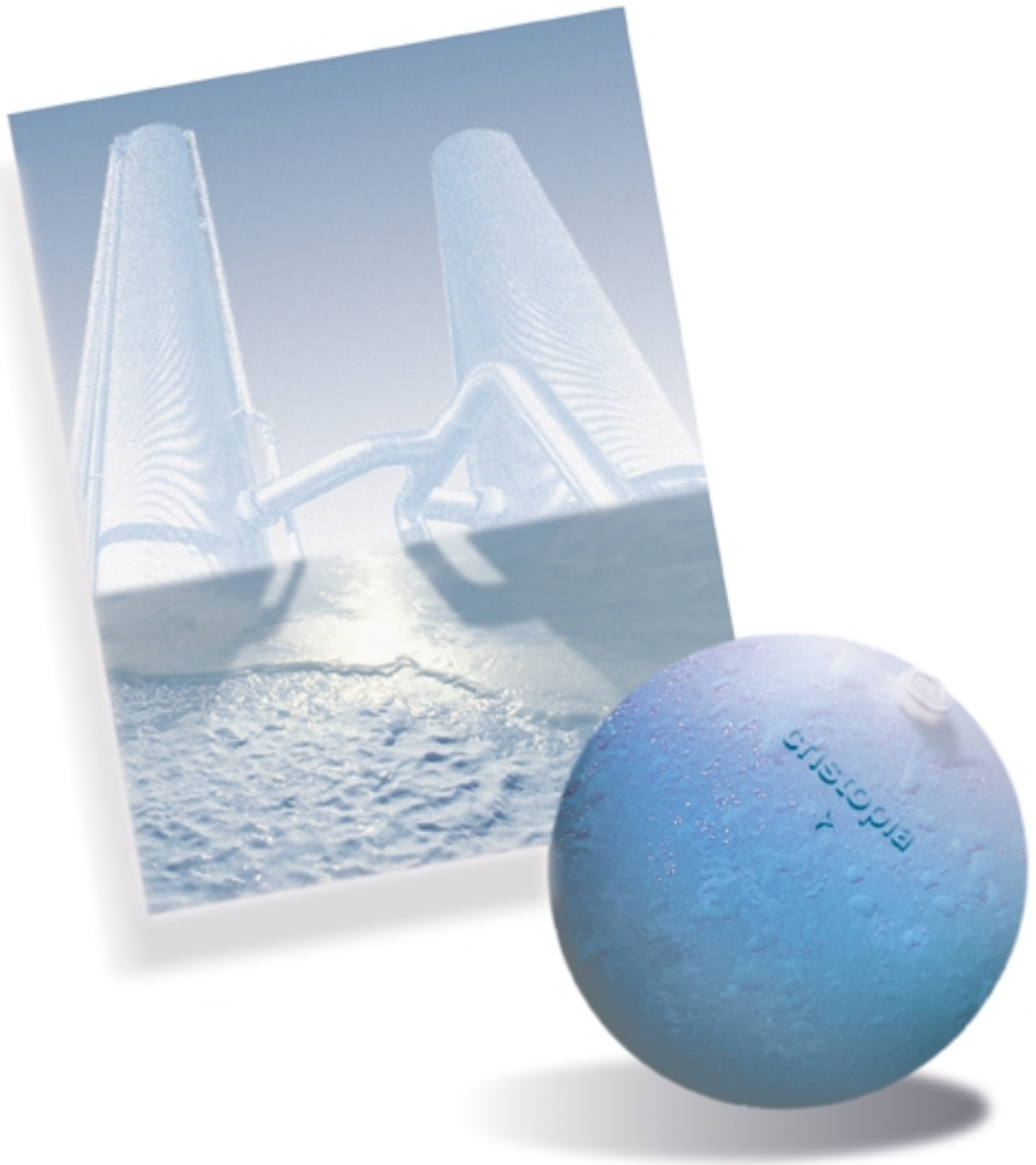


THERMAL ENERGY STORAGE



cristopla

ENERGY SYSTEMS

A TECHNOLOGY ADAPTED TO AIR CONDITIONING AND INDUSTRIAL REFRIGERATION

Thermal energy storage is particularly well adapted to air conditioning and industrial refrigeration systems. By smoothing the production of cooling energy, the STL optimises the use of electrical resources and protects the environment.

Traditional air conditioning systems rarely operate at full capacity. They usually operate during the day to meet the building demand and remain idle at night. Chillers are selected to satisfy the maximum instantaneous cooling demand, which occurs only a few days each year.

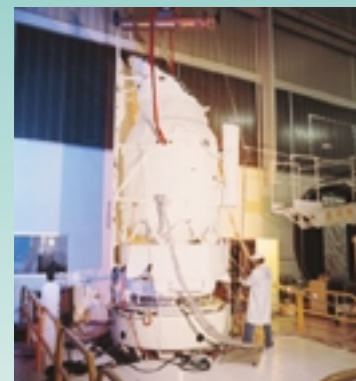
Industrial refrigeration systems provide cooling for a wide variety of applications, many of which require high cooling capacities for short periods only (corresponding to the production cycles).

The STL is a flexible and reliable solution for the management of these important energy needs. It enables a significant reduction in installed chiller capacity (up to 70%), the use of low tariff electricity for significant running cost savings and effective management of cooling according to the real demand.

