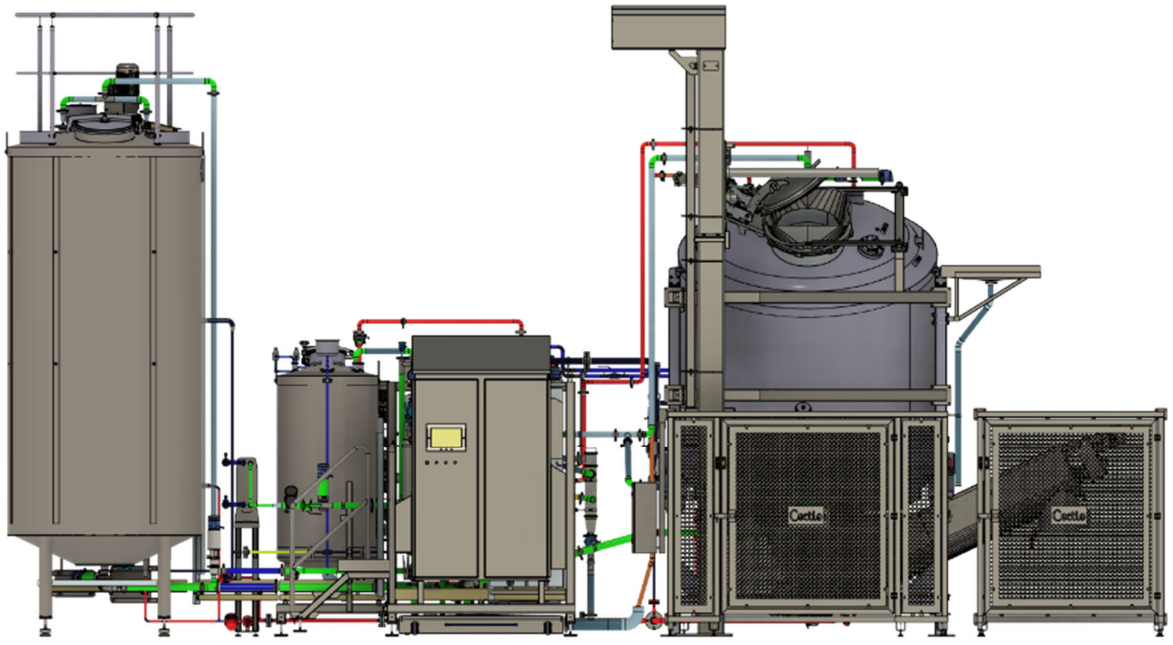
COCTIO AiOS

DESIGNED FOR PRODUCTION OF

HIGH-QUALITY NATURAL BONE BROTH / STOCK / RAMEN /PHO



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1 COCTIO

Coctio is the only company in the world that combines over 30 years of broth production experience with engineering expertise to offer automated turnkey processing lines for the production of additive-free culinary bone broth and sauces. This makes Coctio the ideal partner to enter the emerging bone broth and broth-based sauces, soups and ready meals market.

1.1 Company Background

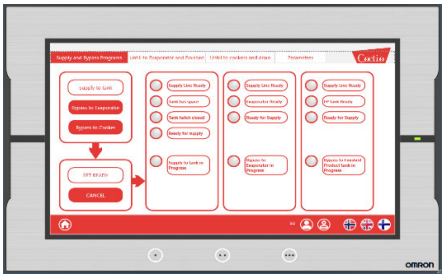
Kai Iiskola, founder and managing director, has more than 35 years of professional experience in the food industry and over 25 years specifically in natural bone broth and sauce production. In 1991, he founded the company Puljonki Oy that became a pioneer in the production of bone broth and sauces for the food service industry including top gourmet restaurants. He continued managing Puljonki until it was sold to Nestlé Professional in 2012. To put things into perspective, the successful operation grew from 150m^2 in 1991, to a production facility of 4,500m^2 in 2013.

