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VOUS PROPOSE
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Désalinisation

Water Desalination



Welcome to Double-Cone Technology (DCT)

DCT has created an enabling technology for industrial applications that require efficient and robust conversion of volume and pressure.

Technology

DCT has developed a new generation of patented pressure-amplifying technology, based on the patented DCT Pressure Amplifier. DCT has developed hydraulic pumps with reduced complexity and maintenance over conventional high-pressure pumps. How it works...

DCT's pressure-amplifying technology permits the use of novel circuitry that has led to patented separation and purification techniques and equipment. The maintenance-free, pulse-free Pressure Amplifier contains no moving parts or electrics, and allows systems to be modularised and simplified.

Products & Services

DCT has eight years of experience in developing industrial-scale product prototypes. Practical proof of utility has been carried out in partnership with companies involved in the open cast mining and groundwater pumping sectors, and also with membrane manufacturers and water companies.

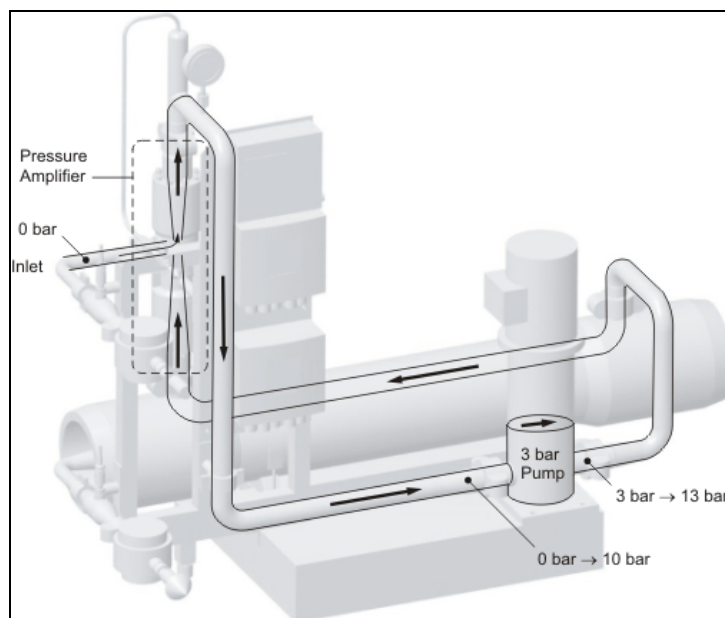
DCT's technology significantly reduces capital expenditure and maintenance costs, and DCT can tailor it to your requirements.

Applications

- Water well pumps
- Water desalination
- Water demineralisation

A self-pressurising circuit powered by a low-pressure circulating pump

DCT's technology is based on a relatively simple self-pressurising circuit; a low-pressure pump circulates liquid in a closed loop containing a Pressure Amplifier Unit.



The diagram above shows the loop in a demineraliser. Work is put into the circuit by the circulating pump as it overcomes the pressure drop over the Pressure Amplifier. The Pressure Amplifier, in turn, takes its energy from the flow of the liquid in order to draw in gas or liquid from ambient pressure. This intake of liquid or gas pressurises the circuit, and the Pressure Amplifier is designed to continue drawing in liquid or gas against an increasing circuit pressure. The diagram above shows example pressures for a demineraliser, where the low-pressure pump continues to provide a 3 bar pressure drop as the circuit pressurises itself to 10 bar.

The circuit must be designed to stabilise at a certain pressure or else the circuit would explode; Pressure Amplifiers have been shown to create pressures well in excess of 1000 bar. Often the chosen operating or stabilising pressure requires the pump to be fitted into a high-pressure housing.

The high-pressure high-volume flow in the loop can be used in many ways, and in the case of a demineraliser it is used two-fold: the high flow rate flushes the filter out, and the high pressure provides the pressure required to filter the liquid. There are two outlets, one to feed the filter and one to release brine from the circuit.

Pressure Amplifiers are therefore circuit components with three connections which convert flow rates and pressures, and can be combined in many interesting ways to create new applications.