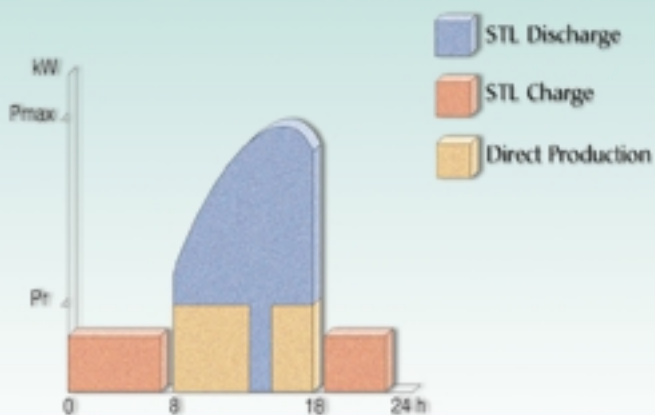
Due to its inherent characteristics and its rapid reaction time the STL improves the reliability of any air conditioning or industrial refrigeration system. The STL provides secure operation for these systems and reduces the number of chiller short cycles.

The STL is commonly used for peak lopping but is also an ideal technology for providing a back-up solutions in air conditioning and industrial refrigeration systems.

NUMEROUS APPLICATIONS...



...TO SMOOTH THE COOLING PRODUCTION



Cooling demand histogram



STORE ENERGY?

TO REDUCE:

- ✓ chiller size: by 30-70%
- ✓ refrigerant charge
- ✓ size of heat rejection plant
- ✓ electrical demand
- ✓ plant room space
- ✓ chiller short cycling
- ✓ system maintenance costs
- ✓ system operation costs



The STL: contributing to a better environment

TO INCREASE:

- ✓ cooling capacity from existing plant
- ✓ chiller annual efficiency
- ✓ smoothness of electrical load profile
- ✓ energy management
- ✓ system life expectancy
- ✓ the COP and the reliability of the system
- ✓ system control

TO PROTECT THE ENVIRONMENT:

- ✓ reduction of CO₂ emissions
- ✓ reduction of electrical consumption during peak hours
- ✓ increase of electrical power plant efficiency due to the shift of electricity from on peak to off peak periods (saving of primary energy)
- ✓ better energy management (savings up to 15%)

APPLICATIONS

AIR CONDITIONING

district cooling systems
apartment buildings
conference centres
shopping centres
recording studios
office buildings
supermarkets
sports centres
museums
theatres
cinemas
hospitals
airports
banks
hotels



INDUSTRIAL REFRIGERATION

slaughterhouses and meat industries
pharmaceutical & chemical plants
central kitchens
bottling plants
dairy industries
cold storage
breweries
ice rinks

BACK-UP

surgical operating rooms
telephone exchanges
military headquarters
storage of explosives
computing rooms
chemical plants
laboratories
cold stores
TV studios



NODULES...

The spherical nodules are blow moulded from a blend of polyolefins and filled with PCM (Phase Change Material).

CRISTOPIA's products cover a wide range with fusion temperatures between -33°C and +27°C.

Three nodule diameters are available:

- 77 mm (type SN) and 78 mm (type IN) for industrial applications.
- 98 mm (type AC.00) for air conditioning.

The nodules are designed for high service pressures (up to 10 bars). For higher service pressures consult CRISTOPIA.

NODULE CHARACTERISTICS

Material: blend of polyolefins.

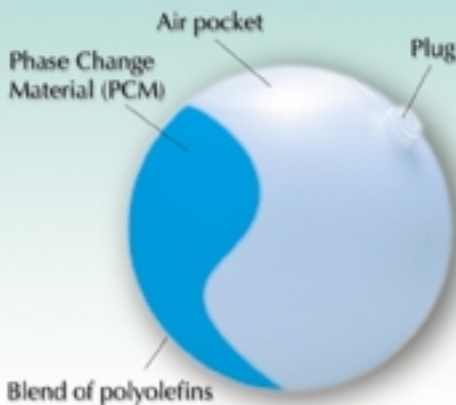
Chemically neutral towards eutectics and heat transfer fluid.

1.0 mm thickness: no migration of the heat transfer fluid.

Sphere obtained by blow moulding: no leakage.

Sealing of the cap by ultrasonic welding.

Air pocket for expansion: low stress on the nodule shell.



AN ADVANCED TECHNOLOGY...TRIED AND TESTED

Considerable R & D has been performed to optimise the nodule characteristics:

thermal tests:

- ✓ PCM developments to match the market demand,
- ✓ research & development programmes on nucleating agents,
- ✓ measurement of supercooling temperatures,
- ✓ measurement of thermal performances: heat exchange coefficient, latent & sensible heat capacities...

physical tests:

- ✓ creep tests,
- ✓ life cycle tests,
- ✓ measurement of the internal failure pressure,
- ✓ chemical ageing of the nodule envelope,
- ✓ measurement of the internal pressure during the crystallisation of the PCM,
- ✓ measurement of mechanical strength,
- ✓ optimisation of nodule expansion,
- ✓ ultrasonic welding...

CRISTOPIA's nodules combine remarkable thermal performances, particularly in terms of exchange capacity, with an outstanding lifetime (equivalent to 30-40 years of operation in normal conditions).

