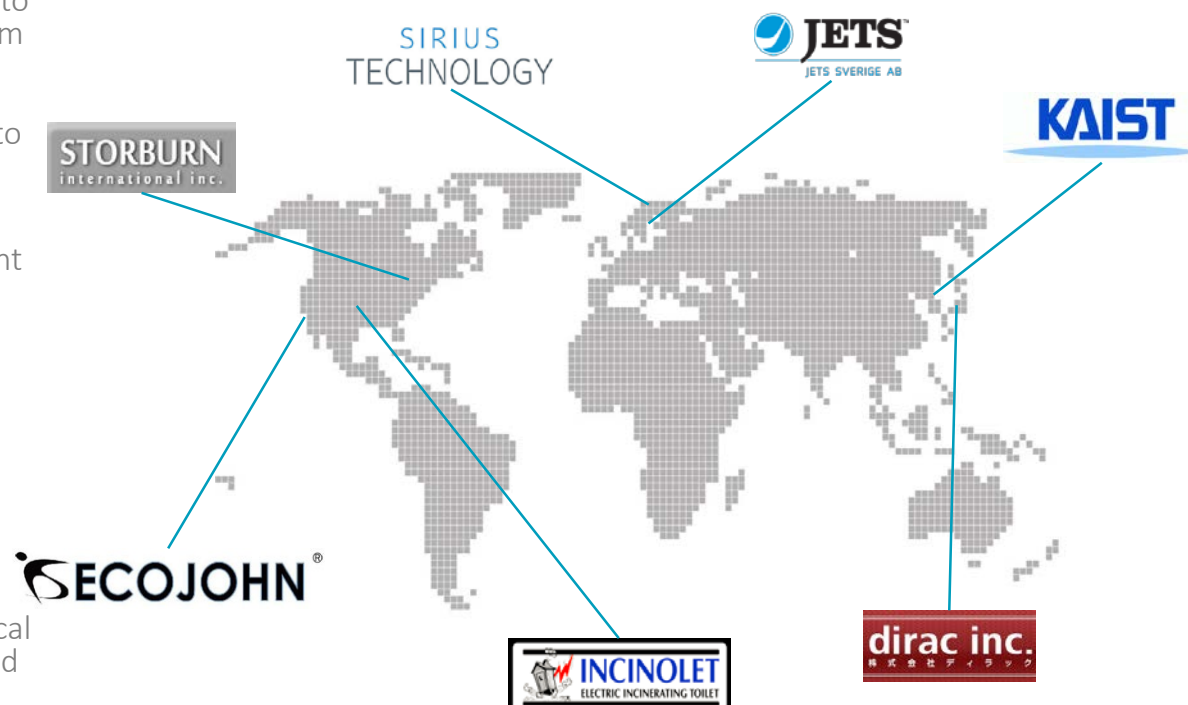
Considering industry players helps identify market trends and focus areas for patenting and innovation.

The patent search was used to identify key market players for consideration. Then a market search was conducted to see what companies were missing from the patent search driving iteration between the patents and market information. Analysis was completed to consider how individual inventors and companies fit together.

Understanding the players, their patent positions and strategies can inform future development, patenting, and potential partnerships.

Dominant Industry Players Criteria

- History of sales
- Frequent patent activity highlighting product innovation
- Unique market position
- Combination of important technical areas for a well developed finished product
- Quickly identified in internet searches and in incinerator toilet product summary discussions





INCINOLET is one of the original incinerator brands, supported by RP/Blankenship patents.

Technology Profile

- Research Products / Blankenship www.incinolet.com has been in business since 1958 and sell a low cost electric incineration toilet.
- RP / Blankenship invented and manufactures the INCINOLET electric incineration toilet. They originally sold the DESTROILET, which was manufactured by La Mere (based on their IP), before RP / Blankenship invented their own incineration toilet designs.
- Office and manufacturing facilities are in Dallas, Texas.
- Claim 55 years of manufacturing the INCINOLET toilet product and boast international sales.
- Sell electric incinerator toilets for ~\$2K.
- Sell paper toilet liners for using with the toilet.
- This company is believed to be in a relatively solid financial situation, based on the timeliness in paying bills (D&B).

Patents Identified

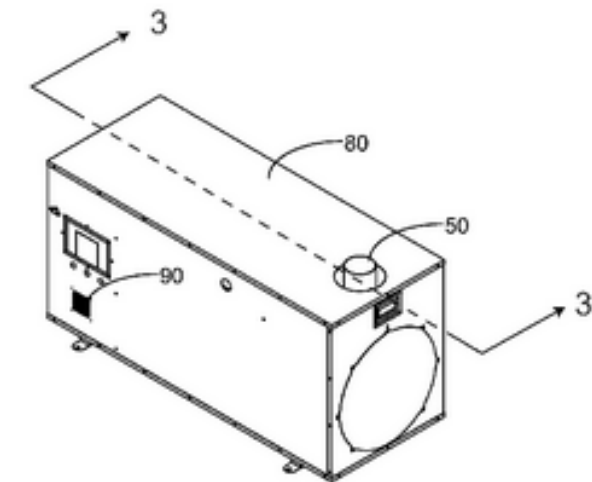
EP0661945A1	JPH07265230	US5361421	US5337422	US5304780	US5218724
US5153942	EP0358726A1	EP0357686A1	US4905324	US4823408	US4205403
US4159547	ES435025A1	GB1457100	US3943579	US3921227	US3890653
GB1067702	GB902772A	US3020559	US5123122		



ECOJOHN is an established player with gas as the primary fuel source.

