



Engineering –FAQ

The equipment that makes up the MTS is different depending on whether the water source is salt or fresh?

That's right, MTS saltwater equipment is reinforced for the level of corrosion involved.

How long does it take to prepare the DCP?

Today, given the timing of imports and exports, the MTS has a lead time of approximately 24 weeks.

Can coating be applied in beach and wall areas other than those recommended by CL?

No, today, Crystal Lagoons recommends applying a special coating that has been developed and tested for years with a supplier with worldwide coverage to have a standard and uniform solution for all markets in the world.

When or what is the best time to purchase the MTS during the project development process?

Usually, the purchase of the MTS should be made when the client is developing the OOC to allow sufficient time for definitions, imports, shipments, and equipment installation.

What is the MTS payment criteria?

The standard payment criteria for the Module is 50% upfront, 40% upon factory shipment, and 10% upon commissioning of the equipment.

What is the incoterm of the sale of the Module?

The incoterm used in the sale of MTS for the ROW market is CIF, and in the US market, it is on-site.

What is the installed power of the lagoon equipment?

It will depend on the size of the lagoon and can be reviewed on a project-by-project basis, according to the characteristics of the project.

Can solar energy be used for the lagoon equipment?

The main lagoon equipment operates on a triphasic connection. The high voltage levels for triphasic systems is something that a solar energy system can hardly achieve at a low cost, and a very large solar farm would be needed to supply this consumption.

The cost of batteries to store solar energy would also be very high. Solar energy could be used for minor equipment, such as bilge pumps (sump pumps), lighting, and control system.

Can I buy the liner locally?

No, the liner must be purchased from an exclusive supplier determined by Crystal Lagoons. This liner provides guarantees and has a particular color that will deliver the characteristic color of lagoons powered by Crystal Lagoons® technology.

What happens when the liner breaks?

It can be patched underwater. If the cut is too large, additional measures would have to be taken to repair it. The solution is studied on a case-by-case basis to avoid emptying the lagoon.

What supports the lagoon? What is the underlying solution?

It will depend on the soil type (material, permeability, etc.), water table condition, etc. With this background, the engineering team can define the bottom and support solution for the lagoon.

If there is a high water table, is it necessary to deplete it in order to build? And after the lagoon is already built?

If the water table level is at the bottom level of the lagoon, it will be necessary to implement a dewatering system designed by the client. This system should operate during the construction and filling of the lagoon. Depending on the water table level and soil characteristics, the water table level and its seasonal variations should be monitored to determine whether or not it should be depleted once the lagoon is full.

What are the costs of earthwork?

Earthwork costs vary greatly locally. It will depend on the soil type, whether it is necessary to implement backfills, etc. In addition, land movement costs will be affected by the distance to the landfill where the soil is extracted. The client will estimate this cost according to the earthwork plans provided by Crystal Lagoons with the Design Criteria Package.

Where is the water discharged from the filters?

Crystal Lagoons® technology operates as a closed system, so the backwash water from the filters is not discarded but is recovered through a sedimentation and filtration system. This allows a great saving in replacement water and contributes to a more sustainable system.

What are the additional costs of using salt water vs. fresh water?

The main difference lies in the materiality of the equipment, frequency of maintenance, and volume of water replenishment. This last point is because, in saltwater lagoons, a purge is required to prevent the lagoon from salinization due to evaporation losses that increase the salt concentration in the lagoon and could eventually damage the equipment. In these cases, water replenishment will be higher.

Can I fill the lagoon with salt water and then replenish it with fresh water?

There would be no problem in using this solution as long as both water sources have been approved by the Water Department and have undergone pilot pool testing.

How are bathing areas defined?

The bathing areas correspond to the lagoon's beach accesses. Depending on local regulations, these zones may need to be demarcated with buoys to prevent users from leaving these zones. The buoys also serve to prevent boats from entering bathing areas where users will be.

Why do some lagoons have pools next to them?