CHARACTERISTICS FOR 1 m³ STL

Nodule type	Phase change temperature °C	Latent heat		Sensible heat		Heat transfer		Nodule weight Kg	Toxicity LD50 value in mg/kg a	Operating temperature limits (°C)
		Ql kWh/m ³	Qs kWh/°C.m ³	solid Qss kWh/°C.m ³	liquid Qsl kWh/°C.m ³	crystallisation Kvcr kW/°C.m ³	PCM fusion Kvfus kW/°C.m ³			
SN.33	- 33.0	44.6	0.70	1.08	1.6	2.2	724	2,600		
SN.29	- 28.9	39.3	0.80	1.15	1.6	2.2	681	1,200	-40°C	
SN.26	- 26.2	47.6	0.85	1.20	1.6	2.2	704	1,200	to	
SN.21	- 21.3	39.4	0.70	1.09	1.6	2.2	653	1,300	+60°C	
SN.18	- 18.3	47.5	0.90	1.24	1.6	2.2	706	2,700		
IN.15	- 15.4	46.4	0.70	1.12	1.6	2.2	602	8,400		
IN.12	- 11.7	47.7	0.75	1.09	1.6	2.2	620	5,000	-25°C	
IN.10	- 10.4	49.9	0.70	1.07	1.6	2.2	617	11,000		
IN.06	- 5.5	44.6	0.75	1.10	1.6	2.2	625	18,000	to	
IN.03	- 2.6	48.3	0.80	1.20	1.6	2.2	592	58,000		
IC.00	0	48.4	0.70	1.10	1.6	2.2	558	85,000		
AC.00	0	48.4	0.70	1.10	1.15	1.85	560	85,000	+60°C	
AC.27	+27.0	44.5	0.86	1.04	1.15	1.85	867	2,500		

Allow a useful expansion volume of 1 to 5% depending on the service pressure (10 to 50 l per m³ of tank)

See our technical manual

A TANK: THE STL

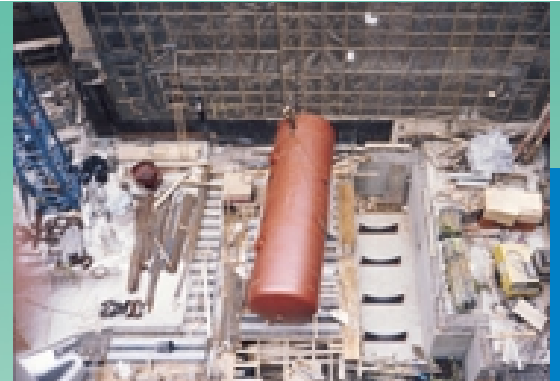
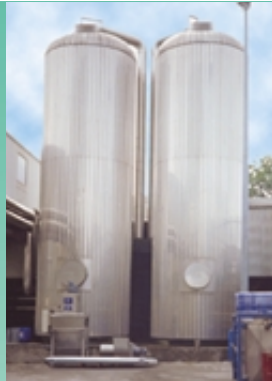
EXAMPLE OF TANK CHARACTERISTICS

Consult us for alternative dimensions.

Volume in m ³	External diameter D mm	Total length without flanges L mm	External surface to be insulated m ²	Inlet and outlet flanges ES mm	Number of cradles	Empty weight PE 4.5 bars kg	Heat transfer fluid volume m ³
2	950	2,980	10	40	2	660	0.77
5	1,250	4,280	18	50	2	1,050	1.94
10	1,600	5,240	29	80	2	1,890	3.88
15	1,900	5,610	37	100	2	2,540	5.82
20	1,900	7,400	47	125	3	3,200	7.77
30	2,200	8,285	61	150	3	4,580	11.64
50	2,500	10,640	89	175	4	6,860	19.40
70	3,000	10,425	106	200	4	8,400	27.16
100	3,000	14,770	147	250	6	11,700	38.80

