Jets™ Sanitary Systems – a smarter, greentech solution for any building

JETS™

Sanitary Systems
– made to please

Jets™ has conquered half of the world market for ships

Now, the time has come for new solutions for buildings!

In an idyllic Norwegian landscape, the Rica Havna Hotel has relied on environment-friendly vacuum toilets for 30 years.

Jets flexibility made it possible to install vacuum toilets in this São Paulo complex although they were not included in the original design.

With São Paulo's high water cost, the payback period for this Jets installation at the university of Uninove was only 15 months.

Low sewage volumes from Jets toilets simplify the process of isolating radioactive sewage from hospitals until it is safe.

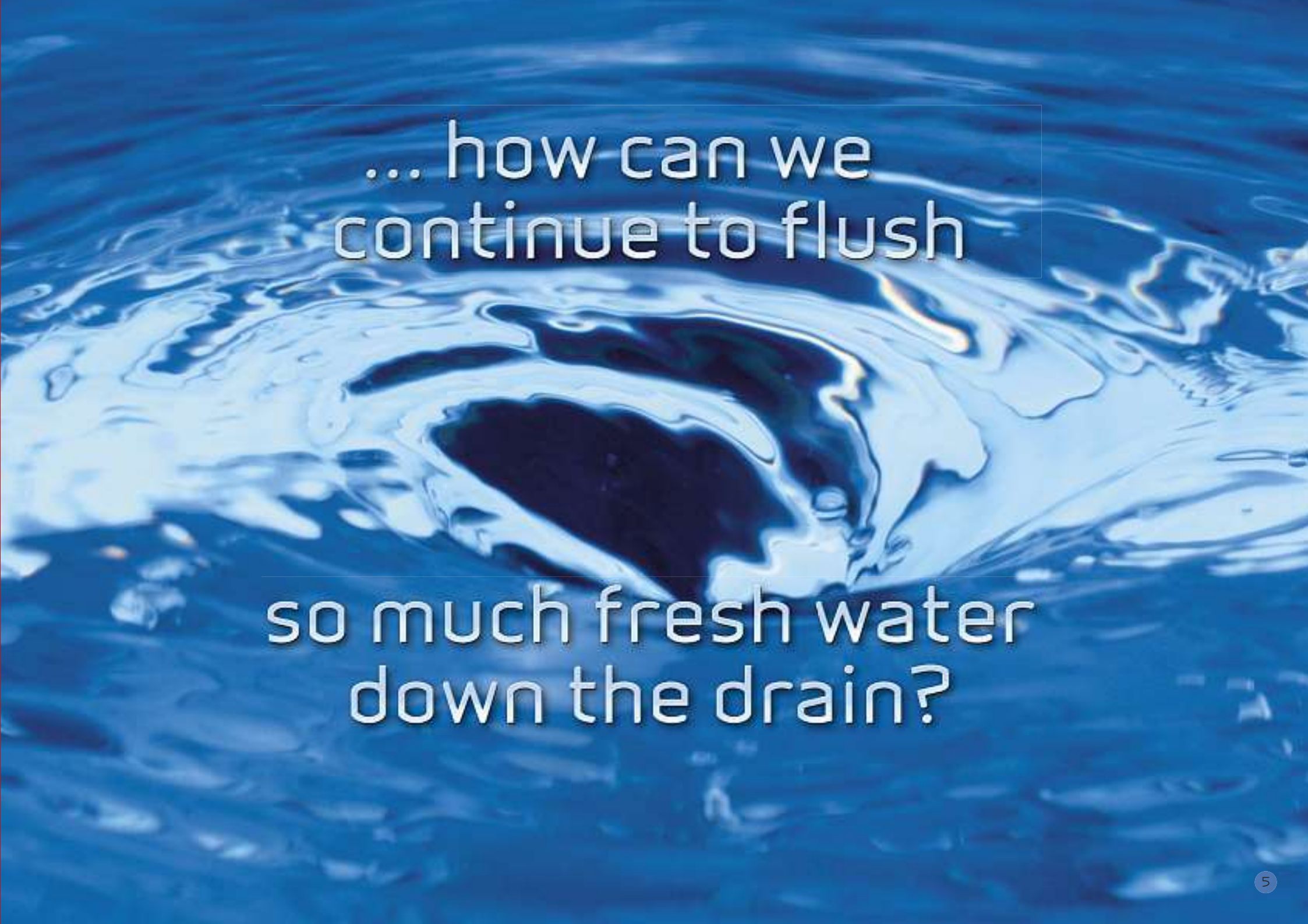
Vacuum systems make it possible to pump sewage upward in challenging locations.

In prisons, Jets vacuum systems prevent exchange of messages and contraband.

The Norwegian University of Life Sciences modernized a 1979 building with vacuum toilets that support biogas production.

Reducing water and sewage volumes by up to 90% simplifies sanitary installations for sports stadiums.

In a world
where fresh water
is scarce ...


... how can we
continue to flush
so much fresh water
down the drain?

Global facts

75%

of the earth's surface is water

1%

Less than one percent is precious fresh water

How do we use our fresh water?

25%
is flushed down traditional gravity toilets to transport human waste

8 litres
Traditional toilets use about 8 litres per flush

17 m^3
Traditional toilets need 17 m^3 per person to transport human waste per year

5%
Vacuum toilets reduce this to less than 5%

1 litre
Vacuum toilets use less than one litre per flush

2 m^3
Vacuum toilets need only 2 m^3 per person to transport human waste per year

Reduce water and sewage by 90%!

60 litres

A traditional gravity toilet releases an average of 60 litres of blackwater per person per day

25%

In most buildings, traditional gravity toilets account for 25% of total water consumption

Water prices are set to soar and sewerage fees will follow suit

Wasting expensive fresh water means flushing cash down the drain!

7 litres

A Jets vacuum toilet releases only about 7 litres of blackwater per person per day

5%

With a Jets vacuum sanitary system, this can be reduced to about 5% of the total

Saving water in buildings makes more sense than ever before – and in most buildings, the first fixtures to target are the toilets

Save dramatically with every flush...

Composition of sewage in a gravity system

Flushing a traditional gravity toilet uses some 8 litres of water to transport 0.2 litres of human waste

8 litres

0.2 l human waste

Water per flush	Gallons	Litres
Conventional high-flush toilets	5.00	19.0
Common low-flush toilets	3.50	13.0
Ultra-low-flush toilets	1.50	5.6
Jets vacuum toilets	0.26	1.0

WC

Time is running out for the traditional Water Toilet

Composition of sewage in a vacuum system

Air

Flushing a Jets Vacuum Toilet uses mostly air and less than 1 litre of water per flush

1 litre

0.2 l human waste

VC™

The time has come for more sustainable solutions and Vacuum Toilets

What is a Jets™ vacuum sanitary system?

A vacuum sanitary system uses air instead of precious water to transport human waste. Only a small volume of water is used to clean the bowl

The basic principle for a modern vacuum sanitary system is the use of an in-line pump to create the vacuum directly in the piping system.

When a vacuum toilet is flushed, the waste in the toilet bowl is drawn into the piping by the very air needed to transport it.

The Jets Vacuumarator™ pump then macerates the sewage using an integrated macerator, and automatically pumps it to a sewerage system of choice.

Two basic Jets™ vacuum systems

VOD™ (Vacuum On Demand):
Smaller systems with up to 4 toilets, urinals and/or grey water interface units.

CVS™ (Constant Vacuum System):
Larger systems with an unlimited number of toilets, urinals and/or greywater interface units.

Vacuum is the future of sustainable sanitary systems!

Three vacuum generating principles

Fifties and sixties solution

First generation vacuum sanitary systems were large and bulky, including an expensive vacuum tank. They required several pumps to operate satisfactorily.

One set of pumps maintained the vacuum in the system's large tank, while a second set of discharge pumps was used to empty the tank's contents.