Technology Profile

- ECOJOHN www.ecojohn.com appears to be the industry leader in North America, selling commercial and residential self-contained incinerator toilets.
- ECOJOHN offers septic alternatives and waste management solutions. The products range from small self-contained residential incinerating toilets and composting toilets, to larger commercial sewage incinerators, mobile restrooms, mobile incinerator units, garbage incinerators, and prefab buildings.
- Founded in the early 1990's and based in the United States, ECOJOHN offers septic alternatives and turnkey commercial restroom and incinerator buildings, offices, and accommodation units.
- All units can be fueled either by propane, natural gas, or diesel fuel.
- There is reason to question the financial stability of this company. Their annual sales are ~\$400K (D&B).



Patents Identified

US9163832 B2

AU1996046368 A

SIRIUS TECHNOLOGY



Sirius Technology leads in electric incineration and has many recent patent filings.

Technology Profile

- Sirius Eco Group www.cinderellaeco.com/en toilets appear to be the industry leader in Europe. The toilets are waterless, electric, and use incineration to convert the waste into sanitized ash.
- Sirius Technology AS is a subsidiary of Sirius Eco Group based in Norway. They manufacture the Cinderella Toilet System for private homes, caravans, mobile wagons, boats, trains, hoist cranes, etc.
- Sirius has significant recent patent activity and are focusing innovations on whole systems that are user friendly and convenient.
- Cinderella Toilet Systems are electric incineration toilets with over 45,000 operating in the market.
- Annual revenue is reported at \$12.6M and the company appears to be financially healthy (D&B).

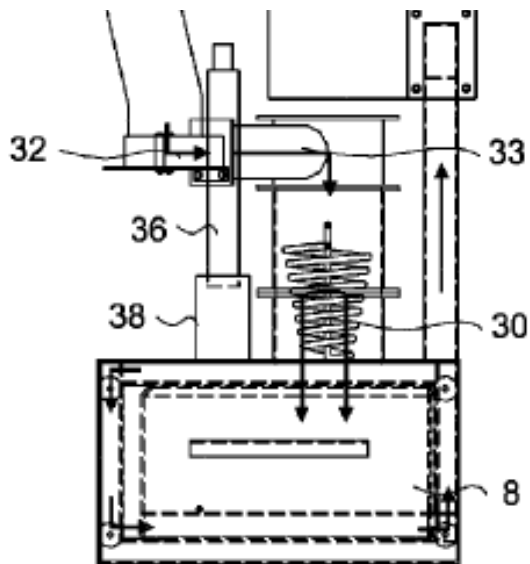
Patents Identified

AU2013313715A1	AU2013313668A1	US8966673	CA2259992
US20150208883	US20150224944	AU2009238759A1	
EP1850722	US6052836	AU1997037126A	

Norwegian Jets is a relative newcomer, but has rights to the RJ Produkter patent portfolio.

Technology Profile

- Norwegian Jets www.jets.se toilets do not require external power or water and utilize incineration and vacuum functions to recycle and disinfect human waste.
- Norwegian Jets AS is a manufacturer of vacuum toilets that delivers toilets mainly to villas, cottages, boats, and buildings with individual sewage.
- Jets purchased CombuTech, a Swedish innovator that develops and manufactures combustion toilets that burn with either electricity or LPG. CombuTech was formed by RJ Produkter.
- CombuTech is the exclusive manufacture for all of Jet's products in Sweden and Norway.
- Jets Sverige AB, has been in business since 2004, reports 5 employees and annual revenues of \$1.1M (D&B).



Patents Identified

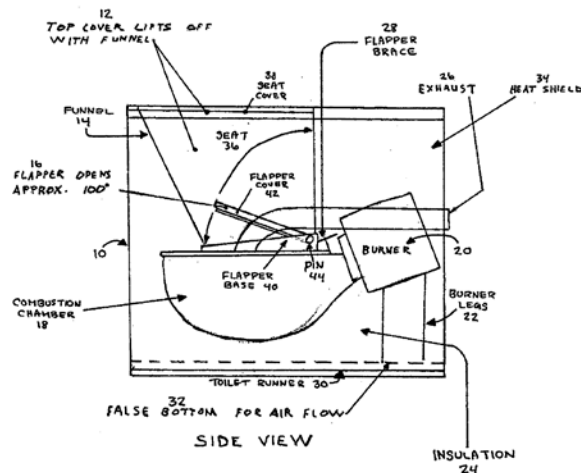
WO2010036201	EP1748715B1	US20070062423
US5924141	AU1998050790A	
WO1998022010	CA2218045	

STORBURN
international inc.

Storburn retrofits systems to run on natural gas and is a distributor turned inventor.