Benefits of DCT's Pressure Amplification Technology

The benefits...	...of an elegant technology...	...with enhanced reliability
Safe	Liquid driven	<ul style="list-style-type: none"> • No electric cables • No sparks
Easy to maintain	Static	<ul style="list-style-type: none"> • No moving parts • No electronic controls
Versatile	Constant flow	<ul style="list-style-type: none"> • No disruptive pulse
Robust	Phase tolerant	<ul style="list-style-type: none"> • No gas pockets
Compact	Modular	<ul style="list-style-type: none"> • No multi-engineering
Environmentally friendly	Thermo-neutral	<ul style="list-style-type: none"> • No energy dissipation

Pressure Amplification Technology Enables New Processes

The initial fundamental research has effectively been converted into a new technology that both introduces new solutions for existing processes and offers solutions to certain previously unsolved problems.

Central to the new technology is the patented Pressure Amplifier, which creates a rapid and controllable pressure build-up by exploiting specialised fluid flows. DCT has been able to demonstrate, for the first time ever, direct hydraulic pumping to a height of 180 meters; the system contains no moving parts whatsoever. Another great success has been the separation of moving parts and electric equipment from a system's actual pumping action. This is very important when pumping dangerous, corrosive materials or when attempting to pump over long distances, for example up a borehole.

Advantages of the Technology

1. Direct hydraulic pumping with *no* electro-mechanical conversion or machinery containing moving parts.
2. Continuous pulse-free high-pressure pumping.
3. Pumping of solutions, multi-phase mixtures and suspensions *without* the requirement that they pass through the circulating pump.
4. Carrier-liquid based pumping.
5. Concentrating waste or chemicals.

Patents:

Double-cone technology is novel and therefore DCT has protected this technology very broadly through numerous top-level international patents. DCT has also protected a wide range of applications which will help protect your future product from imitations.

DCT Engineering

DCT works with its partners to provide complete turnkey solutions. The DCT Engineering Group has the following facilities:

- CAD systems for design, specification and simulation of complete systems.
- On-site manufacturing facility.
- Test facility with diagnosis equipment for full-scale systems.
- Facility for testing well pumps at rated pressure.
- Areas for assembly, finishing and inspection.



DCT Engineering Team

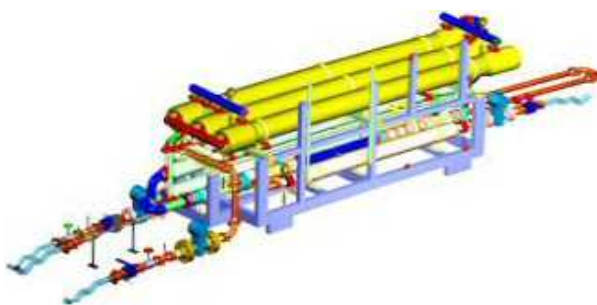


Flow-Powered Static DCT[®] Pressure Amplifier

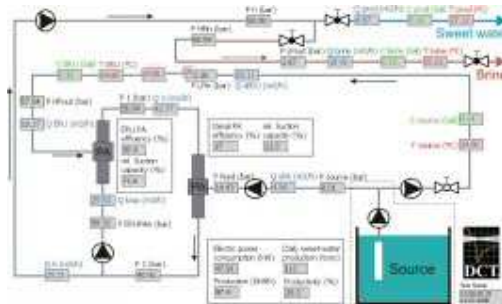
Double-Cone Technology's Pressure Amplifier creates *rapid and controllable pressure build-up* by exploiting specialised fluid flows. This compact device offers an *alternative to high-pressure pumps* and has opened up a new generation of industrial high-pressure circuitry. The DCT Pressure Amplifier enables *direct hydraulic conversion* from high flow-rate to high pressure or from high pressure to high flow-rate.

The Pressure Amplifiers are designed, built and tested in-house by the DCT Engineering Group using on-site DCT Manufacturing Facilities.

The elegant stainless steel amplifier, shown left and right, is valve-free, static and a product of DCT's research into the behaviour of fluids in a state of turbulence or subjected to high material deformation rates. DCT has built Pressure Amplifiers from a few tens of millimeters in length to amplifiers which measure several meters.



CAD system design



CAD system simulation



Water Desalination

The DCT Pressure Amplifier has enabled the design of new and patented Reverse Osmosis (RO) desalination circuits. The resulting plants are robust, reliable, easy to operate and require very little maintenance when compared with conventional plants. The plants do not contain any electronics or valves and they can cope with a rapidly varying feed. During operation the plants are quiet and no chemicals need to be added to the source water. In addition, a high product quality is achieved, as can be seen in the technical data below.