Seventies and eighties solution

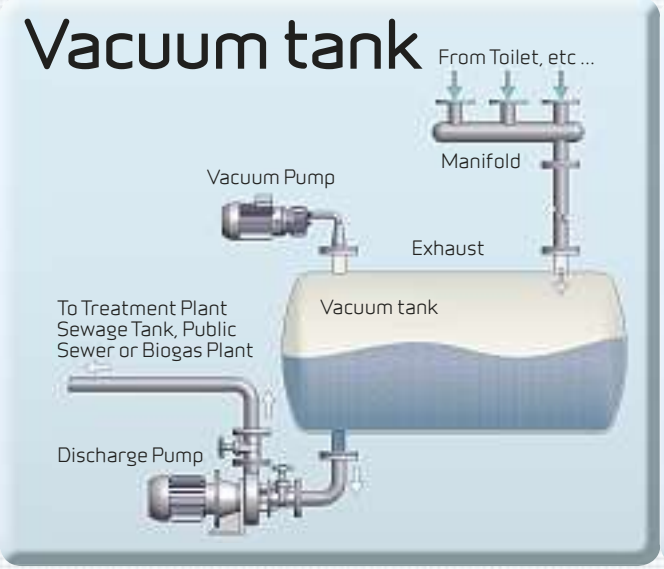
The ejector system launched in the late seventies was an improvement over the first generation. However, it was still a system of considerable size.

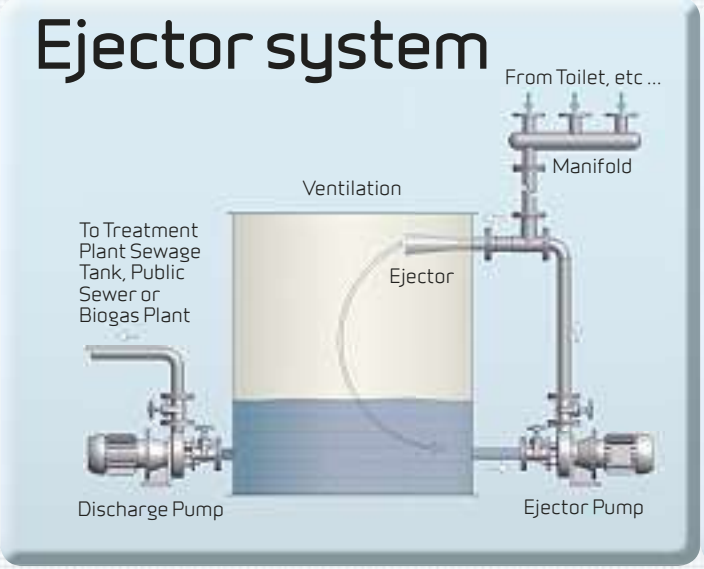
As in the first generation systems, several pumps were needed to operate an ejector system. A recirculation tank was also needed for vacuum generation, and this caused other problems such as foaming.

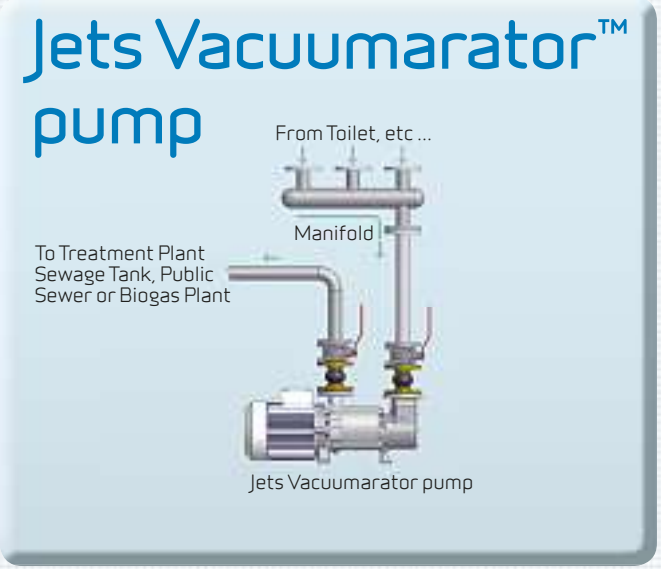
Millennium solution

The patented Jets™ Vacuumarator™ pump is the most compact, efficient and reliable vacuum generator for vacuum toilet systems.

The Vacuumarator ™ can pump directly to a sewage treatment plant, a sewage tank, a biogas plant, or the public sewer system.







Gravity toilets vs vacuum toilets

	Traditional gravity toilets	Jets VC™
Need for gravity / slope	Yes	No
Litres of water per flush	6 to 19 litres	1 litre
Sewage per year per person	13 - 41 m^3	2 m^3
Hygiene	–	+
Pipe dimensions	110-150 mm	50-75 mm
Piping cost	High	Lower
Initial investment cost	Depends on type of project	Depends on type of project
Return on investment	–	+
Installation work advantages	–	+
Installation flexibility	Low	High
Cost of outdoor infrastructure	High	Low
Transport / pumping cost water in	High	Low
Transport / pumping cost sewage out	High	Low
Sewage treatment cost	High	Low
Separation of black and grey water	Not sustainable	Sustainable solutions
Use of blackwater for biogas	Not sustainable	Sustainable solutions

How much can you save?

	Traditional WC	Jets VC™
Water required per flush	8 litres	1 litre
Toilet visits per person - per day - average	6	6
Number of persons	10,000	10,000
Operation days per year	365	365
Total use of water per year	175,000 m^3	21,900 m^3

You will save 153,300m^3 of fresh water annually

Local water price per m^3 (€2 per m^3)	306,600 Euro
Sewage disposal cost per m^3 (€1 per m^3)	153,300 Euro
Total direct savings	459,900 Euro

Indirect savings - water used for flushing toilets:

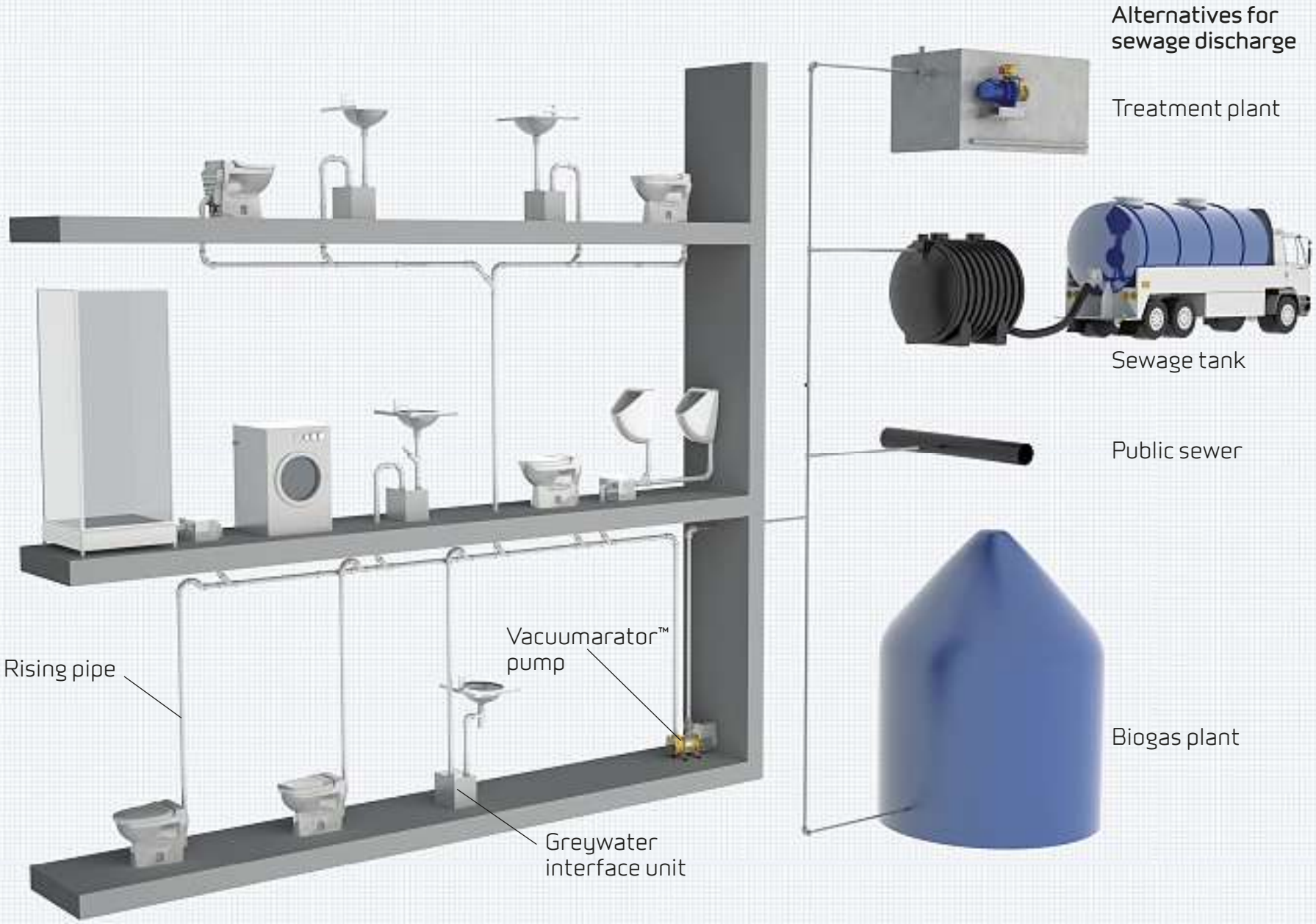
- 80-90% less transportation / pumping cost of fresh water
- 80-90% less transportation / pumping cost of sewage
- 80-90% less sewage for disposal and treatment

