Craft Brewery

40.000 hl, annually

InitialProposal 2023

BASIC CALCULATIONS

With expected final annual capacity of 40,000 hl and fermentation of 7-14 days plus maturation of 7-14 days, average production time is 20 days. Five days in a week are expected for brewing, nights for automatic cleaning of the Brewhouse.

Final annual capacity with 50 weeks in a year means:

800 hl per week. This is 160 hl per day.

Calculations are made for 200 hl per day on double shifts.

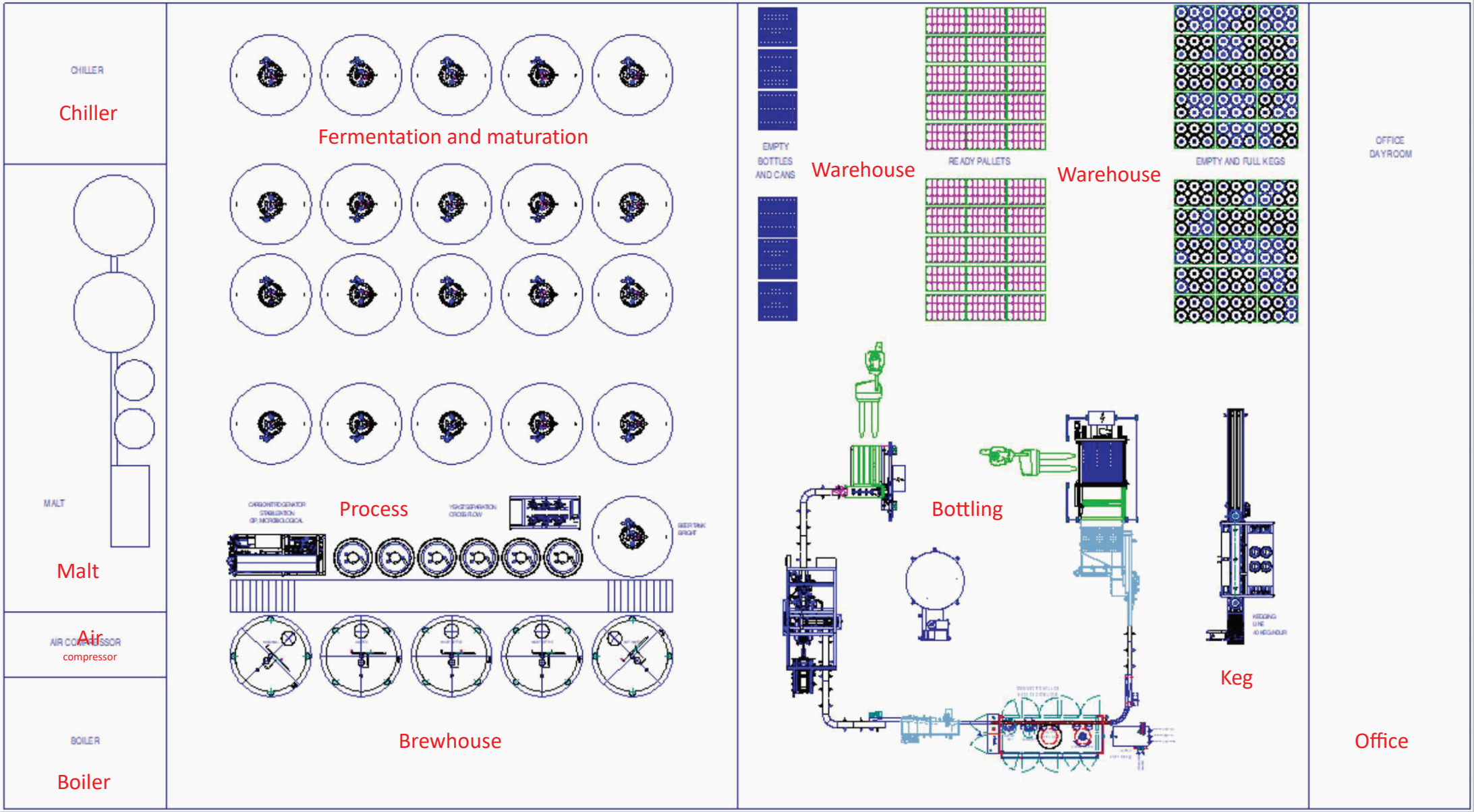
TANKS CAPACITY

As most efficient way of brewing is „non-stop“. It is recommended to size Brewhouse with capacity of 200 hl per day. Due to possible wide variety of beer types, it is recommended to CIP Brewhouse every day at the end of the day, automatically. For first phase, 100 hl tanks are recommended. In second phase, Brewhouse could be extended, and 200 hl tanks could be added. From efficiency point of view, it will always be better to brew 4 days in a week and stop for next week than two days in every week. As Brewhouse should be designed for multiple brews per day, its productivity could be reduced. Recommended Brewhouse size is therefore 25 hl with initial four batches per day with possibility of future extension to eight per day. Larger brewhouse means oversized cargo with excessive price.

For requested 20 days of fermentation plus maturation, minimum 20 tanks are needed.

In initial phase, 5 fermenters plus 5 maturation tanks are expected. For packaging, one Bright Beer tank.

BREWERY LAYOUT 45 X 25 METERS



BREWHOUSE, 5 VESSEL, FULLY AUTOMATIC

Fully automatic brewhouse brings safe and consistent operation. Brew master duty is focused to important technological checks, rather than operations what can be automated. Smaller batches allows more flexibility for different beers. In case of larger brewhouse, main obstruction is transportation of oversized cargo what become very expensive. On site construction of pans is also not an option as that also create excessive costs and jeopardize finish of pans.