Technology Profile

- STORBURN International www.storburn.ca toilets claim to be safe, sanitary, self-contained, portable, waterless, odorless, and can be used inside and outside.
- Storburn International owns the USENBURN brand and toilet system. They also distribute ECOJOHN toilets.
- Storburn is a Canadian manufacturer of gas-fired incineration toilets and has sold approximately 10,000 units since its inception in 1976. Units sell for approximately \$4K and costs \$.08 per use to run and operate.
- The toilets operate on diesel, kerosene, or aviation fuel, but Storburn also converts newer systems to operate with natural gas. Storburn says they are currently working on converting the USENBURN toilet system to operate on natural gas.
- The current status of this business is in question (D&B reports Storburn as out of business). Also there appears to be a relationship between Lake Geneva A&C Corp.



Patents Identified

US4051561	US20070256218
AU1976017219A	CA2587164A1



Dirac is also a distributor turned inventor, and now sells electric and odor mitigating toilets.

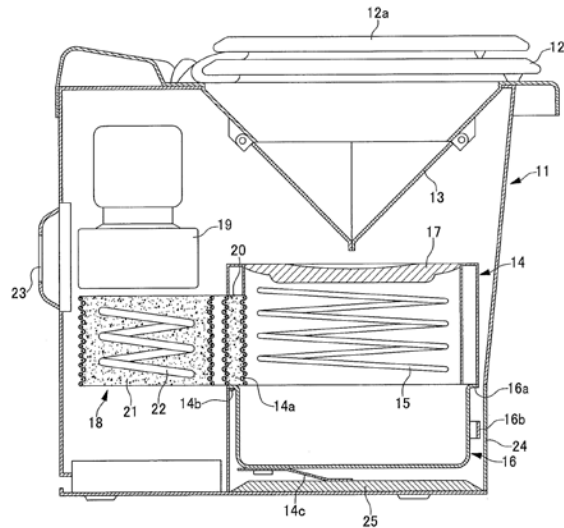
Technology Profile

- Dirac Inc. (dirac-inc.co.jp) was originally an incineration toilet distributor, but recently invented their own incineration toilet and control system.
- Dirac Inc. is located in Japan and was established in 1987. They claim to have sold over 3,000 units.
- Dirac was the exclusive seller of Incinolet toilets in Southeast Asia in 1987 before inventing and manufacturing their own brand.
- There are many similar Japanese and South Korean companies, like Mirae Industrial Systems Co. and Suzuki Shoji KK, patenting incineration toilet technologies.
- Their toilets are electric and use insole paper and a deodorizing catalyst to remove odor and smoke.
- Units sell to individual homes for \$5,900 and to commercial services (like construction sites) for \$14,500.
- Dirac reports annual sales of \$131k with 5 employees (D&B).

Patents Identified

CN102858217A

US20130031707





KAIST is a university working on waterless toilet technology.

Technology Profile

- Korea Advanced Institute of Science and Technology www.kaist.edu is one of many universities in South Korea striving to create better waterless toilets and waste management technologies.
- Korea Advanced Institute of Science and Technology is a University in South Korea focused on science and engineering to support industrialization as part of the government's economic development plan.
- KAIST's specific research field in sustainable water systems has lead to building waterless toilet systems.
- KAIST has recent patent filings in incinerating toilet technology that includes separate urine and feces, as well as reduction of pollution and odor from the treatment process.

Patents Identified

KR101290306	KR101372653
KR20150123442	



Paulee CleanTec

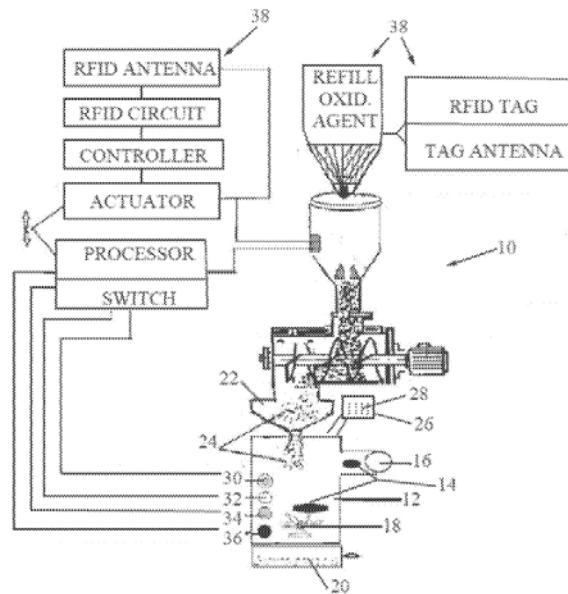


FIG. 1

Paulee CleanTec uses chemicals instead of direct heat to cause an incineration burn.

Technology Profile

- Paulee CleanTec (<http://www.pauleecleantec.com/>) uses an oxidizing agent, potassium permanganate, to start an exothermic reaction that reduces water content, sterilizes, and removes odor during a chemical incineration. During the reaction, the waste is converted into a fertilizer-grade ash in under a minute.
- Paulee CleanTec is located in Tel Aviv, Israel and was established in 2008.
- Their primary market is managing animal waste, but they have developed portable toilet and livestock capabilities. The portable toilet is also self-sufficient and uses the heat generated during the process to provide a light in the cabin.
- They plan to sell the pet poop cleaning device for \$49. The cartridge with the oxidizing agent should last for one month and will retain for about \$10-12. The raw materials for the cartridge and oxidizing agent cost about \$1 to manufacture.
- They have partnered with CB Engineers to develop residential buildings for processing human waste and providing usable water.
- Future iterations of their device will redistribute the heat generated from the incineration reaction to heat the buildings local water supply.