A bathroom exactly the way you want it ...

A Jets vacuum system fits in with any kind of bathroom – a luxurious retreat, the charm of traditional craftsmanship, or an ultra-modern design.

There's no need to compromise on any detail just because you have chosen an environment-friendly sanitary solution. On the contrary – Jets flexibility creates new opportunities for creative bathroom architecture.

A Jets™ System may consist of...



The Jets™

The robust Jets solution has proved to be highly practical for numerous applications.

In-line installation of Vacuumarator™ pumps combined with a small footprint and low weight allows unique installation flexibility and considerable weight savings compared with other systems.

FLOOR-MOUNTED VITREOUS CHINA

WALL-MOUNTED VITREOUS CHINA

STAINLESS STEEL

URINAL

SQUAT PAN

GREYWATER INTERFACE UNIT

System

Unique Vacuumarator™ pump

The patented Vacuumarator™ pumps are the most compact, efficient and reliable vacuum generator available for vacuum toilet systems

- Continuous flow with no increase in temperature will enhance any downstream treatment process
- Single-in, single-out connection allows true in-line installation – no need for extra components
- Highly efficient vacuum production enables a small motor with low energy consumption
- The helical screw and liquid seal ensure efficient vacuum production
- The integrated macerator cuts waste to a fine pulp for optimal transport

MINI: 10NT

SMALL: 15MB-D

MEDIUM: 25MBA

LARGE: 65MBA

XXL: 250NT

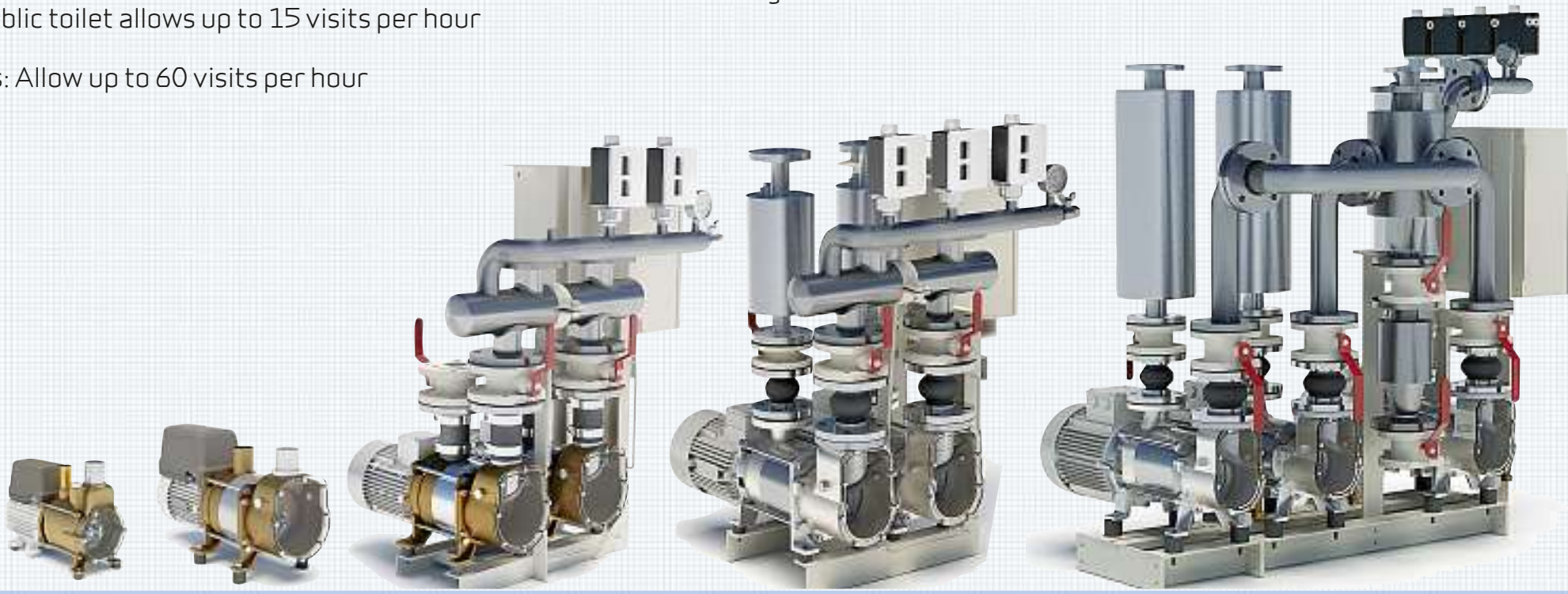
Jets™ is a practically

According to international standards:

- Toilets should have the capacity to handle peak periods when they are used by 67% of users within one hour
- The average person uses a toilet 6 times a day
- One public toilet allows up to 15 visits per hour
- Urinals: Allow up to 60 visits per hour