DCT 180t/day desalination plant.



Plant technical data

Daily production capacity: 180 m³/day
 Energy consumption: 6.4 kWh/m³
 Product water quality: 180 ppm TDS
 (Source 34,000 ppm TDS)
 Number of RO elements: 12
 Size (l x w x h): 4.5 x 1.4 x 1.7 m
 Weight: 2.5 t

Market sectors

- Mobile units
- Disaster aid units
- Ships
- Hotel resorts
- Small villages

Gran Canaria demonstration unit

A plant based on the patented design was built by DCT and sent to Gran Canaria (Canary Islands, Spain) in September 2005. Since then it has been in continuous operation, supplying desalinated water directly into the Gran Canaria water system. The unit is under constant evaluation in collaboration with Dow (Dow Separation Systems) and the University of Las Palmas de Gran Canaria. DCT has progressively upgraded the seawater desalination performance as witnessed by a reduction in energy consumption from 7.4 kWh/m³ in September 2005 to the current value of 6.4 kWh/m³. The unit also serves as a fully operational demonstrator for potential customers and as a test site for the latest developments at DCT and for long-term reliability monitoring.

Design and Benefits of the DCT Desalination Plant

Patented system design

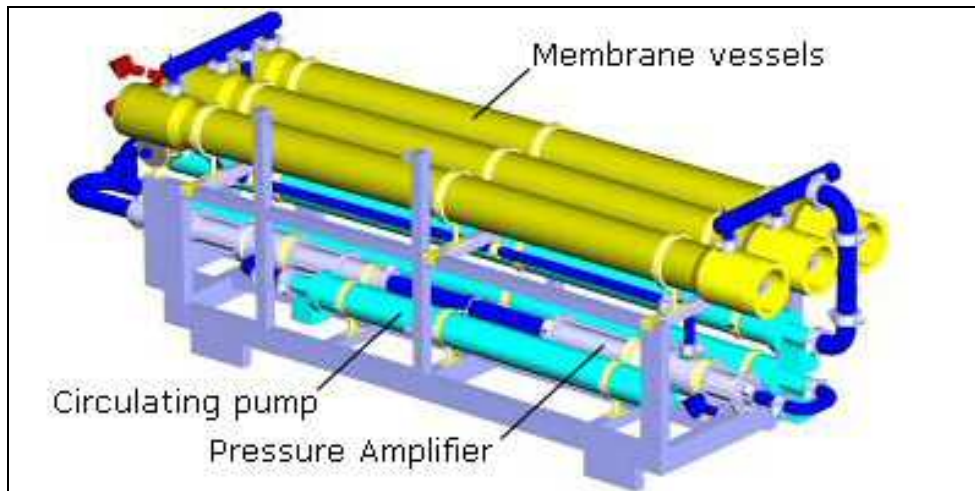
- No fragile high-pressure pump
- No electric or electronic control devices
- No mechanical valves in operation during running mode
- No filter at inlet required (tolerates particles in the seawater)
- No chemicals needed
- Fewer membranes required compared to conventional systems
- No (remote) system management required

Low setup and maintenance cost

- Easy installation/commissioning
- Self-managing while operating
- Pressure Amplifier (PA) availability 100%
- Simple start/stop procedures
- Rapid load changes supported
- Usage of cost-efficient components
- Very low labour cost (no training required)
- Low depreciation due to long life span

Operational and logistical benefits

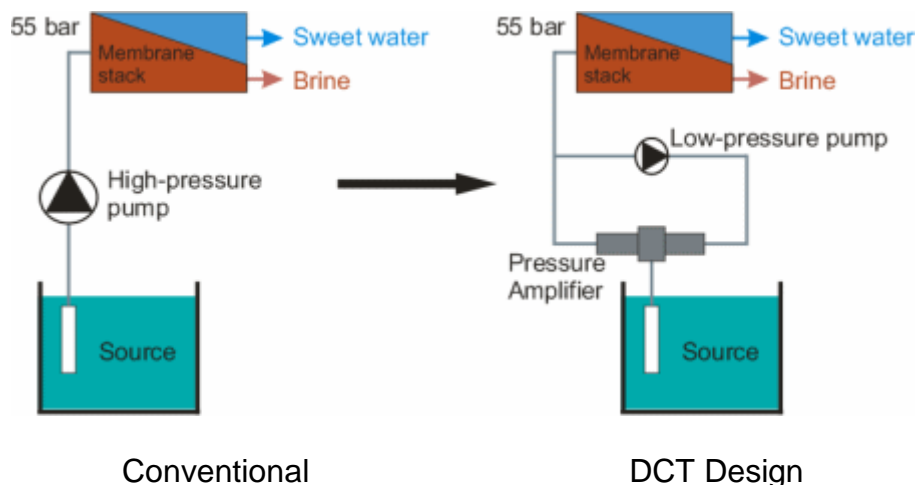
- Small temperature dependence
- Wide range of saline sources
- High operational flexibility
- Environmentally friendly
- Low noise level
- System scalability
- Fits into a 20ft container (easy to transport)