Patents Identified

US 8096597	US 9039053
US 2016/0367090	US 2014/0157502

Specific patents are presented as case studies representative of the patent landscape.

Patents were selected because the patent

- highlights an area or feature of interest
- is cited by many other patents
- demonstrates ownership by a company rather than an individual
- Is well written and includes
 - abstracts
 - claims
 - diagrams and detailed descriptions
- links to an existing or emerging commercial product(s).

These patents illustrate...

- patenting strategy related to various features
- historic, highly cited patents that now are in the public domain
- newer patents that illustrate more recent areas of focus and protection
- claim themes and terminology

Patent Features

Processing	Processing Urine/Feces
	Conveyance
	Sanitization
	Collection
User Interface	Aesthetics
	Portability
	Frontend
Power	Energy Supply/Storage
Control Systems	Monitoring/Control
Separation & Ventilation	Odor Control
	Separation Urine/Feces
Economics	Efficiency and Cost
	Reliability
	Maintenance

1958 – Incinerator Construction – [US 2936724](#) – 20 Cited
John Bishop

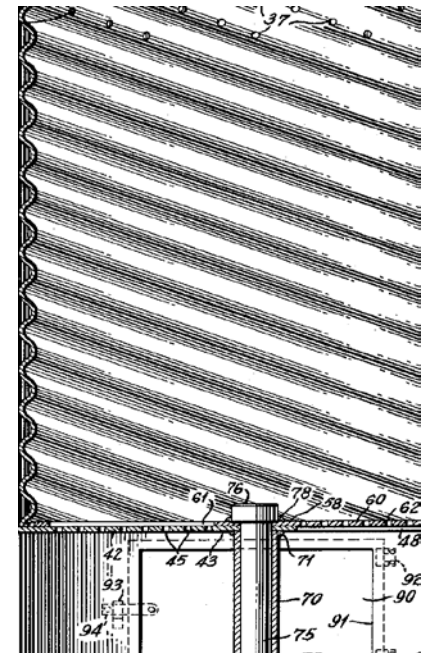
This invention relates to an incinerator construction for the combustion of various types of waste products and more particularly, involves an arrangement of elements that adapt this type of assembly to **small portable units** as well as larger structures of more commercial utility.

Key Takeaways

Control and process systems are the most common focal area for incineration toilet patents. Most disclosures have innovation in aspects of the overall incineration process rather than patents for the individual component improvement.

This early patent illustrates specific claims of reduced cost parts, preheated air for increased efficiency, sanitization, and processing, and the ability to decrease part sizes for more portability.

Citations are balanced between old and more recent patents.



Patent Features

Processing	Processing Urine/Feces
	Conveyance
	Sanitization
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User Interface	Aesthetics
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Power	Energy Supply/Storage
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Separation & Ventilation	Odor Control
	Separation Urine/Feces
Economics	Efficiency and Cost
	Reliability
	Maintenance

1962 – Incinerator Toilet – [US 3020559](#) – 27 Patents Cited
Res Products Manufacturing Company

This patent is for an electric incinerator-type toilet for use in locations where water supplies are limited, such as on railroad trains, airplanes and buses, on farms or camp sites, or at other places **where sewer connections are impossible or impractical.**

Key Takeaways

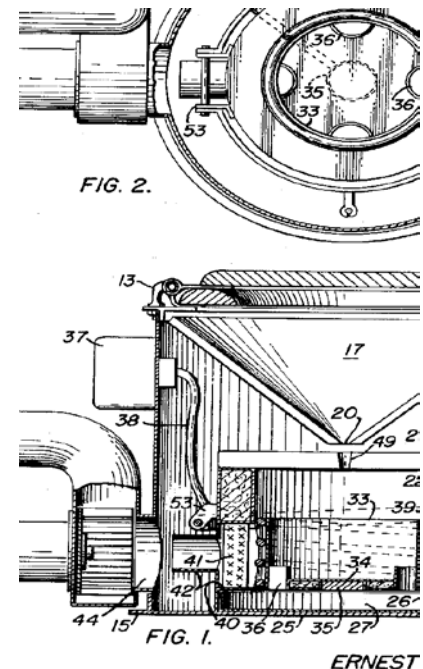
One of the first incinerating toilet patents powered by electricity. It later becomes the INCINOLET Electric Incinerator Toilet sold by RP / Blankenship.

Most citations of this patent are from the 1960s and 70s.

There are a balance of corporations and individuals citing this patent.

The technology is trying to balance an efficient burn while remaining relatively cool around the outer surface, which is important for placing the toilet in more compact spaces.

The patent represents a typical patent in this area; the patent is focused on the entire incinerating toilet system rather than one technology aspect.