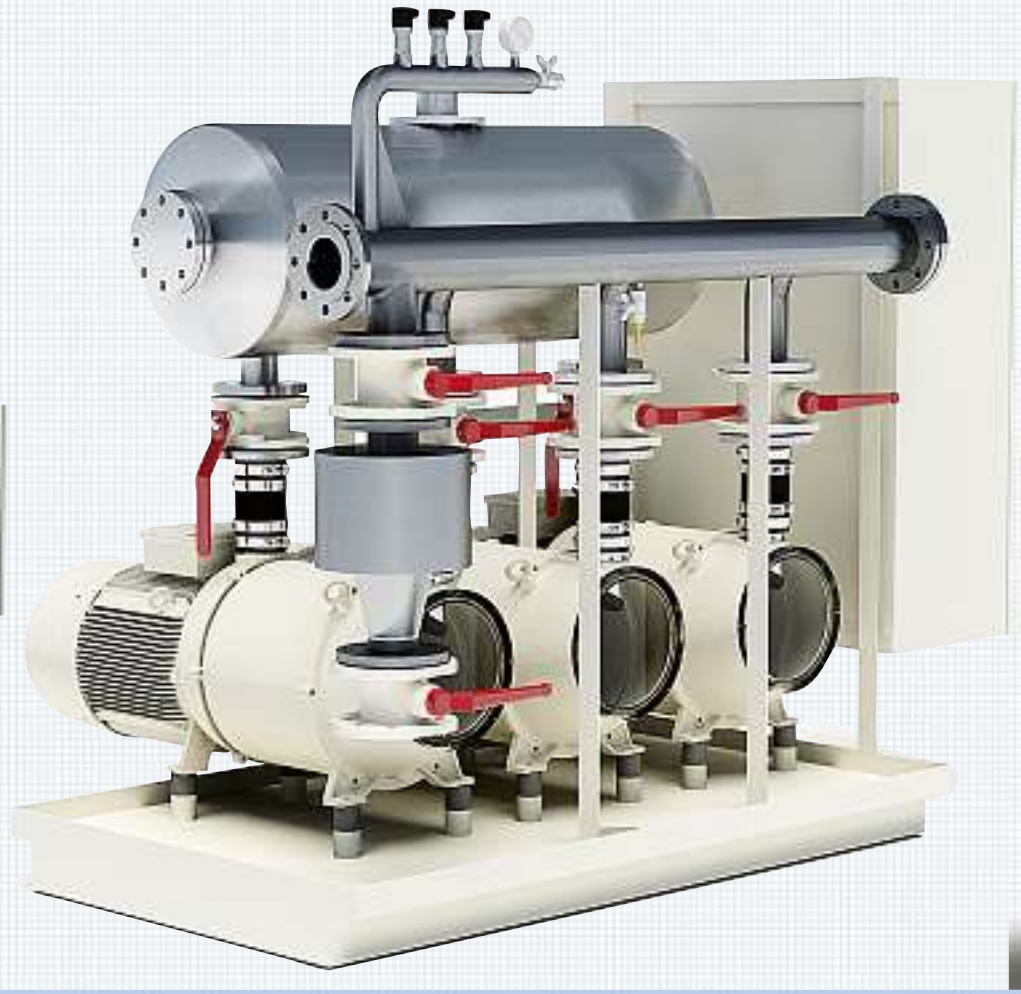
Jets solutions for buildings of any size:

- A Jets solution can be configured for any capacity and configuration
- Compact units with a small footprint are easy to install.



Type	10NT	15MB	30MB-D	50MBA	195MBA
No. of flushes per hour	100	150	300	480	1800

limitless system



750NT

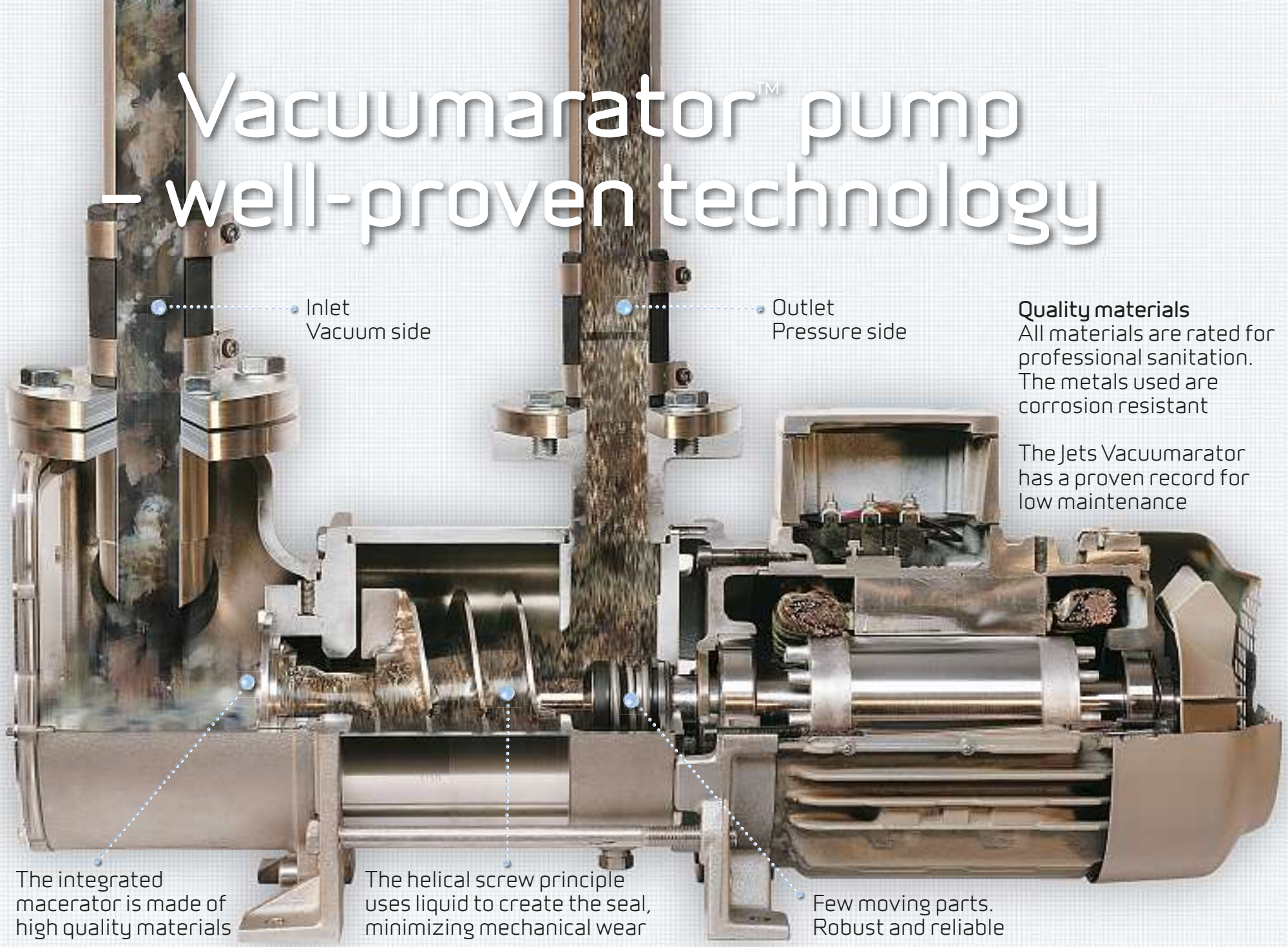
7500

Limitless

The Jets™ vacuum toilet – safe and simple construction

Jets™ – reliable solutions – easy to operate and maintain

Vacuumarator™ pump – well-proven technology



Quality materials
All materials are rated for professional sanitation. The metals used are corrosion resistant

The Jets Vacuumarator has a proven record for low maintenance

New solutions for overloaded infrastructure

Challenges	Jets™ Solution
OVERLOADED WATER AND SEWERAGE INFRASTRUCTURE: Population and industrial growth place reservoir capacity and sewerage networks under enormous strain, and it is expensive to develop new infrastructure.	**NEW POSSIBILITIES FOR PROPERTY DEVELOPMENT:** Vacuum toilets reduce the need for fresh water for flushing by up to 90%. When less water is needed, pumping and water treatment costs are also reduced.
DIFFICULT TERRAIN: Geological conditions can make excavation difficult.	**DIFFICULT TERRAIN:** Vacuum sewers can be laid in shallow trenches in flat, rocky, sandy, or swampy terrain, reducing installation and maintenance costs.
HEALTH: Overflows of sewage laden with bacteria and viruses may cause serious health hazards.	**HEALTH:** Jets sanitary systems dramatically reduce the burden on the existing sewage infrastructure, cutting the risk of overflows.
ENVIRONMENTAL IMPACT: Sewerage systems that cannot cope with growing volumes may leak sewage into drinking water.	**ENVIRONMENTAL IMPACT:** Vacuum toilets provide a cost-effective way to increase water supply and sewerage capacity. They enable greywater/blackwater separation and small local treatment plants. The concentrated sewage is a valuable resource for biogas and fertilizer production.