1.2 Proven process and technology

The process and equipment designed by Coctio are based on the processes and equipment which Kai Iiskola designed and used at Puljonki Oy for over 15 years and are to this day still used by Nestlé Professional to produce their own culinary products including broths and sauces.

1.3 Automation

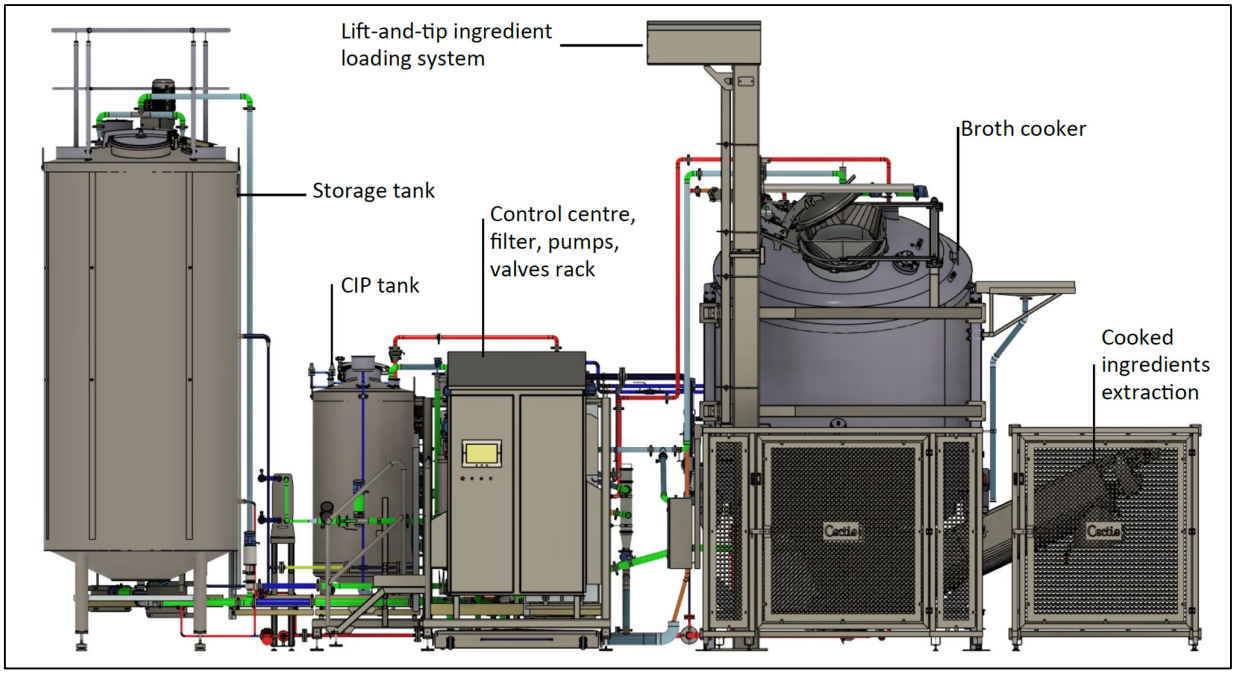
The key processes in the production line are automated to ensure that the most critical processes are repeated as desired for every single batch of bone broth. This allows you to consistently produce large volumes of end-product over a number of batches, maintaining the same level of quality and characteristics across the batches. The automation also allows you to have a very efficient production line that requires very little supervision.



Picture of Coctio AiOS 4300

2 COCTIO AIOS

The Coctio AiOS unit is designed to incorporate all the basic functionalities required to industrially produce high-quality stocks and broths using animal bones. All processes are controlled by automation requiring very little supervision.



2.1 Key benefits

All-in-one system

The unit includes all you need to start industrial production of high-quality stocks and broths. It includes an ingredient loading system, a steam-jacketed closed cooking system, filtration, stock/broth extraction and storage, separate fat extraction, cooked ingredients extraction from cooking system, and cleaning-in-place system.