Nearby pools are implemented according to the client's request. In some cases, they are built by regulation. In other cases, small children's pools are built to avoid contamination problems in the lagoon and to have more contained areas. These pools are not treated with Crystal Lagoons® technology.

Will the entire volume of water be passed through the filters?

Crystal Lagoons® technology does not work like a regular pool. With the additives and other Crystal Lagoons® systems, the dirt is decanted into the lagoon, and a trolley cleans the bottom of the lagoon by vacuuming. This volume of water is filtered and returned to the lagoon.

Should the lagoon be filled with clean water or can it be any type of water and then purified?

The lagoon fill water must meet specific parameters that Crystal Lagoons will provide. The water source should be analyzed and tested in the pilot pool. In some cases, the source water may require pre-treatment, such as removal of hardness, iron/manganese, etc.

What does the design criteria package (DCP) include? What drawings will be provided in the design criteria package?

The design criteria package includes:

- Earthwork drawings.
- Civil works shape drawings.
- Drawings of all piping systems for lagoon treatment.
- Engine room drawings.
- Basic drawings for the development of the electrical project.

The DCP includes drawings, chapters with technical specifications, equipment details, specifications for the development of structural engineering and other systems such as the development of the rainwater system around the lagoon, water balance reports for estimating replenishment systems, etc.

How far does the scope of the DCP extend to the development of the Master Plan?

Crystal Lagoons develops all aspects of the lagoon treatment systems. What goes outside the lagoon: rainwater systems, landscape lighting outside the lagoon, aesthetics, development of the sandy areas, etc., are the client's scopes.

How much water is replenished in the lagoon? How is this water replenished?

The volume of replenishment will depend on the size of the lagoon, where the lagoon is located, and the type of water used in the lagoon. The engineering team will submit with the DCP a Water Balance Report which will indicate estimated replacement volumes for the specific project. In general, evaporation is the major source of water loss from a lagoon. Operating losses are minor, and eventually, some geomembrane loss is considered. In cases where salt water is used, replenishment may increase as a purge will be used to avoid salinization of the lagoon water due to evaporation.

How many personnel are needed to maintain the lagoon?

This depends on the size of the lagoon and its characteristics. The operations team at TEX will determine the number of man-hours for lagoon maintenance.

Where are the chemicals stored? Is this space considered part of the engine room?

Additives should be stored in a ventilated warehouse, not exposed to sunlight. This space is not considered in the machine room space as it will depend on where the customer wants to keep them.

Are building permits required for this type of construction and/or reservoirs?

This will depend on the local regulation of each project.

In case of emergency, where is the lagoon water discharged?

The water must be disposed of in a system to be determined by the customer. In some situations, it may be possible to opt to use the sewer system by obtaining prior permission from the local authorities.

How is the lagoon emptying system?

Since the lagoons do not require regular emptying, there is no emptying system per se. If required, motor pumps or bilge pumps must be installed in the lagoon and discharged into the system defined by the client. For the deeper areas at the bottom, there are deeper discharge chambers where a bilge pump can be placed to remove the remaining water on the membrane.

For cold climates, how does the lagoon behave in winter?

In climates where the water in the lagoon or pipes could freeze, exceptional measures should be taken. The lagoon should be winterized according to a protocol Crystal Lagoons will provide to the client during the engineering stage. According to his experience in the area, the client should review the protocol and take additional measures if required.

How and how soon is the lagoon cleaned in case of emergency (hurricanes, storms, sandstorms, etc.)?

It will depend on the situation presented. The Crystal Lagoons® systems are prepared to operate in emergencies and return the lagoon to its original state in a short time.

Do I need a backup generator for the lagoon equipment?

It will depend on the frequency of power outages in the area. If these are scarce, a backup system could be provided for the emergency systems in the engine room to be able to control and warn in case of flooding in the engine room and chambers, and on the other hand, a backup system for the monitoring station to be able to monitor water quality in case of emergencies and warn the lagoon operators from Crystal Lagoons how they should act.

How often should the lagoon water be changed?