Costly infrastructure is needed

Cost-effective solutions for overloaded pipes or new infrastructure

Jets™ benefits authorities, consultants, developers, investors, builders, owners, operators, and users ...

Jets™ benefits

International organizations

- Global pressure to use resources responsibly
- Reuse water and reduce strain on global water supplies
- Experience and expertise in realistic solutions for sustainable sanitation

Governments

- A practical contribution to national management of water resources
- Reduce pressure on overloaded sewers
- Save water where supplies are scarce

Health authorities

- Reduce health risks of sewage overflow
- Closed systems keep vermin out
- Can isolate toxic waste
- Each flush extracts pathogens

Green buildings

- Fully commercialized technology ready to install
- Concentrated sewage can be used for valuable fertilizer and biogas
- Green solutions for buildings from cabins to skyscrapers

... creating opportunities for all players in property! Open up and see the complete picture ...

for authorities

Local authorities

- Cut water for flushing toilets by up to 90%
- Extend the life of existing infrastructure
- Reduce blackwater by up to 90%
- Enable greywater/blackwater separation
- Lessen the load on septic systems in rural areas
- Enable small sewerage systems independent of central networks

Environment

- Less water and sewage to treat and transport - save energy and money
- Sewage solutions for wetlands and environmentally sensitive areas
- New opportunities in sustainable tourism

Green organizations

- Save water and turn sewage into fertilizer and biogas
- Enable separation of blackwater and greywater
- Combine user comfort with low environmental impact

Jets™ benefits consultants

Research institutes

- The vacuum principle provides a working platform for new solutions in sustainable sanitation
- Jets technology for blackwater separation supports biogas production
- Recover useful fertilizer ingredients from sewage
- Potential for sustainable eco-systems

Urban planners

- Less fresh water to disinfect and pump
- Small-diameter pipes have less impact on infrastructure
- Self-contained sewage treatment independent of central systems
- Increase capacity of existing systems
- Extend the life of septic systems in rural areas

Architects

- Freedom to position toilets and bathrooms without gravity limitations
- Low-impact installation in retrofits and historic buildings
- Small-diameter pipes allow streamlined solutions
- Route pipes around obstacles - even pump sewage upward
- Faster installation - less disturbance to tenants
- Scope for green credits
- Practical green opportunities for your innovation and expertise

Technical consultants

- Less concrete drilling
- Route pipes around obstacles
- Less conflict with wiring and ventilation
- Connect pipes to any sewage infrastructure
- Solutions for prisons, radioactive sewage, temporary facilities and supermarket freezer drainage
- Can be combined with electronic sensors for automatic flushing
- Less underground piping is needed
- Draw on Jets' expertise and experience

Owners, operators and users

Owners

- Vacuum toilets save costs over the lifetime of the building
- With skyrocketing utility charges, reducing water and sewage by up to 90% saves money
- Jets systems reduce installation costs for challenging retrofits
- The powerful pump and robust system mean that Jets systems will keep functioning reliably for many years

Operators

- Protect yourself from rising water and sewerage charges
- Turn a basement or storeroom into valuable space
- Cut installation time/ costs
- Simplify retrofits
- Low-impact installation: less disturbance to tenants
- Robust system with proven reliability
- Electricity consumption is extremely low
- Can be combined with electronic sensors for automatic flushing

Users

- At last – an environment-friendly toilet that's a pleasure to use
- Appreciate the comfort of a flushing toilet used on luxury cruise ships and yachts worldwide
- The vacuum extracts odours and bacteria for the highest level of hygiene
- Reduce water costs and sewerage charges

Developers and builders

Developers of new property

- Smart green solutions that work in practice
- Faster installation
- Potential for decentralized sewerage systems
- Less invasive infrastructure development
- Easy to comply with environmental regulations
- Save materials and installation costs

Renovating / rehabilitation companies

- Faster installation with more flexible schedule
- Less core drilling and floor penetration
- Easier retrofits
- Less disturbance to tenants
- Opportunities for using wasted space
- Modern sanitary solutions for old buildings
- Save materials and installation costs
- Pipes can be routed around obstacles and hidden in walls
- Pump sewage upwards

Plumbers and contractors

- Small pipe diameter for rapid installation
- Flexible installation schedule
- Less conflict with electrical wiring and ventilation
- Less concrete drilling
- Easier to route pipes around obstacles
- No slope needed for pipes
- Cut retrofit costs
- Less disturbance for tenants
- Enormous scope for expertise in vacuum systems

Water utilities

- Sustainable water management
- Same infrastructure can handle higher capacities
- Reduce the strain on the water supply systems
- Get the most value for your investment in water

Sewage utilities

- Get more out of existing infrastructure
- Decentralized sewage solutions
- Reduce overflow risks
- Concentrated sewage suitable for biogas and fertilizer
- Enable greywater/ blackwater separation
- Increase the capacity of septic systems

Investors and entrepreneurs

Investors

- Promising investment potential as awareness of water scarcity grows
- An opportunity for far- sighted investors – there is no substitute for water
- Ideal for funds with environmental profile
- New opportunities in sustainable tourism

Entrepreneurs seeking new business opportunities

- Potential for green profile
- Opportunities for sustainable tourism
- Water management will be the "next big thing"
- Possibilities for greywater/blackwater separation
- Extend the life of septic systems in rural areas

Innovative companies

- Be a step ahead in applying practical technology to save water
- Freedom and flexibility never before possible in sanitary systems
- Combine comfort with an environmentally responsible profile
- Opportunities for converting sewage into biogas and fertilizer

Jets™ toilets save USD 165,000 every year for this business complex in São Paulo

The Torre São Paulo is a 28-storey office block of 86,184 square metres.

The building was not originally designed for vacuum toilets when construction started.

After the project had been on hold for some time, the new owner saw the advantages of a Jets installation.

The system, with 412 toilets, was delivered in December 2007. And further vacuum toilet installations are planned.

Challenges	Jets™ Solution
WATER SUPPLY: Although Brazil has the largest reserve of fresh water on Earth, São Paulo is facing a water crisis due to wastage and contamination.	**WATER SUPPLY:** The Jets vacuum system reduced water use by up to 90% of what gravity toilets would need. With São Paulo's soaring water prices, that meant a payback period of less than two years and substantial savings every year after that.
SEWAGE: The costs of treating sewage have risen in line with water prices.	**SEWAGE:** Sewerage costs were also reduced by up to 90%, saving running costs for the building complex every day.
SEWER CONNECTION: The closest point for the sewer connection was already working at full capacity. The nearest possibility was 200 metres away.	**SEWER CONNECTION:** The pumping power already available in the Jets system made it possible to pump the sewage to the connection point further away. A gravity system would have required an additional pump.
INFRASTRUCTURE: The vast population of the megacity has placed its infrastructure under strain.	**INFRASTRUCTURE:** Jets solutions create new opportunities for property development in areas with overloaded water and sewerage systems.
BUILDING DESIGN: The building had not originally been designed for vacuum toilets.	**BUILDING DESIGN:** The small-diameter pipes needed for the Jets system made it possible to install vacuum toilets in a later construction phase. The flexible piping will also make it easier to change the layout to suit the different needs of new tenants in the future.
High costs	**Lower total costs**

In São Paulo, Brazil, water is scarce and expensive. In 2007 this university installed a Jets system which paid for itself in 15 months

Challenges

WATER SUPPLY: High bills for water were a burden on the university.

SEWAGE: With so many users, the volume of sewage and the associated costs were substantial.

CLOGGING: Clogging and vandalism had been a problem with the previous toilets, where a blockage could put a whole group of toilets out of action.

22,000 STUDENTS: With traditional gravity toilets -
60,000 toilet flushes per day
420,000 litres of water per day

Daily water cost
USD 1800

Jets™ Solution

WATER SUPPLY: With less than 1 litre per flush, Jets toilets reduced water consumption for flushing from 420,000 litres to about 60,000 litres every day.