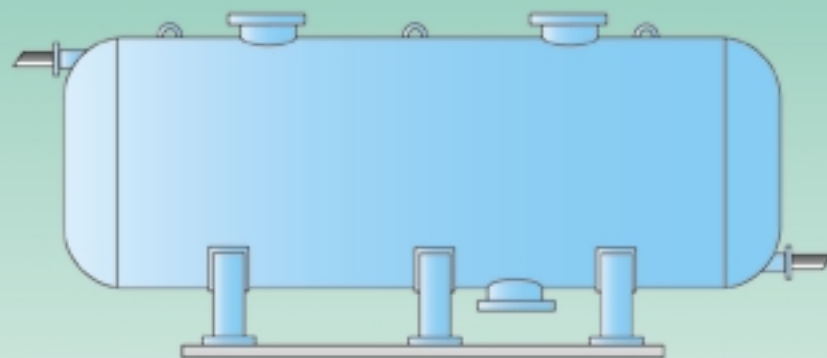


Standard pressure drop 2.5 mWG at nominal flow rate - See our technical manual



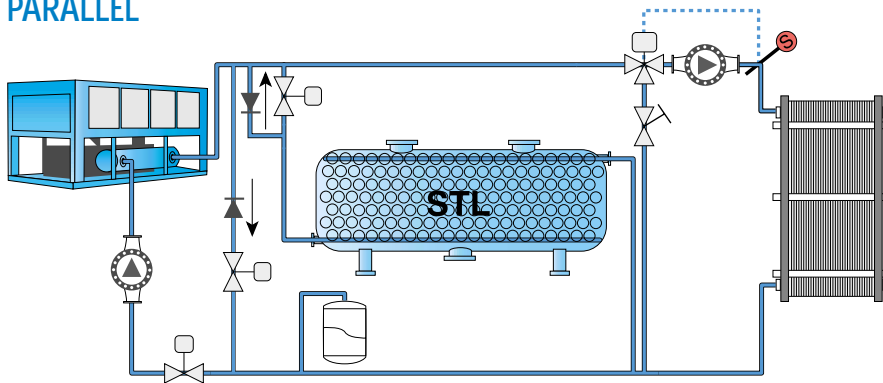
...IN A MADE TO MEASURE TANK

The dimensions of the tank(s) are calculated based on the plant space available at site and to satisfy the thermal performance requirements. The tank may be cylindrical with design service pressures up to 10 bars or rectangular (concrete or steel) for atmospheric pressure. Cylindrical tanks can be designed horizontally, vertically or for burial underground. Tanks are fitted with upper manholes for installing the nodules and a lower manhole in the event of emptying. Two internal headers (top and bottom) are designed to generate maximum heat transfer efficiency. The heat exchange between the nodules and the system is achieved by circulating the heat transfer fluid through the tank.

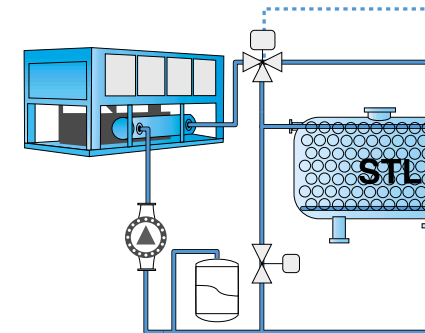


HYDRAULIC LAY-OUTS TO SUIT YOUR APPLICATION

PARALLEL



SERIES DOWNSTREAM



DESCRIPTION OF THE MODES OF OPERATION

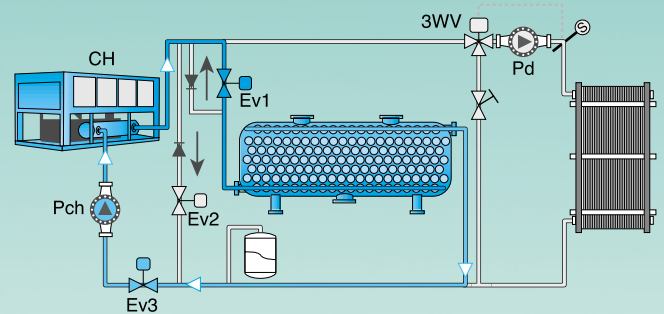
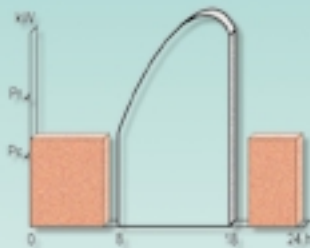
PARALLEL LAY-OUT EXAMPLE

CONTROL DIAGRAM	COMPONENT							
Operation mode	Pd	Pch	Ev1	Ev2	Ev3	3WV	CH	Chiller set point
Charge	0	1	1	0	1	0	1	Night
Direct production	1	1	0	1	1	R	1	Day
Discharge only	1	0	0	0	0	R	0	/
Direct production + Discharge	1	1	0	1	1	R	1	Day
Direct production + Charge	1	1	1	0	1	R	1	Night

R : regulating
0 : off / closed
1 : on / open

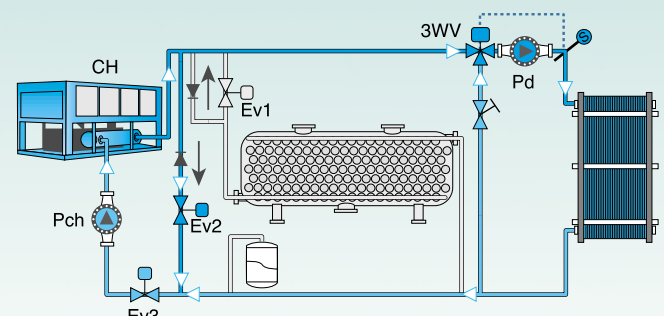
CHARGE

Overnight the chiller is used to store cooling energy in the STL. The heat transfer fluid is cooled by the chiller to temperatures below the phase change temperature of the PCM. Circulating this fluid through the tank causes the crystallisation of the PCM contained in the nodules. The energy is stored at constant temperature as latent heat during the liquid-solid transition.



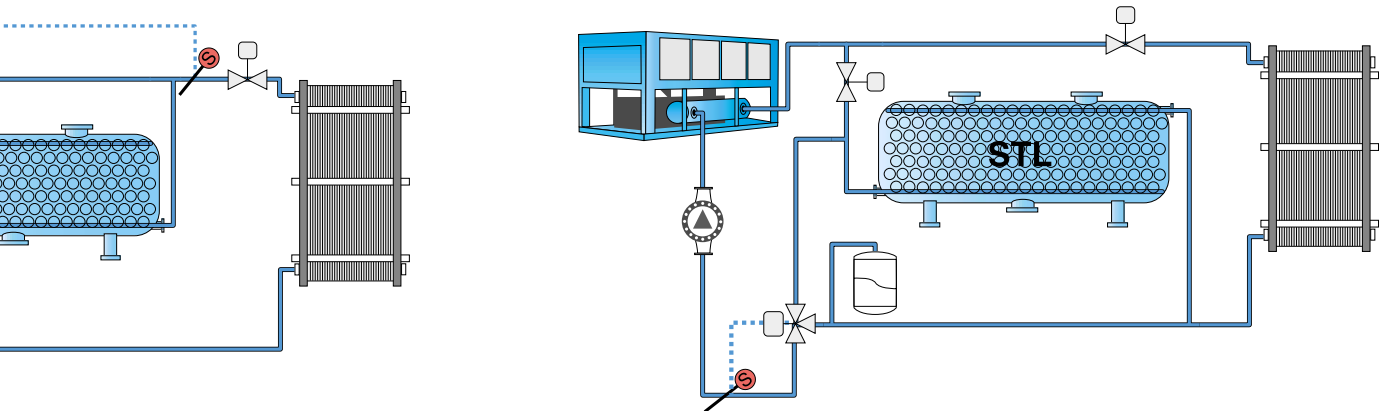
DIRECT PRODUCTION

When the cooling demand is lower than the installed chiller capacity, the demand is satisfied by the chiller alone. The chiller capacity is controlled according to the demand. There is no flow through the STL.