Components of a DCT desalination module

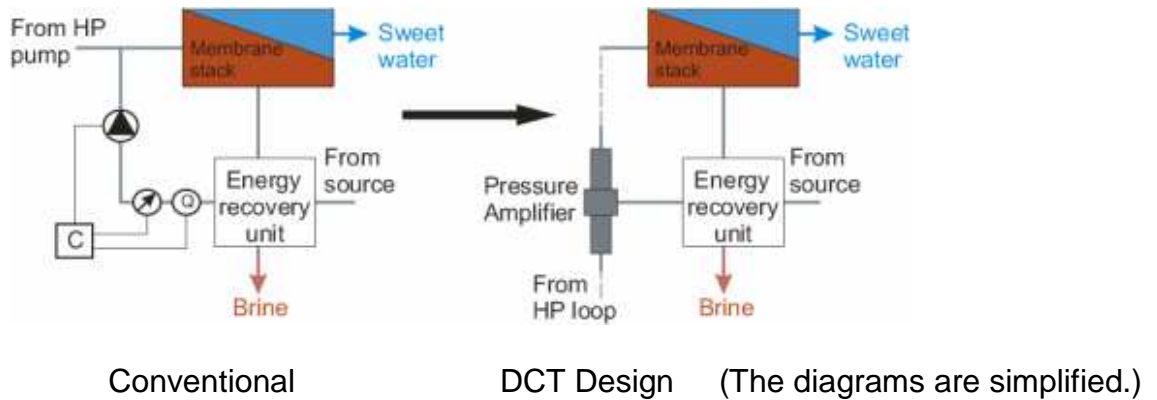
How Reverse Osmosis (RO) Desalination Works and the DCT Concept Pressure development

- In reverse osmosis desalination a pressure of 50 – 60 bars is used to drive water through a semi-permeable membrane.
- Salt ions as well as all particles down to a size of around 0.1 nm are retained, resulting in a substantially purified output (product).
- Only a small percentage of the incoming salt passes through the membrane, the majority is discarded in the concentrated saline solution (brine).
- In the patented DCT system the conventional high-pressure pump is replaced by a circuit containing a DCT Pressure Amplifier and a low-pressure centrifugal pump.



Energy recovery

- Energy recovery devices are used to reclaim some of the residual energy in the brine in order to assist the pumping of the seawater feed (analogous to a turbo charger).
- In the DCT reverse osmosis desalination plant, the conventional booster pump and dedicated electronic control system that would normally be associated with an energy recovery device are replaced by a DCT Pressure Amplifier resulting in an equally efficient, but simpler and more reliable system.



Mobile Water Desalination

A number of years ago, DCT set itself the ambitious target of producing a dedicated mobile desalination unit which

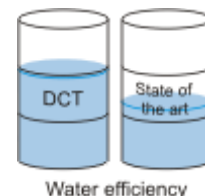
- can be transported to disaster relief areas by truck
- is suitable for decentralised sweet water production for remote communities
- produces very pure, cool water
- is virtually maintenance-free
- requires no control electronics
- can be switched on and off at will



In 2002 we achieved and publicly demonstrated all of the above criteria using a Pressure Amplifier and novel patented circuitry for reverse osmosis seawater desalination.

Highest water and energy efficiencies

For every 1000 litres of water used, our mobile desalination unit produces up to 650 litres of drinking water. This productivity is much higher than the best conventional desalination plants (=45%). We are also steadily improving the energy efficiency by optimising the Pressure Amplifier circuit, and we anticipate an energy efficiency similar to that of large centralised desalination plants.