SEWAGE: Volumes were cut by up to 90%, dramatically reducing the load on the sewerage systems and cutting costs accordingly.

GREATER RELIABILITY: Students appreciated the new Jets toilets, and there were far fewer problems with blocked toilets. If one toilet did get blocked, it was an isolated problem which did not affect the other toilets.

22,000 STUDENTS: With Jets vacuum toilets -
60,000 toilet flushes per day
Only 60,000 litres of water per day

Daily water cost
USD 320

Jets™ building features in the Uninove university project

At Uninove's Campus "Barra Funda", one central 195MB Vacuumarator™ collects sewage from half of the building (360 toilets). Another 195MB Vacuumarator™ is connected with the first to serve the other 360 toilets. The water supply is connected to the reservoir, which collects rainwater.

The vacuum system makes it possible to transport sewage upwards.

Jets™ breakthrough in Brazil


"Our first major breakthrough in Brazil - the Uninove university in São Paulo."


"With Brazil's high charges for water and sewerage, the payback period for installations completed so far has been about 15 months."

Interview with Marco Cerulli, Tavola engenharia – Jets distributor in Brazil


"Our second breakthrough in Brazil - the Torre São Paulo office block."

"Green buildings – my niche"

"I had seen traditional vacuum systems for toilets before. As an engineer, I was sceptical. But when I saw the Jets solution, I understood straight away that this was a much, much better design. With a small, powerful Vacuumarator™ pump and no need for a vacuum tank, it was easy to use and maintain.

I was looking for an opportunity in technology projects that would enable me to compete with larger players. Green buildings created a niche for me. Jets vacuum toilets became an important part of my portfolio.

As a trial, Tavola installed 5 toilets at Incor, the Heart Institute at the University Hospital of São Paulo. During each of the two installation phases, half of the emergency room closed down for the installation. The other half continued functioning normally.

"They all liked how easy the system was to run"

The clients loved the vacuum system. The patients liked the idea of green technology and the hospital was very pleased with how easy the system was to run.

"Only this?"

If I take people to see the Vacuumarator™ pump, I have to ask the maintenance staff to clean the technical room first, because they hardly ever have to go in there otherwise and it might get a bit dusty. When my guests ask where the whole vacuum installation is, I say: "You're looking at it."

"What?" they say, "only this?" They can't believe it's so compact.

The next installation was at the university of Uninove in São Paulo. The complete project involves 720 toilets in the Barra Funda buildings and 680 on the Santo Amaro campus.

Another major installation was the WTorre office block with 426 toilets. A great advantage of Jets systems is the flexibility that they enable in the floor layout.

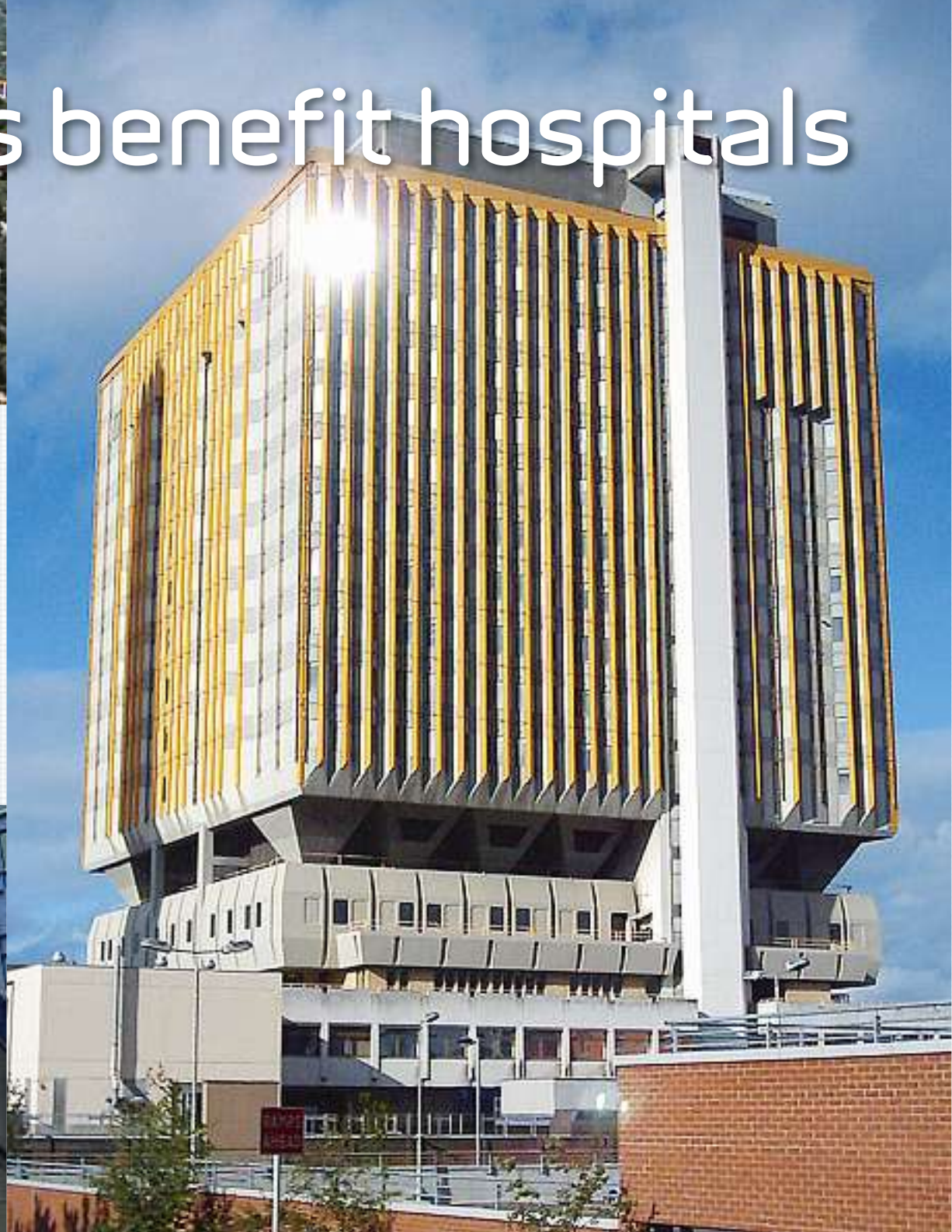
Today, there is a whole new awareness of the potential of vacuum toilets for saving water in Brazil. And with Brazil's high charges for water and sewerage, the payback period for the installations completed so far has been about 15 months."

Vacuum toilets benefit hospitals

Vacuum sanitary systems can be installed without closing down hospital sections. With small-diameter vacuum pipes, there is much less need for core drilling and the resulting noise and dust. This hospital in France, Les Cadrans Solaires, has 138 vacuum toilets. These were installed during renovation of the building with very little impact on the normal hospital functions. The system has functioned reliably since it started operating in 1993.

At the Belfast City Hospital, renowned for its work in cancer diagnosis, treatment, and research, Jets sanitary systems provide a practical and effective solution for storing radioactive sewage until the radioactivity has been reduced to a safe level. The low volume of sewage from vacuum toilets simplifies this process. Greater hygiene with less risk of aerosol contamination from flushing toilets is another important factor.

In a pilot project, five vacuum toilets were installed at Incor, the Heart Institute at the University Hospital of São Paulo, one of the world's leading cardiology institutions. The installation was completed in two stages. During each stage, half of the emergency room was closed down for the installation – the other half continued functioning normally.