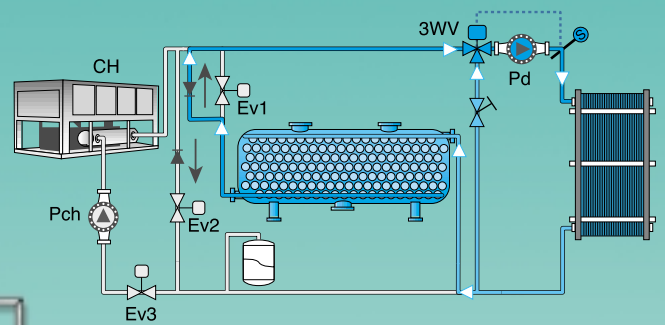
PRINCIPLE OF THE STL

SERIES UPSTREAM



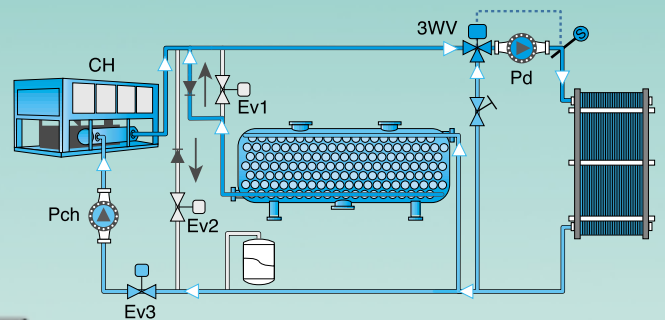
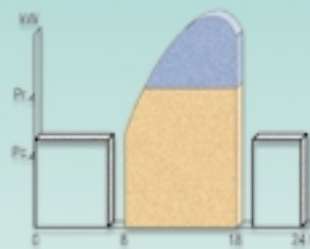
DISCHARGE ONLY

The STL can be used alone during peak electrical tariff periods or for back-up applications (the chiller being off). The heat transfer fluid enters the STL at a temperature higher than the PCM fusion temperature and is cooled by the nodules. The leaving temperature is controlled by the three way valve to match the system demand.



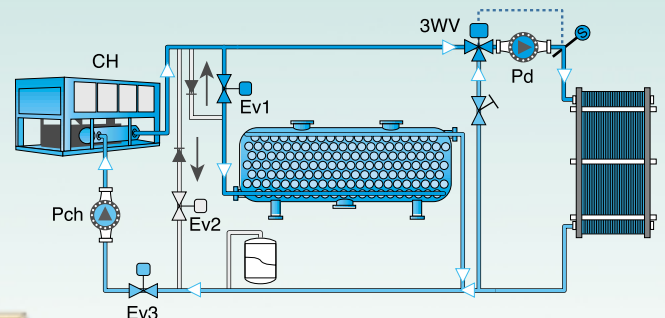
DIRECT PRODUCTION + DISCHARGE

When the system demand is greater than the installed chiller capacity the cooling energy is provided by the combined efforts of the chiller and the STL. The chiller works at full capacity with the STL providing the short fall.



DIRECT PRODUCTION + CHARGE

In this mode, generally during the night, the chiller charges the STL and supplies the cooling demand (limited to 10-15% of the chiller capacity in charge mode). The chiller is controlled by its outlet temperature.





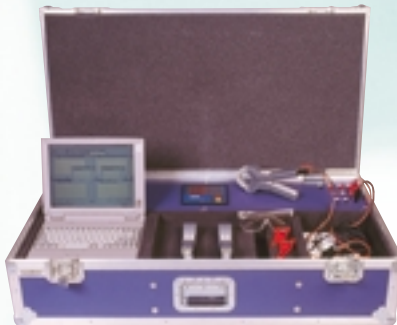
THERMAL ENERGY STORAGE

CUSTOMER SERVICES

TEST FACILITY

CRISTOPIA has developed an experimental test facility to provide the most relevant advice on the use of the STL (lay-out, hydraulic details, controls, storage strategy,...).

This test facility may also be used to simulate any new project with an STL.



CRISTOPIA ENERGY SYSTEMS'STL: FOR BETTER ENERGY MANAGEMENT

AC.27

AC.00

IC.00

IN.03

IN.06

IN.10

IN.12

IN.15

SN.18

SN.21

SN.26

SN.29

SN.33



AIR CONDITIONING:

Heat pumps,
Low temperature energy recovery,
air conditioning, back-up, computing rooms,
clean rooms,...

INDUSTRIAL REFRIGERATION AT NEGATIVE TEMPERATURES:

Slaughterhouses, central kitchens, dairy industries,
bottling plants, salting, ice rinks,...