Patent Features

Processing

Processing Urine/Feces

Conveyance

Sanitization

Collection

User Interface

Aesthetics

Portability

Frontend

Power

Energy Supply/Storage

Control Systems

Monitoring/Control

Separation & Ventilation

Odor Control

Separation Urine/Feces

Economics

Efficiency and Cost

Reliability

Maintenance

1974 – Incinerator Toilet – [US 3943579](#) – 12 Cited
Ernest Blankenship / Res Products Incinolet Corp.

The invention is an incinerator toilet comprising an incinerator chamber formed by inner and outer walls each of which are formed from a **single cylindrical piece of drawn metal** and which have their upper and lower ends connected together forming an enclosed and surrounding chamber for holding heat insulation material. An electrical heating coil is **removably supported** within the chamber with its terminal ends extending outward through the inner and outer walls. A blower is located outside of the chamber for drawing gases from the interior thereof by way of the vent line. An **odor reducing heat activated catalyst** is located in a container between the blower and the outer wall of the chamber and in the flow path of gases passing through the vent line.

Key Takeaways

The patent focuses on the entire incineration system to be cost efficient, control odor, reduce maintenance, and better improve processing. Previous patents required combining multiple pieces of metal to enclose the burning chamber, but this shows a move to have one single piece form the incinerating enclosure.

The majority of citations are for older patents.

U.S. Patent March 16, 1976 Sheet 1 of 3 3,943,579

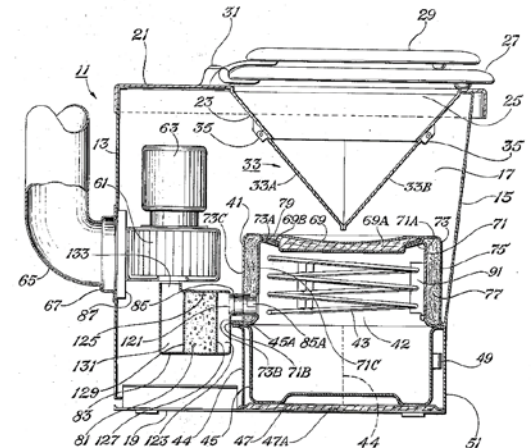


Fig. 1

Patent Features

Processing

Processing Urine/Feces
Conveyance
Sanitization
Collection

User Interface

Aesthetics
Portability
Frontend

Power

Energy Supply/Storage

Control Systems

Monitoring/Control

Separation & Ventilation

Odor Control
Separation Urine/Feces

Economics

Efficiency and Cost
Reliability
Maintenance

1975 – Store and Burn Incinerating Toilet and Method – [US 4051561](#)
– 7 Cited

Storburn Limited A Canadian Corp.

A **store and burn** incinerating toilet has a heat permeable upwardly opening receptacle over a combustion chamber. Vapor and products of combustion generated in the receptacle pass from the receptacle into the front portion of the combustion chamber and toward the rear of the chamber and into an **afterburner flue stack** leading from the rear of the chamber. **Preheated air** is introduced into the receptacle during the burn cycle, and air is also introduced at the lower end of the stack. While incineration is in progress the closure is locked by a **thermally responsive safety-locking** device. During the accumulating and storing interval, a layer of **masking foam** may be applied and maintained over the waste in the receptacle.

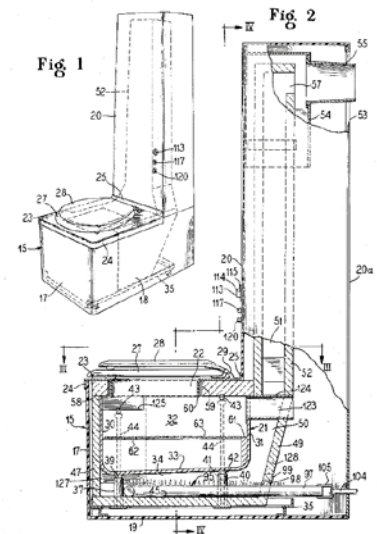
Key Takeaways

This patent is one of the few improving the aesthetic nature of the incinerating toilet. The design and the sanitary covering foam are to improve the overall look and feel of the unit.

The patent also treats the waste differently by storing the waste until a predetermined amount is present and then activating the burn.

Thermally responsive lock to prevent burning users is present since a primary concern is the unit reaching too high of a temperature during treatment.

U.S. Patent Oct. 4, 1977 Sheet 1 of 3 4,051,561



Patent Features

Processing	Processing Urine/Feces
	Conveyance
	Sanitization
	Collection
User Interface	Aesthetics
	Portability
	Frontend
Power	Energy Supply/Storage
Control Systems	Monitoring/Control
Separation & Ventilation	Odor Control
	Separation Urine/Feces
Economics	Efficiency and Cost
	Reliability
	Maintenance

1977 – Toilet of Incinerating Type – [US 4148103](#) – 14 Cited *Volcano KK*

A toilet of the incinerating type includes several pots which are set on a **turntable** at equal angular intervals, with one of the pots ready for use at all times. A pot containing human waste is automatically connected to an incinerator for incineration of the waste, and the other empty pots are automatically moved to a desired position ready for use and a position waiting for use.