Automated system for consistent production output requiring little supervision

The entire unit is under Coctio automation including the cooking process, extraction process and washing process. The automation during the cooking process ensures that recipe parameters are followed exactly as intended so that each batch of stock is produced in the same way. As processes are automated, it also means that only 1 to 2 people are needed to operate the machine during batch changes to load and unload ingredients from/to the cooker making it very easy to operate.

Automated boiling control even at high pressure - clear broth, ramen broth, pho broth

Coctio's unique automated boiling control allows all levels of boiling even at higher pressure. Whether it is a slow simmer to get a clear broth or fast boiling to get milky ramen broth, you can achieve the results you desire by simply setting the right recipe parameters.

Easy & fast installation

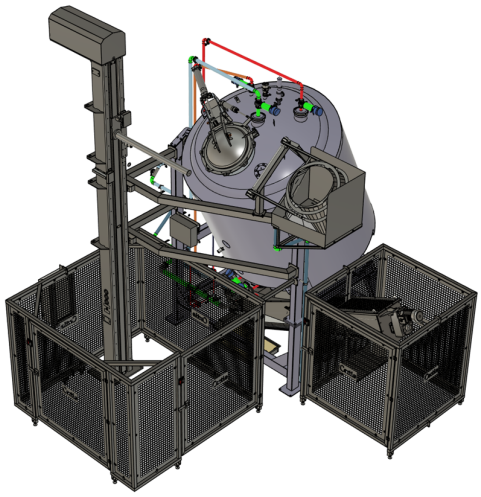
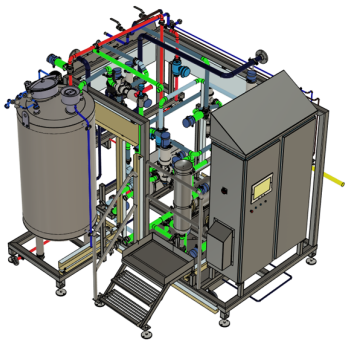
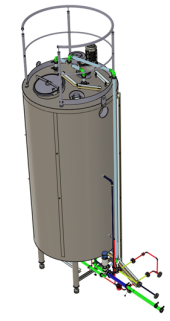
The unit is completed off-site and shipped in 3 parts which are then connected on site in a few days. Then the unit only needs to be connected to the necessary utilities on site.

Small footprint

The entire unit fits within a 60m2 – 77m2 footprint depending on model and requires little space around it.

2.2 Equipment details and models

The table below lists the equipment included in the base AiOS system.

Equipment features	
Cooking vessel • Closed, tilted, insulated and stainless steel sheathed vessel • 3 x steam jackets – 1 on the bottom, 2 on the side. • 1 x cooling jacket located at the top • Internal rotating mechanism to extract cooked ingredients from the cooking vessel • Pressure wash jet • Vertical pillar lift & tip system • Automatically openable hatch on top • Automatically openable hatch at the bottom • Automated water feed with flow meter • Broth and fat extraction pump • Conductivity measurement for fat separation • Glass pipe section at broth extraction point to view liquids coming out of cooker. • Automated control of cooking process (pressure, temperature, time and cooling) • Screw conveyor under the vessel to transport remaining cooked ingredients (2.5-metre long) • Drainage box underneath cooker • Necessary valves and sensors	
Filtration • 200-micron sock filter in stainless steel enclosure • Sock filter easily removed/replaced/changed. **Automation and electrical cabinet** • Control panel **Bach Cleaning-in-Place (CIP) station** • 500-litre water supply tank with insulation and acid proof • Detergent dosing pump set, valves for acid and alkali • Sieve on CIP line to cooker • Automation control Washing by three-phase cleaning circulation per washing target allowing production to continue on other equipment. **Pipe connections**	
End-product storage tank • Insulated, heated tank • Mixing arm • Automated weighing of content • Liquid end-product pump to transfer product from storage tank to next process	

2.3 Processes

2.3.1 Ingredients supply

Solid and liquid ingredients (except for water) are introduced into the broth cooker via the top hatch with the help of a lift & tip system that accommodates a 200/300/500 litre trolley. Cooking water is measured automatically and added via a direct pipe connection.