INDUSTRIAL REFRIGERATION AT VERY LOW TEMPERATURES:

Chemical processes, pharmaceutical plants, deep freezes,...

AIRPORT : AEROPORT NICE - AEROPORT DU RAIZET *POINTE-A-PITRE* - SWISS AIR *ZURICH* - AEROPORT *BRUSSELS* - BANGKOK AIRPORT - ATLANTA AIRPORT ORLANDO AIRPORT - CINCINNATI AIRPORT **BANK :** LAMBERT BANK *BRUSSELS* - BANKSYS *BRUSSELS* - COMMERCIAL BANK CONGO - CITY FIRST HONG KONG BANK *ZHEJIANG* - SOCIETE GENERALE *PARIS* - CREDIT INDUSTRIEL DE L'OUEST *NANTES* - BANCA NAT. DEL LAVORO *GENOVA* - BANCO AMBROSIANO *MILANO* - BANCA NATIONAL DEL LAVORO *BOLOGNA* - BANCA DEL MONTE *MILANO* - BANCO POPOLARRE *SONDRIO* - BANCO DI SICILIA *TORINO* - BANCA CALTAGIRONE - KOREAN DEVELOPMENT BANK *SEOUL* - CAIXA GENERAL DESPOSITOS *PORTO* - UBS *GENEVE* - SBS *LAUSANNE* - SBS *GENEVE* - ROYAL BANK OF SCOTLAND *LONDON* **DCS :** UNIVERSITY *AMSTERDAM* - UKM UNIVERSITY *KUALA LUMPUR* - BANGSAR ENERGY PLANT *KUALA LUMPUR* **HOSPITAL :** HOSPITAL *INNSBRUCK* - BRUGMANN FABIOLA *BRUSSELS* - BRUGMANN *BRUSSELS* - HOPITAL ST. PIERRE *BRUSSELS* - HOPITAL ST. LOUIS *PARIS* - CLINIQUE DES DOMES *CLERMONT-FERRAND* - C.S.P. *CLERMONT-FERRAND* - HOPITAL *HYERES* - INSTITUT PAOLI CALMETTES *MARSEILLE* - HOPITAL ST. ROCH *NICE* - CLINIQUE CLAUDE BERNARD *ALBI* - C.H.R.U. *ANGERS* - HOPITAL AYGUEROTE *TARBES* - THIAN JIN HOSPITAL *THIAN JIN* - CLINIQUE NOTRE-DAME *THONVILLE* - HOPITAL FELIX GUYON *ST. DENIS DE LA REUNION* - B.G. HOSPITAL *FRANKFURT* - FORNACA OSPEDALE *TORINO* - PACINI *ROMA* - CHA HOSPITAL *SEOUL* **HOTEL :** HOTEL PENTA *PARIS* - JARDINS ST. BARTHELEMY *LYON* - MADISON HOTEL *HAMBURG* - HOTEL DAVAR *INDORE* - HOTEL SANTOOR *INDORE* - HEDGE HOTEL *BOMBAY* - HOTEL NEW ARAM *JAANAGAR* - HOTEL ABANDO *BILBAO* - HOLIDAY INN *GENEVE* - OLYMPIA HILTON *LONDON* **JAIL :** LYNWOOD JAIL *LOS ANGELES* **MILITARY :** BASE MILITAIRE *FRANCE* - CHANGI NAVAL BASE *SINGAPORE* **MUSEUM :** MUSEE DES SCIENCES ET TECHNIQUES DE LA VILLETTE *PARIS* - NATIONAL MUSEUM *NUREMBERG* **OFFICE BUILDING :** ELECTRIC UTILITY *ADELAIDE* - DROUOT *BRUSSELS* - TRACTEBEL *BRUSSELS* - EUROPEAN COMMUNITY *BRUSSELS* - CODIC *BRUSSELS* - C.F.E. DE BROUX *BRUSSELS* - DELTA POSTAL *LIBREVILLE* - ELECTRO BUILDING *SHENZHEN* - REQUING *ZHEJIANG* - C.P.A.M. *NANTERRE* - ARSENAL *BOURGES* - P.T.T. ST. CROIX *BORDEAUX* - SENAT *PARIS* - NOUVEAU MINISTERE DES FINANCES *PARIS* *BERCY* - KABIVITRUM *LIMOGES* - MONTE CARLO PALACE *MONACO* - CENTRE ADMINISTRATIF *NICE* - DOW CHEMICAL *SOPHIA ANTIPOLIS* *C.R.A.M.A. BORDEAUX* - U.R.S.S.A.F. *BEZIERS* - MATRA *TOULOUSE* - C.A.F. *BORDEAUX* - C.R.A.M. *LYON* - CHAMBRE DE COMMERCE *AURILLAC* - C.I.A.T. *CULOZ* GALDERMA *ALBY-SUR-CHERAN* - CHALET BELLECÔTE *COURCHEVEL* - IMMEUBLE CASCADES *FORT DE FRANCE* - DIR. DEP AGRICULTURE & FORÊT *FORT DE FRANCE* POSEIDON HOUSE *FRANKFURT* - TRITON HOUSE *FRANKFURT* - IMMUNO *HEIDELBERG* - CARL ZEISS *AALEN* - SITA *NEW DELHI* - EXHIBITION CENTRE *HAIFA* - OFFICE BUILDING *MILANO* - ORSI AUTOMAZIONE *GENOVA* - METALLURGIC FACTORY *VERONA* - ZOO PROFILATTICO *MILANO* - GUERRINI *TORINO* - ENEL *VENEZIA* - C.E.A.S. *MATERA* - EXHIBITION CENTRE *RIMINI* - DESPAR *PESCARA* - UNIVERSITY *MILANO* - DONG IL *SEOUL* - HUNGING-DONG BUILDING *SEOUL* - ELECTRICAL ASSOCIATION *SEOUL* - METEO *CASABLANCA* - SCHOOL OF MAKASSED *LEBANON* - INSTIT. SUPERIOR DI TECNOLOGIA *LISBON* - LA BOLSA DE LISBOA *LISBON* - KV. KRYSSAREN *STOCKHOLM* - KLAMPAREN *STOCKHOLM* - KV. KYLHuset *STOCKHOLM* - KV. VAEVEN *STOCKHOLM* - MAERSTA CENTRUM *STOCKHOLM* - S.P.P. *STOCKHOLM* - KEBO *STOCKHOLM* - CIBA GEIGY *BASEL* - S.K.A. *ZURICH* - R.W. GRAND