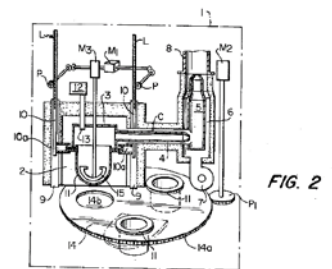
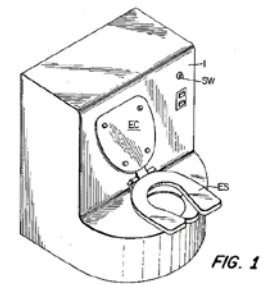
Key Takeaways

The owner and inventor are both Japanese. There is a considerable amount of incineration toilet activity in Japan.

Some incineration toilets do not treat each individual use. Rather, they store the waste until a certain amount has been deposited and then treat a larger batch of feces.

Citations are balanced between old and recent patents.

U.S. Patent Apr. 10, 1979 Sheet 1 of 3 4,148,103



Patent Features

Processing	Processing Urine/Feces
	Conveyance
	Sanitization
	Collection
User Interface	Aesthetics
	Portability
	Frontend
Power	Energy Supply/Storage
Control Systems	Monitoring/Control
Separation & Ventilation	Odor Control
	Separation Urine/Feces
Economics	Efficiency and Cost
	Reliability
	Maintenance

1979 – Waste Disposal System and Method – [US 4161792](#) – 15 Cited
 1979 – Waste Disposal by Incineration – [US 4162656](#) – 15 Cited
Standard Products Co.

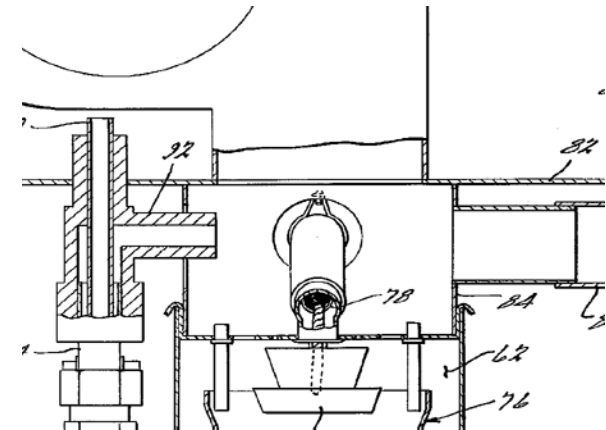
Disclosed is a **portable waste disposal system** that is designed primarily for use in marine craft, mobile homes, campers or the like. The system comprises a macerator unit for converting excrement to a liquefied effluent, and an incinerator unit for incinerating the effluent. The fuel for the burner is **regulated by a pair of fuel valves**, one of which is cycled to **maintain the temperature** of the exhaust gases from the combustion chamber within predetermined limits.

Key Takeaways

Valves are often claimed to regulate the amount of fuel supplied to a burner for incineration. This is important to control the temperature of the toilet system since it is often integrated into enclosed and compact spaces for more portable units.

While the patent does not focus on user interface, a different company patenting a flushing toilet control system with a specific user interface cited the patent as prior art.

Citations are relatively equally distributed between older and newer patents.



Patent Features

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1980 – Toilet Seat Volatile Gas Incinerator – [US 4200940](#) – 36 Cited
Wes Buchanan

An incinerating device such as a **grid of tungsten wires or a glow plug** is inserted in the passageway and connected to an electrical source, preferably one of low voltage, for **incinerating and burning the odorous volatile body gases**. Incinerating the odorous volatile body gases **destroys the odor** allowing the by-products of combustion to be discharged back into the same bathroom atmosphere.

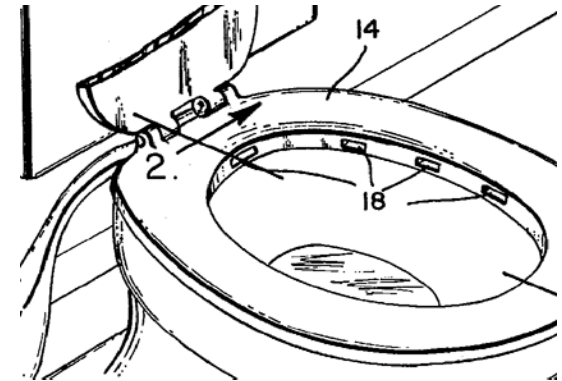
Key Takeaways

A common method for odor control is using vacuums or pumps and then burning off the odorous gases in some fashion. This invention calls for hot wires.

Still heavily cited today for odor control in incineration toilet systems.

This patent is unique in the landscape because it focuses on only one aspect of using incineration with a toilet, the odor control.

Only one focus area leads to a “stronger” patent compared to entire system patents. It is easier to combine multiple strengths in system level patents to create a product, but not as easy to use a single element in a product design without licensing from the patent owner.



Patent Features

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User Interface	Aesthetics Portability Frontend
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Economics	Efficiency and Cost Reliability Maintenance

1984 – Electrical Combustion Toilet – [US 4425671](#) – 6 Cited

Ewald Nelken

An **electrical combustion toilet** including a housing having a seat and a cover, a first receiving chamber for receiving toilet wastes, a combustion chamber situated below the first receiving chamber adapted to receive wastes therefrom by force of gravity and to electrically incinerate the wastes, an ash chamber for receiving combustion residue from the combustion chamber, and **a fireproof cover adapted to seal** the combustion chamber. The toilet is rendered firedamp-proof by an encapsulation structure and by being **supplied with pressurized air** for preventing explosive gas mixtures.