DCT is currently planning to manufacture a more compact version of this desalination unit for a number of markets, including that of disaster relief.

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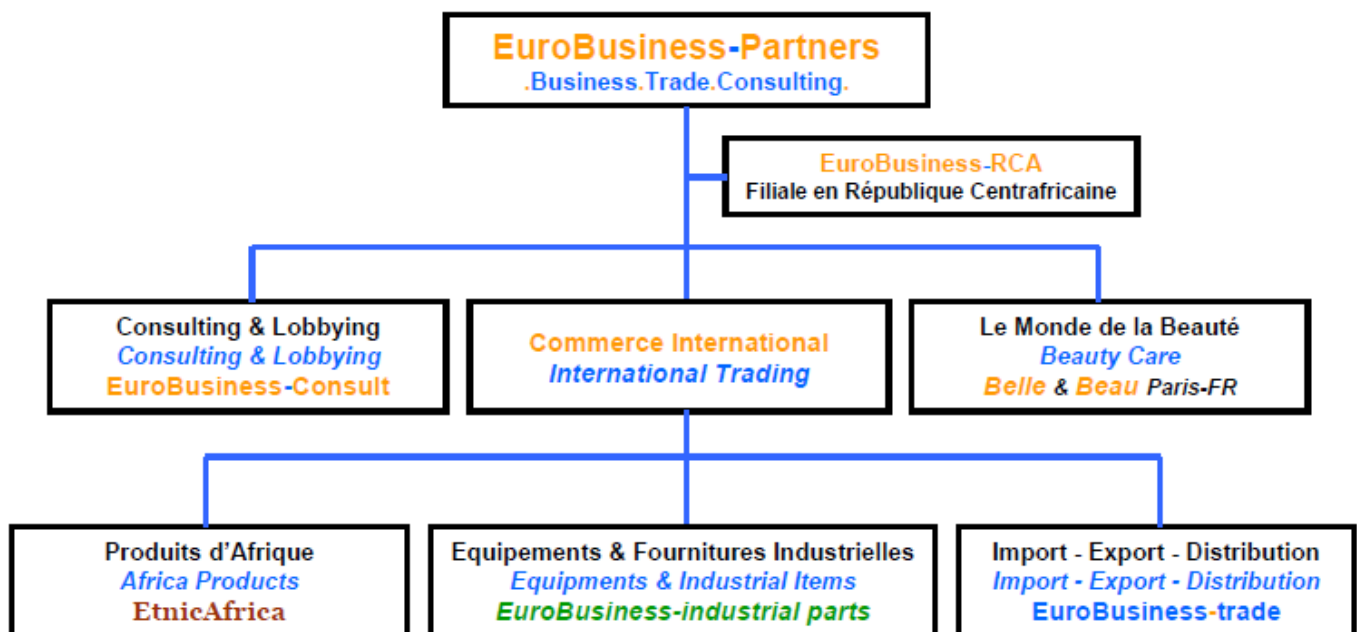
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QUELQUES REFERENCES / SOME REFERENCES

ALGERIE : AFRICAFE – HENKEL ENAD – SAFPI – SPA VERRERIE INDUSTRIELLE DU MAGHREB – SARL BOUKHAROUBA ABDALLAH – SARL BATICERAM – SARL KPMA – SARL SPCITE – GENERAL PLAST – SARL IBRAHIM & Fils - CLINIQUE DES OASIS
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MADAGASCAR : AQUACULTURE MAHAJAMBA – LA COTONNIERE – LES PECHERIES DE NOSSI BE - SOCTAM
MALI : OMA OMNIUM MALI – PRODIMAL – SOMAPIL
MAROC : LABORATOIRE LARATS – LAFARGE CEMENTS – NOVARTIS PHARMA – OFFICE CHERIFIEN DES PHOSPHATES – ROYAL AIR MAROC – THERMOPLAST – ONHYM D.A.M
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MAURITANIE : SNIM
NIGER : SOMAIR - ENITEX
NIGERIA : OK SWEETS (OK FOODS LTD)
REPUBLIQUE du CONGO : ENI CONGO
SENEGAL : COMPAGNIE SUCRIERE SENEGALAISE – PFIZER – SIGELEC - BERNABE
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