LANCY *GENEVE* - MISSION JAPON GRAND SARCONNEX - ARES SERONO *GENEVE* - GLAXO *GENEVE* S.I. LES ROCHES *GENEVE* - CA-VIDY *LAUSANNE* - S.R.K. *BERN* - P.T.T. *BERN* - S.B.G. *GENEVE* - TETRA PAK *PULLY* - ST. JAMES STREET *CENTRAL LONDON* - W.M. BUILDING *EDINBURG* - OCEAN VILLAGE *SOUTHAMPTON* - SWEB *CARDIFF* - WREN HOUSE *LONDON* - CYANAMIDE Ltd. *GOSPORT* - MOORGATE *LONDON* - SHEEPEN PLACE *COLCHESTER* - WATERSIDE *LONDON* - HALIFAX BUILDING *LONDON* - MEDICAL DEFENCE UNION *CENTRAL LONDON* - ST. JOHN'S INNOVATIVE CENTER *CAMBRIDGE* - ROYAL BOTANIC GARDENS *KEW* - GLOUCESTER PARK *LONDON* - CALVERGATE *NORWICH* - APSLEY HOUSE *LEEDS* - LOVELL PARK *LEEDS* - OLD BROAD STREET *LONDON* - WESTMINSTER *LONDON* - BRITISH GAS *MORECAMBE* **RESTAURANT :** LA BOUTIQUE DU PÂTISSIER *PARIS* - CAFETERIA FLUNCH *PARIS* RISTORANTE *PESCARA* - RESTAURANT JAPONAIS *GENEVE* - FLPO *DORKING* **SUPERMARKET / DEPARTMENT STORE :** LACOP *POREC* - IRMA *COPENHAGUE* INTERMARCHE *PARIS* - INTERMARCHE *ORANGE* - CASINO *CLERMONT-FERRAND* - MAMMOUTH *BORDEAUX* - INTER II *CALAIS* - MULTISTORE OPERA *PARIS* BLANDIN *GADELOUPE* - HIJ. DEPT. STORE *UTRECHT* - BURGERS VERW. *AMSTELVEEN* - SUPERMARKET *ANCONA* - GAROSHI *TORINO* - CENTRO COMM. *CATANIA* CENTRO COMM. *SASSARI* - HALLE DE CAROUGE *GENEVE* - CORA *LA RÉUNION* **SCHOOL :** COLLEGE OF THE DESERT *LOS ANGELES* **THEATER / CINEMA :** THÉÂTRE DE LA COLLINE *PARIS* - SALLE PLEYEL *PARIS* - SALLE POLYVALENTE *ROUBAIX* - SINAVEX *NYON* **INDUSTRY :** ISTRAGRAFICA *ROVINJ* - FLOTEX *CHÂTEAU-RENAULT* S.N.F. FLOERGER *ST. ETIENNE* - PROMONTA *HAMBURG* - UNIV. DO MINHO *BRAGA* - SAMSUNG *NEW DELHI* - KV. POSTGARDEN *STOCKHOLM* - SILLOE *STOCKHOLM* STAEFA CONTROL SYSTEMS - MIGROS *ZURICH* - FENCHURCH AVENUE *LONDON* **CHEMICAL :** I.N.A. RAFFINERY *RJEKA* - NITROCHIMIE *ST. MARTIN DE CRAU* - SANOFI CHIMIE *SISTERON* **COMPUTER ROOM :** OTIS *PARIS* - PEUGEOT *POISSY* - SHELL CHIMIE *BERRE* - CAISSE NATIONALE CREDIT AGRICOLE *ST. QUENTIN* - CONTRÔLE AERIEN *REIMS* - TEL. COMPANY *FREIBURG* - SHELL *KÖLN* - ALENIA *NAPOLI* - ALENIA CASELLE *TORINO* - BOLSA DE VALORES *LISBON* - COMPUTER CENTER *OSLO* SHELL REFINERY *GOTHENBURG* - ELLIS MECHANICAL *GOSPORT* - SHELL CARRINGTON **PHARMACY :** ROUSSEL UCLAF *PARIS* - FIDIA *PADOVA* - SOFARIMEX *LISBON* PENN CHEMICAL - HAESSE AB *GOTHENBURG* - PHARMACIA *UPSALA* - KABI VITRUM *STOCKHOLM* - GLAXO WARE **LABORATORY :** CENTRE D'ETUDE ATOMIQUE *BRUYERES* - I.N.R.A. *JOUY-EN-JOSAS* - CENTRE TRANSFUSION SANGUINE *LILLE* - LYCEE TECHNIQUE *RENNES* - L.P. *HERICOURT* - CINEMATHEQUE *BOIS D'ARCY* I.P.Q. *ALMADA* **CENTRAL KITCHEN :** LES PLATS DE FRANCE *ROANNE* - AZUR RESTAURATION *NICE* - CUISINE CENTRALE *LYON* - CUISINE C.H.R. *NICE* - CUISINE CENTRALE *LE MANS* - ETS DUPONT *CARVIN* - NOUVELLE GASTRONOMIE FRANCAISE *LA MOTTE-BEUVRON* - CUISINE CENTRALE *RUEIL-MALMAISON* **DAIRY INDUSTRY :** RO-KA *GLOSTRUP* - DRAC LAIT *GAP* - LES FERMIERS SAVOYARDS *FRANGY* - LAITERIE DES USSES *ANNECY* - FROMAGERIE DES CHAUMES *MAULEON* - FROMAGERIE VIONNET *PRESILLY* - PROMINOX *NEVERS* - FROMAGERIE *SAMOËNS* **FOOD INDUSTRY :** LESIEUR *DUNKERQUE* - LINDT *OLORON* - VEGETABLE COOLING *VENICE* **SLAUGHTER HOUSE :** ABATTOIRS DE FONTANIL *GRENOBLE* - INDUSTRIE DES VIANDES *CHAMBERY* - MUNICIPAL SLAUGHTER HOUSE *FRANKFURT* **DRINK :** STE. DES EAUX DE *VITTEL* - TECHNOFRIGOR *ANGOULÊME* - USINE DE SIROP *CHOLET* - S.C.I. DES CROSTES *LORGUES* - HARP GUINNESS *DUNDALK* - MARCARDLE & MOORE *DUNDALK* - CAVE VIN *AZEITAO* - CAVE VIN *BUCELAS* - SCOTTISH NEWCASTLE *EDINBURG*