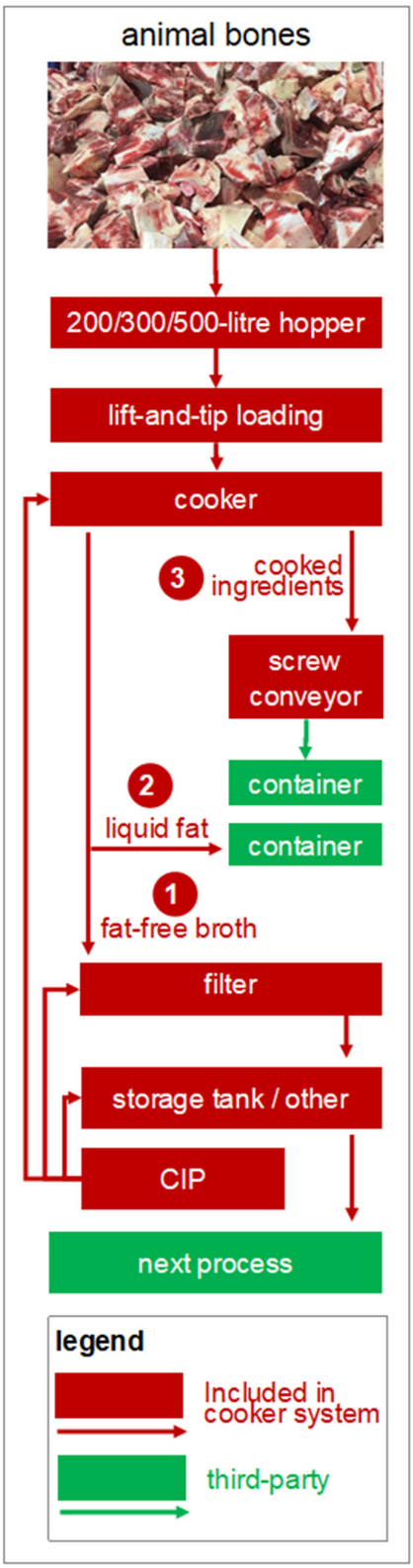
2.3.2 Broth cooking

Once the ingredients are in the cooking vessel, the top hatch needs to be closed manually (sensor tells system if hatch is closed properly) and the cooking process is started automatically by choosing the recipe set-up from the automation control panel or by manually inserting values to the available cooking parameters. Individual process parameters (such as cooking temperature, time, cold jacket timing, cooling) are manually selected as a sequence and can be saved as a recipe.

Once the cooking process has been started from automation panel, the system will automatically heat the steam jackets and cook the contents at the predetermined temperature, pressure and time. No supervision required.

Once the cooking process is finished, the operator can then start the extraction process which will begin with the extraction of the liquid contents. These are extracted through the outlet valve at the bottom of the vessel. First, the broth is extracted and passed directly through a 200-micron sock filter and directed to a storage tank. As the broth is extracted, the fat that has risen to the top inside the cooker will start to mix with the stock at the exit point. Once this happens, the system will stop the extraction and the operator can see this through a glass section of the pipe at the exit point. At that stage, the operator can redirect the rest of the liquid to a separate ending where the liquid fat will exit to be collected into a container or other as defined by the customer.

Finally, the cooked bones are extracted through the bottom hatch, dropped into a 2.5 metre long screw conveyor that will transport the bones from under the cooker to the side where they can be collected into a trolley or other container as provided by customer.



2.3.3 Storage

The broth is pumped from the cooker through a filter and to the storage tank. The product is fed into the storage tank from the bottom and taken out at the bottom. The product can be mixed inside the tank and the pump speed can be adjusted as required.