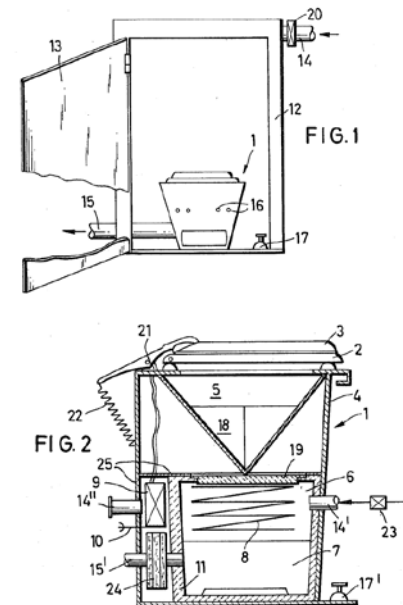
Key Takeaways

Some toilet systems are designed for a specialized use. This patent claims a system specific for use in coal mines where flammable materials may be present in the air.

The patent provides a full toilet system that uses pressurized air to ensure heating elements do not interact with trace amounts of material in the open air, and provides a firedamp proof for a safer and more reliable use.

This is rarely cited, but is cited by a recent Sirius Technology patent, who was identified as a current player in the incineration toilet space.

U.S. Patent Jan. 17, 1984 Sheet 1 of 4 4,425,671



Patent Features

Processing

Processing Urine/Feces
Conveyance
Sanitization
Collection

User Interface

Aesthetics
Portability
Frontend

Power

Energy Supply/Storage

Control Systems

Monitoring/Control

Separation & Ventilation

Odor Control
Separation Urine/Feces

Economics

Efficiency and Cost
Reliability
Maintenance

1992 – Method for Automatically Controlling Incineration in an Excrement Disposal System – [US 526554](#) – 22 Cited

Claude Bigelow

A method is provided for **automatically controlling the incineration** of solid wastes in a self contained toilet. A **waste withdrawal pump** is actuated to pump down the contents of the holding tank to a predetermined lower holding tank level once the upper holding tank volume limit has been reached. The system also provides **for recirculation of the waste** in the holding tank to prevent solids from settling out therein. The slurry from the holding tank is **automatically metered** into the incineration chamber **according to the temperature** in the incineration chamber at a rate appropriate for complete incineration. The system employs a **diagnostics routine to detect and identify malfunctions**, and a **maintenance routine** to allow specific inputs to be displayed and to provide an **interface for operator control**.

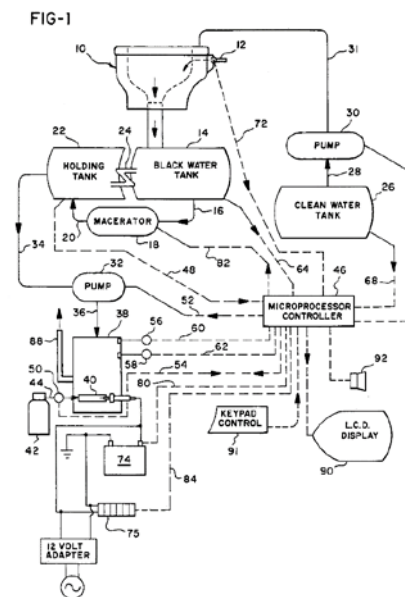
Key Takeaways

The patent has a strong emphasis on the entire system level operations and a well developed user interface to display how the system is working.

Incineration toilets are able to use sensors and gauges to control the burn of the waste.

Because of the age of the patent, the majority of citations are for recent filings.

U.S. Patent Nov. 30, 1993 Sheet 1 of 6 5,265,544



Patent Features

Processing	Processing Urine/Feces Conveyance Sanitization Collection
User Interface	Aesthetics Portability Frontend
Power	Energy Supply/Storage
Control Systems	Monitoring/Control
Separation & Ventilation	Odor Control Separation Urine/Feces
Economics	Efficiency and Cost Reliability Maintenance

2006 – Shipboard Human Waste Treatment for Removing Solids – [US 7005077](#) – 12 Cited

Samuel Brenner

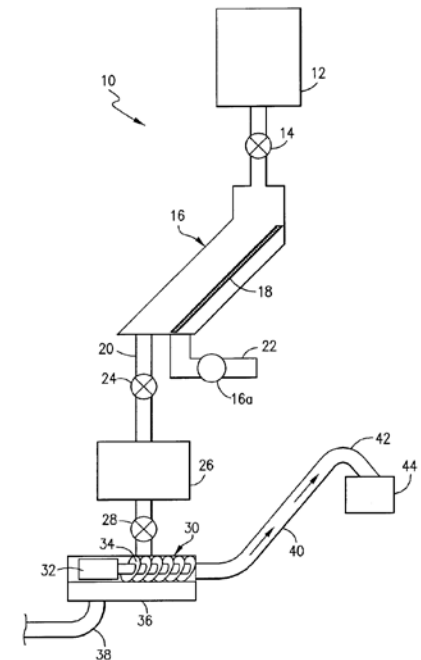
A method and system for **separating human waste solids from liquid** for a shipboard toilet system that allows for the separation of solid waste, **compaction** of the solid waste and **storage** of solid waste. Wastes are deposited into a shipboard toilet system that uses **vacuum toilets** to flush waste into a large, **inclined solid waste separation tank**. The separation tank has a **separating screen** disposed across its entire width to retain solid wastes while allowing liquid to flow through. After separation from liquids, solid waste material is compacted and dewatered with a **helical screw** through an inclined tube, and packaged for later removal as landfill or burned in the ship incinerator.