BREWHOUSE, MASHING

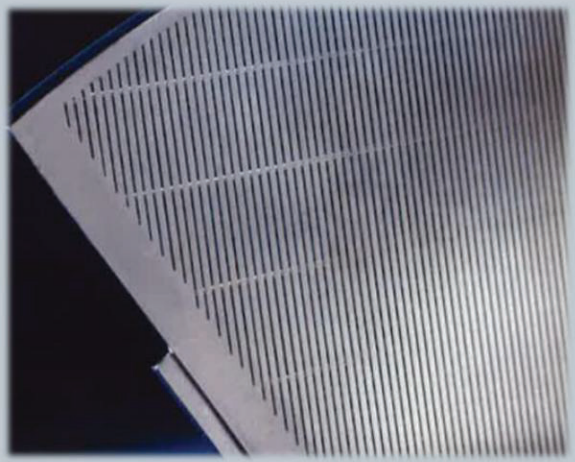
Malt is transported into mesh kettle with conveyor from malt room where weigher and mill is. Number of silos needs to be determined, but usual setup are two main silos for common malt and two smaller silos for special malts. Silos are on load cells to visualize its volume.

Each batch has its own recipe what determine amount and type of malt. That malt is transported to check weigher and than to four drum mill.

BREWHOUSE, LAUTER TAN

Lauter tun is most complex of the vessels. Its efficiency determinates efficiency of whole brewhouse. Its cycle is the longest so, it determinates number of batches per day. Typical cycle of lauter is 2,5 hours including transport of mash and automatic removing of spent grains.

False bottom is made trapezoidal holes with opening up to 13%. Spent grain is thrown at the bottom to pump what transport it outside of brewery.



BREWHOUSE, COLLECTOR AND KETTLE TUN

Wort is transferred into collector what is additional vessel to gain time. During this transfer, wort temperature rise up close to boiling temperature.

From collector, wort is transferred into kettle tun for boiling. Boiling usually takes 90 minutes and require three additions of hops. Hops addition is automatic, based on recipe. Weight of hops and their content is prepared by brew master. Boil itself is in recirculation into inner mushroom to improve heat transfer.

BREWHOUSE, WHIRLPOOL, WORT COOLING, AERATION

Wort is transferred into whirlpool after boiling to forcing denser solids into a cone. This is to remove coagulated proteins, residuals of hops etc.