The lagoon water should not be changed. Crystal Lagoons® systems are designed to maintain the water under a certain quality standard, provided that the operating conditions are respected, Crystal Lagoons monitor additive dosage, and the Crystal Lagoons-approved water source is used.

What kind of discharges does the lagoon have?

The lagoon treatment does not consider discharges, but all water is treated and reused. However, the following cases may occur:

- Excess rainfall discharges: Through an evacuation system, the excess rainfall directly into the lagoon allows guiding the water to prevent the lagoon from exceeding its maximum level.
- Removal of sludge from filter backwashing: The wastewater found after lagoon treatment is a sludge of organic nature. The frequency of removal will depend on the environmental conditions and the type of water in the lagoon but usually varies between 3 and 6 months. The approximate withdrawal volume for a lagoon of around 10 hectares is 12 - 20 m³. Local authorities shall approve its final disposal.

Can the lagoon function as a rainwater catchment?

No. The lagoon can receive direct rainwater but is not designed to receive runoff. This surface water can carry contaminants that will affect the lagoon's water quality.

Equipment service life - Elements Lifespan

The most important elements considered in the lagoon are:

- Pumps & Pumps Engines
- Filter & Filtering Media
- Pipes & Valves
- Electronic Measuring Elements (Sensors, Meters, etc.)
- Liner
- Ultrasonic Devices
- Suction Cart
- Nozzles

The different equipment has a lifespan indicated in the table below:

EQUIPMENT	LIFESPAN
Pumps & Pumps Engines	Up to 10 years depending on Preventive Maintenance.
Filter & Filtering Media	Filters between 10 – 15 years. Filtering Media around 5 years.
Pipes & Valves	Pipes, depending on materiality: between 20 to 50 years. Valves, around 5 years.
Electronic Measuring Elements	Depending on the element: between 2 to 10 years.
Liner	Up to 35 years. However, warrant extends for 10 years only.
Ultrasonic Devices	Newer devices, with mechanical wiper, between 4-5 years, due replacement needed of the wiper (however, it should keep working).
Suction Cat	Depending on the element: between 2 to 5 years.
Nozzles	At least 10 years, unless a powerful chemical or high amounts of sand are constantly used through the devices.

CAPACITY

How many square feet of beach area should be allocated per person?

30 sqf p/p mínimo y 55 sqf p/p recommended.

How much beach area is recommended in proportion to the lagoon size?

In an M-class Lagoon, for reference, we recommend a beach area that is equivalent to 50% of the total lagoon area in a PAL and 25% in a RE lagoon.

What are the site and area requirements for the machine room?

The machine room area is determined on a case by case basis dependent on the lagoon size and whether the machine room will be above or below ground. For example, a M-class Lagoon requires an area of approximately 20x20m. Also, the machine room requires vehicular access for maintenance operations. Additional considerations will be evaluated in the design phase.

How far away can the machine room be from the lagoon?

The machine room will ideally be within 150m of the lagoon edge. Distances up to 300m can be evaluated depending on the system utilized. Costs can be reduced by placing the machine room as close to the lagoon edge as possible.

How can I determine the total number of users for the lagoon?

Our recommendation to determine the capacity of the lagoon is to generate a visitor estimate, especially in public access projects.

CONSTRUCTION

What is the recommended lagoon depth?

The standard depth is 2.4 m. To ensure an optimal blue color a minimum of 1.8m depth is required.

What are the minimum area and width of the lagoon?

The minimum lagoon size is 1ha. Smaller lagoons will be evaluated on a case by case basis. The minimum width is 6m in specific areas to ensure circulation of the suction cart. In these cases, the lagoon shape needs to be thoroughly reviewed.

Can structure be placed in the lagoon with pillars (eg: bora bora cabanas)?

Elements that perforate the liner are not recommended. Crystal Lagoons will provide alternative design solutions to generate a similar effect for elements that float over the water. Pillars also generate significant impediments to our maintenance cleaning system.

How close can buildings be to the lagoon edge?