& UNDER CRISTOPIA LICENCE :

BANK : CHENGDU AGRICULTURE DEV. BANK *CHINA* - BANK OF TAIYO KOBE *JAPAN* - KWAN JOO BANK *SOUTH KOREA* **CHURCH :** SUNG NAK CHURCH *SOUTH KOREA* RISSHO KOOSEIKAI *KYOTO* CHURCH *JAPAN* **DAIRY INDUSTRY :** MIDORI DAIRY *JAPAN* **DCS :** TIDEL PARK *INDIA* - MM 21 (D.C.S.) *JAPAN* - SEA SIDE MOMOCHI (D.H.C.) *JAPAN* - BANGSAR ENERGY PLANT *SOUTH KOREA* **DRINK :** SUNTORY BREWERY *JAPAN* **FOOD INDUSTRY :** KONUMA VACUME COOLER *JAPAN* **HOSPITAL :** *ZHEJIANG* CANCER HOSPITAL *CHINA (P.R.C.)* - CHA HOSPITAL *SOUTH KOREA* **HOTEL :** HOTEL KANONGAKY *JAPAN* - KAMAT PLAZA *MUMBAI INDIA* - OBEROI TRIDENT *UDAIPUR INDIA* - HOTEL SHEEBA INN *AHMEDABAD INDIA* - HOTEL PLAZA JULLUNDER *INDIA* **INDUSTRY :** SAMSUNG LIMITED *NOIDA INDIA* **LABORATORY :** TDK *JAPAN* **MUSEUM :** SAGA PREFECTURE MUSEUM *JAPAN* **OFFICE BUILDING :** HANGZHOU LINGYA BLDG *CHINA (P.R.C.)* - WUHANG POST & T.T. HOTEL *CHINA (P.R.C.)* - CHENGDU GANGBENG INT. CENTRE *CHINA (P.R.C.)* - BEIJING HAIDIAN SCE & TECH. BLDG *CHINA (P.R.C.)* - THE OBEROI GONER *JAIPUR INDIA* - QUERY SOFT SYSTEM *PLUNE INDIA* - CMM STUDIO *MUMBAI INDIA* - AMUL DAIRY ANAND *INDIA* - IBARAGI SUISAN *JAPAN* - HOKURIKU ELECTRIC CO. *JAPAN* - KANAZAWA INST. OF TECHN. *JAPAN* CHIBA PREFECTURE CENTRE *JAPAN* - CHUBU ELECT. POWER SHIMOHIRO *JAPAN* - YOKOHAMA CITY CENTRAL LIBRARY *JAPAN* - NIKONIKODO *JAPAN* - POLICE OFFICE *KANAGAWA PREF. JAPAN* - FUJI FILM *JAPAN* - TAISEI OFFICE INSURANCE *JAPAN* - IBARAGI PREFECTURE ITSUURA MUS *JAPAN* - DAEWOO *SEOUL SOUTH KOREA* HANSOL *SEOUL SOUTH KOREA* - HALLA SHIPYARD *SOUTH KOREA* - YOUNG KWANG KEPCO OFFICE *SOUTH KOREA* - MOKPO PROJECT *SOUTH KOREA* **SUPERMARKET / DEPARTMENT.STORE :** CARREFOUR *WUXI CHINA (P.R.C.)* - CARREFOUR *GUBEI CHINA (P.R.C.)* - WINSOME SUPERMARKET *CHINA (P.R.C.)*



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