Key Takeaways

Most incineration toilets do not mention separating liquids from solids since the incinerator can treat both simultaneously by boiling off liquids and burning the solids.

This patent does mention separating urine and feces for a ship system, which is larger than an individual toilet system, but also uses incineration to treat the feces.

The majority of citations are for recent filings.



Patent Features

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2012 – Apparatus and Method for Collecting and Disposing Pet Waste by Incineration – [US 8096597](#) – 2 Cited

Oded Shoseyov and Oded Halperin

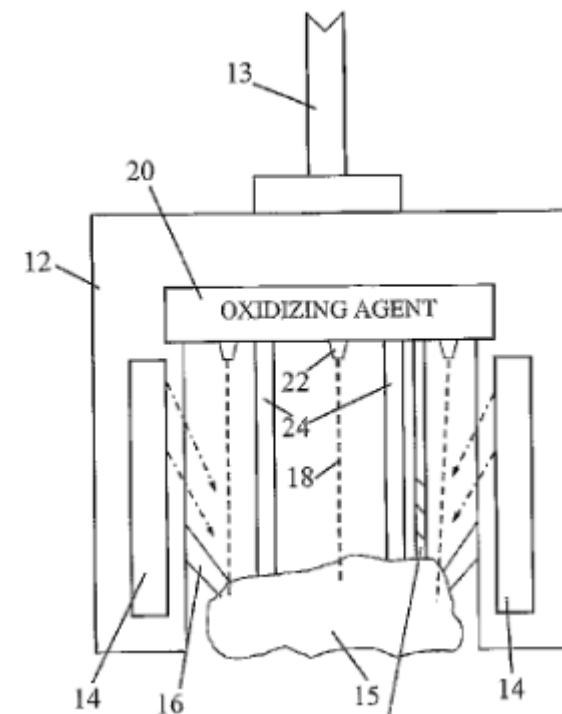
Apparatus for pet waste disposal including a **portable waste collection receptacle** disposed on a handle, characterized by a heat source mounted together with the waste collection receptacle, capable of incinerating waste disposed in the waste collection receptacle. An **oxidizing agent** (e.g., potassium permanganate) can be mixed with the waste to generate heat to the waste. This provides **efficient heat transfer** to the interior parts of the feces and water evaporation therefrom.

Key Takeaways

This technology uses chemicals to incinerate the feces rather than an external heat source, like a gas burner.

The patent is primarily for managing pet, such as dog or cat, waste. However, the technology can be applied to human waste.

The two patents that cite this technology are from the same owners. This technology is relatively new and is an outlier relative to the majority of incinerator toilet systems.



Patent Features

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2013 – Incinerating Commode – [US 8533873](#) – 1 Cited

James Ira West Jr.

An improved incinerating commode for the disposal of human waste through **injection of a combustible or cleaning fluid** into the chamber where the waste is incinerated, **separation** of the urine component from the fecal component of human waste, the use of **one or more burners**, the use of a **baffle to increase heat** and create **turbulent flow**, and use of the urine component mixed with a cleaning fluid to steam clean and cool the chamber that incinerates the waste. **Cyclic rate** is improved by the introduction of a **water cooling jacket** around the combustion chamber to decrease both cooling and pre-heating times for the combustion chamber. Waste is directed into the combustion chamber using a splash plate.

Key Takeaways

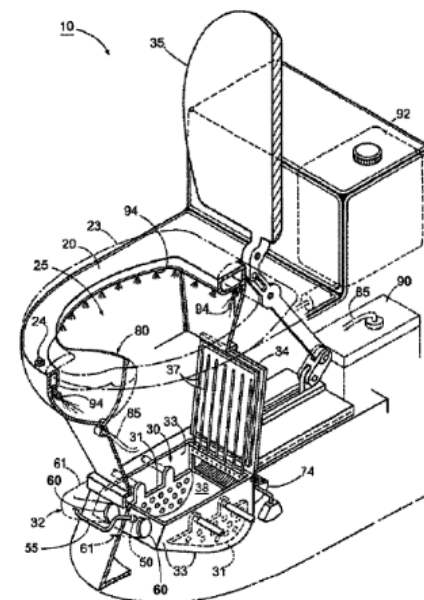
This patent is for a complete treatment system that primarily improves:

cycle time, the time required to heat and then cool the toilet, with a water cooling jacket;

heat required for incineration with a baffle for a more efficient burn;

and cleaning the bowl with a cleaning or combustible fluid.

The inventor has 6 other incineration toilet patents.



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