2.3.4 Storage tank to next process

The system also includes a pump and piping to transfer the end-product to the next process (piping ends on the system pipe rack – additional piping can be connected to it as needed to reach next step in process).

2.3.5 Cleaning

Cleaning the interior surfaces of Coctio vessel, filters, storage tank, pipes and associated fittings is done by the integrated Coctio Simple Cleaning-in-Place (CIP) station. Each wash can be defined as desired from the

automation panel. The system allows the following option: 1) rinse with water, 2) Alkali wash, 3) Acid wash. Typically, the cleaning cycle comprises the following stages:

1. Pre-Rinsing with warm water
2. Circulation of alkaline or acid detergent solution
   (Detergent concentration: the amount of detergent in the solution must be adjusted to the correct concentration before cleaning starts. During cleaning, the detergent solution is diluted with rinsing water. The dosage must always be according to the detergent supplier's instructions).
3. Rinsing out alkaline or acid detergent with clean, warm water

The equipment is split into 4 washing areas for the cleaning system. 1 area can be washed while the other is functioning. The four areas are as follows:

1. Cooker and product line
2. Product line, Product Filtering enclosure and Storage Tank
3. Filtering line
4. Product line from Storage tank to next process (assuming reasonable distance).

Each wash cycle requires a certain length of time to achieve an acceptable result. The length will depend on how dirty the equipment is. Each batch of washing mixture is directed to the drain after cycle is complete.

The external surfaces of the Equipment can be washed with foam cleaning equipment

Wastewater coming from the processes will be directed to the customer's wastewater treatment process.

3 MODEL SIZE AND BATCH PRODUCTION

The table below shows the estimated ingredient quantities to produce broths/stocks (note that actual quantities will depend on recipe) as well as estimated output quantities per AiOS model

AiOS model		AiOS 4300	AiOS 6500	AiOS 9000
Equipment	unit			
cooking vessel (net cooking volume)	litres	4300	6500	9000
storage tank (net internal volume)	litres	5000	10000	10000
Space requirements				
minimum clear height	metres	5.5	6	6.5
equipment width	metres	6	6.5	7
equipment length	metres	10	11	11
Batch production (only estimates, will depend on recipe)				
Batch input				
bones	kg	1800	2700	3800
water	litres	2000	3000	4200
vegetables and herbs	kg	250	375	500
Batch output				
broth	litres	2200	3300	4500
cooked ingredients	kg	1670	2505	3420
liquid fat	kg	180	270	380

The bone mixture is typically made of 90% meat and bones and 10% of fat.

Minimum batch size: Having split steam jackets on the side of the cooker allows minimum batch size to be approximately 50% of quantities show above.

3.1 Indicative batch process times (varies by recipe)

The following table shows the estimated process times for different types of bones.

		Beef	Pork	Chicken	Fish	Vegetable
Ingredient loading	hours	0.5	0.5	0.5	0.5	0.5
Heating up to desired temperature*	hours	1- 1.5	1- 1.5	1- 1.5	1- 1.5	1- 1.5
Cooking	hours	5 – 12 depending on pressure	3-8 depending on pressure	2-6 depending on pressure	1-4 depending on pressure	1-4 depending on pressure
Extract and filter stock	hours	0.5	0.5	0.5	0.5	0.5
Extract and filter liquid fat	hours	0.25	0.25	0.25	0.25	0.25
Extraction of cooked ingredients	hours	0.25	0.25	0.25	0.25	0.25
Total process time	**hours**	**7.5 - 15**	**5.5 - 11**	**4.5 - 9**	**3.5 - 7**	**3.5 - 7**

* Heating up time will depend on temperature of ingredients and water

3.2 Recommended bone specifications

Bones used to produce broth for human consumption have to come from animals that have been deemed fit for human consumption. Ideal size for cut or crushed bones is 4cm x 4cm, maximum size 10cm x 10cm. The following provides some detail on the type of bones used by type of animal:

Beef: mixture of marrow bones, rib bones, back bones and connective tissue/joints

Chicken: hen and broiler bones, but also some chicken skin can be mixed with the bones. Chicken heads, feet and toes are not recommended for use in premium broths.