A minimum space around the lagoon of 6 meters is required between the lagoon and all built structures as these elements can interfere with the piping trench. However, there can be exceptions in particular cases and can be evaluated. These elements must be coordinated with all consultants to ensure optimal function of Crystal Lagoons® technology.

What kind of lighting can be used in the lagoon?

Underwater LED strips are the best option for lighting in the lagoon. The specific design detail will be evaluated on a case by case basis.

PROGRAMMING

How can public and private elements be separated around the lagoon?

Public and private areas can easily be separated through access control and operational strategies.

What activities can be performed within the lagoon?

There are a number of possibilities for activating crystalline lagoons, Crystal Lagoons has developed an activation guide that lays out the many activities available and will be sent during the early stages of project development.

Operations - FAQs

How often should the lagoon be cleaned?

The lagoon should be cleaned in its entirety every 2 days during high season and 3 days during low season.

Is it necessary to remove the pneumatic cart from the lagoon every day?

No, it is not necessary. In general, the pneumatic cart is always inside the lagoon and is only removed for repairs or maintenance.

What is the origin of the equipment and additives?

The pneumatic cart, so far, is only manufactured in Chile and the Crystal Lagoons additives come from Chile and USA and the other additives, such as chlorine and sulfate, can be purchased locally.

Is it necessary to have a warehouse to store the products?

Yes, to store the manual cleaning equipment and the necessary accessories to perform the operation correctly.

Can another supplier be chosen to perform telemetry maintenance?

No, it is part of the TLSA to use our providers for the proprietary Equipment and Additives.

Does the lagoon have to be emptied from time to time?

No, our technology allows us to maintain the water body in good conditions without the need to empty the lagoon.



What is controlled from the control center?

The water parameters are controlled and as well the pumps for the additives, are activated by telemetry. Additionally, the performance of the pneumatic cart is monitored with the GPS.

How much water is discharged per day?

Our system is closed and no water is discarded under normal conditions (there may be eventualities where the customer decides to discard water to restore the visual condition of the lagoon).

Is it necessary to empty the lagoon to repair leaks?

It is not necessary, it can be repaired with caulking or patching. These are procedures that we share with the client.

Is our system redundant?

Yes, all pumps have a spare in order to continue operation.

How much is the electrical consumption of a lagoon?

This can be answered once you have a Concept Design, at which time you can roughly estimate the operating costs of the MTS.

How often do the additive tanks have to be loaded and how are they handled?

It is recommended to use all PPE. In addition, all local regulations should be reviewed with a prevention specialist. In general the chlorine and sulfate tanks are charged monthly. The others depend on the frequency of use.

How much stock of additives does the lagoon require?

This depends on several factors, but it is important to mention that when you have the CD you can estimate the stock needed for 1 year of operation under normal conditions. You will have to purchase at least 6 months of stock.

Is it necessary to perform preventive maintenance on the equipment?

Yes, The pneumatic cart should be maintained every 6 months. And the pumps should be maintained as indicated in the manual.

How often does the coating of the beach area have to be maintained?

The supplier guarantee is of 5 years.

In case of equipment failure, can the equipment be replaced by a local supplier?

Most of the equipment is can be found in other parts of the world and could be purchased elsewhere, but must first be discussed with Crystal Lagoons.

Can any type of water be used?

Yes, we are able to use mostly any type of water source (sea water, brackish, fresh water) after pilot test evaluation and eventually defining a pretreatment only if required.

Are the additives dangerous?

No, since they comply with NSF standards for drinking water and are used in minimum concentrations and therefore diluted in the total volume of the lagoon. Storage and safety precautions must be taken according to the Safety Data Sheet for additives in the warehouse.

What is the shelf life of the additives?

Two years stored in adequate conditions.

Can the artificial Lagoon have fishes?

It is not possible due to oxidation pulses.

What types of boats can be used?

Boats without motors, and boats with a sail size depending on the depth of the lagoon. Motorboats must be electric and have protection for the propeller.

Is it possible to swim - dive?

Yes, in the areas specifically designated for this purpose.



Technology by
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WORLD'S TOP AMENITY



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