Challenges	Jets™ Solution
ISOLATION OF SEWAGE: Sewage contaminated by radioactive isotopes poses a risk to the environment.	**ISOLATION OF SEWAGE:** Jets sanitary solutions make it possible to install a sealed system for isolating radioactive sewage until the radioactivity has been reduced to a safe level. The low volume of sewage from a vacuum sanitary system simplifies this process.
HYGIENE: Hospital-acquired infections are a growing concern.	**HYGIENE:** A Jets toilet draws air and pathogens into the vacuum system with every flush. Practically no aerosols are released into the room.
RENOVATIONS: May disturb patients and make it necessary to close sections of the hospital.	**RENOVATIONS:** Vacuum sanitary systems with small diameter pipes can be installed in existing facilities with much less downtime and disturbance to patients than gravity systems involve. There is less need for floor and ceiling penetration, with the resulting dust produced by concrete drilling. Sewage can even be pumped upwards for up to 4 meters.

Hospitals need better sanitary systems

Vacuum toilets offer new solutions for sewage isolation and hygiene

The Norwegian University of Life Sciences (UMB) – focusing on sustainability – chooses Jets™ Solutions

Vision: closing the loop

The Norwegian University of Life Sciences and Jets™ both require an innovative sanitation system for collecting and recycling waste-water and organic household wastes in order to reuse water, energy and nutrients.

Challenges

Jets™ Solution

SEWAGE IS A RISK IN INLAND WATERS: Sewage washes out nutrients that cause harmful accumulation in inland waters. Bacteria feeding on decomposing sewage steal dissolved oxygen from the water, which can suffocate other aquatic life.

SEWAGE IS A RESOURCE: Greywater (from sinks, showers and washing machines) and blackwater (from toilets) go to separate outlets. This creates possibilities for water saving and reuse, and production of organic fertilizer and renewable energy (biogas) from blackwater. This is the aim behind the sanitation system at Sørhellinga Building and student apartments at the Norwegian University of Life Sciences (UMB). They are equipped with a Jets vacuum toilet system and biological purification of greywater.

FOSSIL FUELS: Diluted blackwater from gravity toilets is difficult to convert into biogas as an alternative to fossil fuels.

RENEWABLE ENERGY: Concentrated blackwater from vacuum toilets is a resource for renewable energy (biogas).

WORLD PHOSPHATE SHORTAGE: Exploding growth in food production could cause a shortage of phosphate, which is essential to agriculture. There is no substitute for phosphate, and energy is needed to produce it.

RECOVERY OF NUTRIENTS: Vacuum toilets make it possible to recover valuable nutrients from blackwater so that it can be used as organic fertilizer in the field of agriculture.

FRESH WATER IS USED TO FLUSH TOILETS: Energy used to purify and pump fresh water is wasted when the water is used to flush toilets.

LESS ENERGY AND CO_2 EMISSIONS: A source separating outlet, vacuum toilets, and low-energy greywater purification reduce the energy needed for water pumping and sewage treatment. This also reduces CO_2 emissions.

RENOVATION OF OLD BUILDINGS: Renewal of existing buildings creates opportunities for more sustainable solutions.

SØRHELLINGA – AN OPPORTUNITY REALIZED: The university's Sørhellinga Building, built in 1979, has been modernized with environment-friendly technology including vacuum toilets, a source separating outlet for grey- and blackwater, and a separate water supply for flushing toilets. The biological purification of greywater has been developed by the university and Jets through the company Ecomotive™.

New solutions needed

Sustainable solutions implemented in practice

Reliable Jets™ operation in Swedish prisons since 1993

In 1993, Jets vacuum toilets were installed in cells for awaiting-trial prisoners in Uddevalla, western Sweden.

A sanitary system that cannot be used as a "cell phone"

At the police station in Huddinge, part of the Stockholm urban area in Sweden, Jets vacuum toilets have been installed in detention cells.

Challenges	Jets™ Solution
SECURITY: Plumbing for traditional gravity toilets in prisons can be used to send contraband or messages.	**SECURITY:** The Jets vacuum system prevents the exchange of objects or use of the plumbing as a "cell phone". Prison staff who are planning to search cells can shut off the vacuum pumps first, so that illegal objects cannot be flushed away.
WATER CONSUMPTION: Gravity toilets in prisons need large volumes of water.	**WATER SAVINGS:** Water consumption can be reduced to a fraction of the amount needed for gravity toilets. Jets systems can be combined with electronic flush controls to prevent unnecessary flushing. The costs of wastewater treatment are also lower.
CLOGGING: Blockages – sometimes caused by objects flushed down the toilet deliberately – can present a major problem in prison toilets.	**RELIABLE OPERATION:** The vacuum system keeps the wastewater moving swiftly through the system, reducing the build-up of waste and blockages. Foreign objects can be trapped before they get to the pump. The Vacuumarator™ pump grinds solids to prevent clogging. Each cell toilet can be monitored so that if blockages do occur, it is easy to track down the source. The vacuum system also solves the problem of foreign objects that end up in municipal wastewater networks.
INSTALLATION AND UPGRADE COSTS: Installation and renovation of plumbing systems may be complicated and expensive.	**LOWER INSTALLATION COSTS AND SIMPLER UPGRADES:** The small footprint of the system, simpler logistics, less need for core drilling and sewerage trenching help to reduce installation costs. And the piping can be installed at a later stage than gravity piping, enabling a more flexible construction schedule. Small-diameter vacuum piping can be routed upward and around obstacles, reducing the need for penetration of concrete floor slabs. Toilets can be installed on any floor – even in basements.
HYGIENE: Unhygienic toilets may be a health risk in prison communities.	**MORE HYGIENIC:** The powerful vacuum draws the waste along with 60 litres of air into the piping with every flush, reducing aerosols and odours.
TEMPORARY FACILITIES: Gravity toilets may be difficult to install in temporary facilities	**CAN BE USED IN TEMPORARY FACILITIES:** The flexible design possibilities and small footprint of a Jets vacuum system, along with the reduced need for underground plumbing, make it an effective solution for temporary and mobile prison facilities.

When 60,000 fans visit toilets within a few minutes you need enormous water and sewage capacity!

Unless you install a vacuum sanitary system

Challenges	Jets™ Solution
FIFA RECOMMENDATIONS: There should be at least 20 toilets for each 1000 women, and 15 toilets and/or urinals for each 1000 men, with a higher ratio in VIP areas. The infrastructure required to achieve this may be difficult to provide.	**FIFA RECOMMENDATIONS:** Jets vacuum systems can meet the recommended specifications and cope with high flushing rates in short periods, proven for decades on the world's largest cruise liners. The small footprint of the system, simpler logistics, less need for core drilling and sewerage trenching make it easier to install vacuum toilets. Small-diameter vacuum piping can be routed upward and around obstacles.
WATER CONSUMPTION: Gravity toilets for stadiums need large volumes of water.	**WATER SAVINGS:** Water consumption can be reduced by up to 90% compared with gravity toilets.
SEWERAGE: The volume of sewage from the stadium may overload the existing infrastructure.	**SEWERAGE:** Vacuum toilets reduce sewage volumes by up to 90%, reducing the load on the existing public network.
DIFFICULT TERRAIN: Geological conditions at stadiums can make excavation difficult.	**DIFFICULT TERRAIN:** Vacuum piping can be laid in shallow trenches in flat, rocky, sandy, or swampy terrain, reducing installation and maintenance costs. The built-in vacuum can also be used to pump sewage to the nearest connection point.
HYGIENE: Inadequate, unhygienic and dirty toilets may be a health risk and encourage anti-social behaviour.	**MORE HYGIENIC:** The powerful vacuum draws the waste along with more than 60 litres of air into the piping with every flush, reducing aerosols and odours. Spectators respect clean and efficient toilet facilities.

Costly infrastructure is needed

Cost-effective solutions for stadiums

Jets™ systems add sanitary benefits to food processing plants

The ultimate in hygiene is essential at this Marine Harvest salmon processing plant in Herøy, Norway — one of the largest in the world. Jets vacuum toilets make it possible to keep the sanitary systems completely separate from the production area.