Fish: fish bones and trimmings, small amounts of skin and heads without gills

Seafood: shellfish shells (shrimp, lobster and crab)

3.3 Cooking water

Cooking water can either be cold or hot but has to be deemed fit for human consumption. The hotter the water, the faster the heating up stage of the cooking process which is why we recommend using hot water.

3.4 Indicative BRIX level

The following table shows estimates of the brix level (indication of total solids content) for broth depending on types bones used.

Type of bones	Beef & Pork	Chicken	Fish	Vegetable
BRIX range	7 - 12	4 – 8	3 – 7	3 - 6

4 TECHNICAL SPECIFICATIONS

4.1 Vessels

Vessel	Max temperature	Max pressure (gauge)
Broth cooker	140 °C	3 bar
Broth storage tank	90 °C	0 bar
Coctio Simple CIP	90 °C	0 bar

4.2 Pipes and valves

Pumps, valves and other fittings are procured from reputable producers such as Alfa Laval.
All parts that are designed to come in contact with food ingredients and the end-product will be made of AISI 304 stainless steel unless otherwise stated.
All valves and fittings used on the production line will be food-grade.
All product pipes are not insulated unless otherwise stated.

4.3 Sensors and metering

Equipment	Measurement/other
Broth cooker	temperature (location high)
	temperature (location low)
	temperature (location top)
	electric lock (location high)
	inductive sensor (location low)
	flow metering (water fill)
	pressure
	sealant water detection
	level switch
	conductivity sensor
Product line/filter	inductive switch (filter enclosure cover)
Broth storage tank	weight (product amount, dosings)
	temperature
	electric lock (high)
	level switch
Coctio Simple CIP	flow metering (cip pressure line)
	flow metering (cip return line)
	conductivity sensor
	temperature
	level measurement
	electric lock (location high)

4.4 Automation

	Description
Electrical cabinet	Electricity, Automation water-cooled enclosure including 12” touch screen (HMI panel)
Omron automation	Local data storage on usb – other connections available as options. Remote maintenance connection, Firewall / VPN Panel remote operation, VNC server

4.4.1 Process control

Equipment	Automatically controlled processes	Manually controlled processes
Broth Cooker	Water fill/Dosing	Raw material loading
	Heating/Cooking/Pressure relief	
	Use of the bottom mixer after filling	
	Cooking programs, according to the recipe	
	Cooling	
	Broth emptying, filtering, transfer to storage tank	
	Fat emptying	
	Bone emptying	
	Hatch control (bottom and top)	
Storage tank	Fill/Emptying/dosing	Hatch control (top)
	Heating	
	Product mixing	
	Weighting	
Batch CIP station	Batch Clean 1: Cooker + Product line	Hatch control (top)
	Batch Clean 2: Product line + Product Filtering enclosure + Storage Tank	
	Batch Clean 3: Product line	
	Batch Clean 4: Product line after storage tank	
	Water fill	
	Heating (full batch)	
	Hot water Press – Fat removal	
	Detergent concentration (full batch)	

4.5 Utilities

AiOS model		AiOS 4300	AiOS 6500	AiOS 9000
Utilities	units			
steam (peak demand)	kg/hour @ 8 bar	300	450	600
electricity	Amp @ 400V	85	85	85
cooling water (peak demand)	litres/hour	500	750	1000
pressurized air	litres/hour	300	300	300

4.5.1 Interfaces and requirements

id	Interface	specifications
1	Steam	DN50, flange EN-1092-1 PN16 @8 bar
2	Condensate	DN32, flange EN-1092-1 PN16 No condensate pumping, max 2 m lift height
3	Tap water (1 bar)	DN25, G1” female thread Max supply pressure 1 bar Sealant water for equipment, cooker coolant water
4	Tap water	DN32, flange EN-1092-1 PN16 Normal pressure, @5-8 bar Cooker water fill, CIP water fill
5	Cooling water from cooker	DN15, G1/2” female thread
6	Pressurized air	Supply pressure min 7bar
7	Electricity	400 V, 3-phase, 50hz
8	Chemicals	DN15, G1/2” female thread Separate lines for alkali and acidic detergent concentrates
9	Drainage pipe, one outlet	76mm dairy grade piping Sealant water Drainage from product line Drainage from tanks, vessels Over flows from tanks/vessels Cooker pressure relief Drainage water may contain small amounts of fat, product, detergents drainage water ph 3…12, temp may > + 40 C
10	CIP liquid outlet to waste water treatment	51mm dairy grade piping, SMS connector pH 3…12 Temperature 3…80 C Max 20 m lift height
11	Safety relief valve	DN50 dairy grade connector, male DIN11851 Installation of the discharge piping according EU Pressure Equipment Directive
12	CIP vessel ventilation	Passive Connection for ventilation system possible
13	Bone screw conveyor	Drainage outlet, Bone outlet

5 UTILITY CONSUMPTION ESTIMATES

5.1 Electricity, steam, compressed air and water

The table below sets out the necessary utilities and energy consumption estimates for a batch.The following calculations assume a power voltage of 400V, 3-phase, 50hz (other voltages and frequencies on request).

AiOS model	Electricity	Steam (3 bar)	Compressed air (5 bar)	Cold water (1bar)
AiOS 4300	20-30 kwh/batch	300 kg / hour to heat up contents to desired cooking temperature. 30kg / hour to maintain desired cooking temperature For example: chicken stock Heat up 1.5 hours, cook 6 hours => 630kg of steam / batch	150 litres/batch	0-500 litres/hour (will depend on recipe)
AiOS 6500	30-40 kwh/batch	450 kg / hour to heat up contents to desired cooking temperature. 45kg / hour to maintain desired cooking temperature For example: chicken stock Heat up 1.5 hours, cook 6 hours => 945kg of steam / batch	150 litres/batch	0-750 litres/hour (will depend on recipe)
AiOS 9000	40-50 kwh/batch	600 kg / hour to heat up contents to desired cooking temperature.60kg / hour to maintain desired cooking temperature For example: chicken stock Heat up 1.5 hours, cook 6 hours => 1260kg of steam / batch	150 litres/batch	0-1000 litres/hour (will depend on recipe)

5.2 CIP washing water

The table below sets out water requirements for CIP washing purposes:

	FLOW IN	FLOW OUT
	Clean water Peak demand	Clean **hot** water Peak demand
CIP: Pre-rinse cycle	400 l / cycle	440 l / cycle*
CIP: Alkali cycle	400 l / cycle	440 l / cycle*
CIP: Acid cycle	400 l / cycle	440 l / cycle*
CIP: post-rinse cycle	400 l / cycle	440 l / cycle**
External washing	60 l/min	60 l/min

*Disposed to customer's waste water systems.
**This clean recyclable water can be re-utilized in the next wasch cycle as pre-rinse water.

6 DESIGN STANDARD AND REQUIREMENTS

The design of the equipment meets the criteria of the following legislation and standards

Legislation

The design of equipment is based on the following legislation:

Country/Region	Legislation
Finland	EU legislation/directives

Design standards

The design of equipment is based on the following standards:

Country/Region	Design standards
Europe	SFS-EN ISO 12100:2010 SFS-EN 1672-2:2005 SFS-EN ISO 14159:2008

Other possible standards include ASME, SELO, CSA. If you require a specific standard, please let us know.

CE Marking

The equipment provided by Coctio will be CE Marked.

Environmental conditions

The design of equipment is based on the following climate conditions in the process room

Parameter	Min. value	Max. value	Unit
Temperature	15	45	°C
Humidity	30	70	%

If you have any questions, do not hesitate to contact us!

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