Challenges	Jets™ Solution
FOOD SAFETY: Consumers and authorities set high standards for food safety. It is vital to pay the utmost attention to hygienic food production. One recall of products or a stop in production because of contaminated food due to poor hygiene can spell disaster for a food producer and its reputation.	**EXTREME HYGIENE:** The flexibility of the Jets vacuum system makes it easy to keep sewage in a closed system separate from the production area, contributing to the highest standards of cleanliness and hygiene.
TOILET FLUSHING MAY SPREAD GERMS: Gravity toilets may spread germs and odours with every flush.	**CLEANER FLUSHING:** The powerful vacuum draws the waste along with 60 litres of air into the piping with every flush, reducing aerosols and odours to an absolute minimum.
LACK OF INFRASTRUCTURE: Processing plants may be some distance from municipal sewer connections.	**PUMP SEWAGE TO NEAREST CONNECTION:** The built-in pumping power in the Jets system can be used to pump sewage several hundred metres to the nearest connection point. No extra pump is needed for this process. And with 90% less sewage, the load on the infrastructure is far less.
FACTORY UPGRADE COSTS: The need for continuous renewal and upgrades of the production facilities involves high costs.	**SAVE UPGRADE COSTS:** The flexibility and adaptability of the Jets vacuum system save costs when production facilities are upgraded. It is easy to position sanitary facilities wherever they fit in best in the building.
DIFFICULT TERRAIN: The land around processing plants may be rocky or difficult to excavate.	**SHALLOW TRENCHES:** Less excavation is needed for vacuum piping.
REGULATIONS FOR FACTORY DESIGN: Stricter regulations from the authorities may require changes in factory sluices and plumbing installations. This can be difficult to achieve with gravity sanitary systems.	**REGULATIONS FOR FACTORY DESIGN:** Replacing gravity toilets with vacuum technology during renovations makes it easier to update the factory layout for compliance with new regulations that may be introduced in the future.

More than 30 years of reliably functioning vacuum toilets

In the idyllic Norwegian setting of Tjøme in Vestfold, the Rica Havna Hotel had relied on vacuum toilets for 30 years. The time had come to upgrade the system to make the most of the efficient functionality available today.

A Jets unit with two Vacuumarator™ pumps was installed as a new "heart" in the existing system. The compact and reliable new solution saves energy and is easy to maintain.

Henning Ottersen,
Technical Manager

In this magnificent landscape, guests expect the hotel to show the utmost respect for the environment.

With lower water consumption and sewage volumes, the system minimizes the impact on its surroundings.

"In unspoilt fjords and valleys greentech solutions make sense – smarter ways to build are the bonus!"

"When you look out over the Ørsta fjord and the Sunnmøre Alps, you understand: the environment is at the heart and soul of this hotel. Our guests expect us to take the best possible care of it.

The small-diameter vacuum piping was a great advantage during the renovations. It reduced our installation costs because we did not need to do so much core drilling or to hack up existing floors, and we needed less ceiling height.

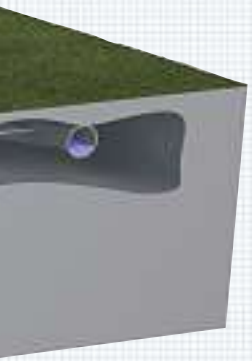
What's more, we did not need to close the hotel during the building period.
The vacuum system cuts our water consumption and sewage output by 80-90%, reducing our operating costs.
And the sewage – both blackwater and greywater – is a resource with the potential for renewable energy.
To survive in this competitive market, we must listen and live up to our customers' expectations regarding environmental issues. Choosing the greenest possible alternative gives us a competitive edge."

New opportunities in both new bu

ildings and rehabilitation projects

Simple installation, not dependent on slope. Easy to route around ventilation ducts and other obstacles

Only 3 points for core drilling. Savings compared with core drilling of 17 holes for ordinary wastewater pipes.



No need for submersible sewage pump

Case 1 - Making the most of a basement

CHALLENGE: An insurance company needed extra space. To make the most of the basement, the company wanted to install two toilets there. But the basement was below the municipal sewer line.

JETS SOLUTION: The vacuum system enabled sewage to be pumped up to the municipal sewer. No need for new piping or concrete drilling in the upper floors. Above ground, the staff could carry on working as usual without downtime.
The compact Vacuumarator needed less than a square metre of space, so it was easy to fit into an existing storeroom.

Case 2 - Don't disturb tenants below

CHALLENGE: An apartment owner wanted to install a new bathroom in the building without disturbing the existing tenants who were living below, or putting a soil pipe through their ceiling.

JETS SOLUTION: A Jets system was installed, with the vacuum pipe leading up to the ceiling and into the existing soil pipe. The people living below were unaffected.

Case 3 - No concrete drilling for the dentist

CHALLENGE: The offices for the county dentist were above a supermarket. The dentist needed two toilets in the waiting room as well as a washbasin and mouth-rinse facility in the surgery. Installing a gravity toilet would have involved drilling through the concrete floor slab, not to mention placing a soil pipe over the vegetable counter of the supermarket below.

JETS SOLUTION: Instead of core drilling, a Jets vacuum system was installed. The Vacuumarator was placed in the loft together with the air compressors needed for the dental equipment.

Case 4 - Defying gravity

CHALLENGE: A house situated below the municipal sewer line and close to a protected lake with 250 species of nesting birds.

JETS SOLUTION: A Jets vacuum system was installed with two toilets, a shower and kitchen plumbing in the main house. A self-contained basement unit had a shower, toilet, washbasin and kitchen. A gravity solution would have required a large tank and pump station, and would have been more expensive to install. The sewerage pipe had to be dug beneath the road, so the small dimensions and small sewage volume were a major advantage. The result: a complete sanitary solution, fully compliant with municipal regulations.

Jets™ Sanitary Systems – made to please


Jets for All Kinds of Buildings

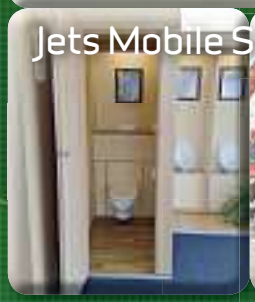

Jets in Trains

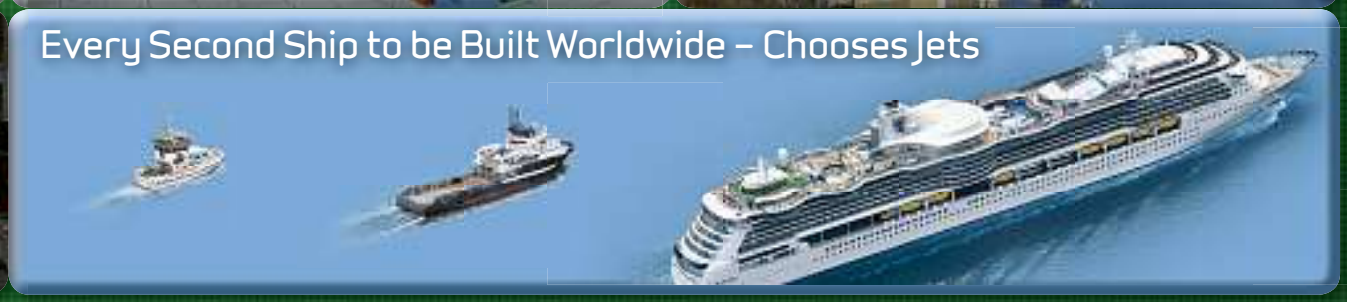

Jets in Buses and Coaches


Jets for Leisure Areas


Jets in Supermarkets


Jets for Cabins


Jets Mobile Solutions


Every Second Ship to be Built Worldwide – Chooses Jets

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– solutions that make sense for a new century

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Parts of the JETS™ sanitary systems (including, but not limited to, VACUUMARATOR™ pump technology) are patent protected by JETS AS
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