From whirlpool, wort is cooled down with against ice water on high efficient plate heat exchanger – wort cooler. After cooling, sterile air is dosed as well as yeast.

FOUR BATCHES PER DAY

Mashing	Lauter	Collector	Boiling	Whirlpool	Cooling
2,0 h					
	2,5 h				
		1,0 h			
			2,0 h		
				1,5 h	
					1,0 h

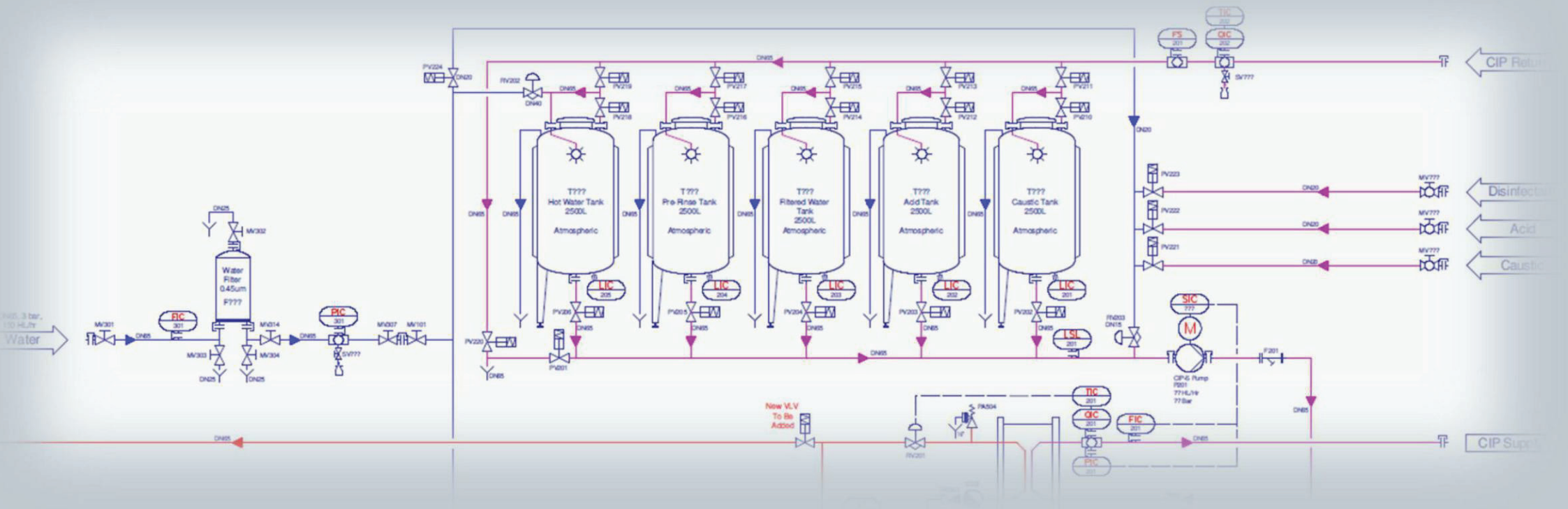
One batch takes 8 hours maximum. Every other batch leaves in 2,5 hours. For smoother process, second lauter and mash tun is recommended when running non-stop.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
			Batch 1																				
					Batch 2																		
								Batch 3															
										Batch 4													
													Batch 5										
															Batch 6								
																		Batch 7					
																				Batch 8			

Single brewhouse is capable of 5 batches including CIP or 8 batches non-stop.

CIP CAPACITY

Central CIP system is recommended. Brewhouse will require its detergent tank as well as fermenters. Packaging needs its own detergent tank too. It is recommended to use six tank system: brewhouse caustic, fermenters acid, packaging caustic, packaging acid, hot water and recovery water.



CIP DAILY TASKS

CIP Task									
Filling lines	1,0 h								
Yeast Filter + BBT		1,0 h							
Fermenter			1,0 h						
Maturation tank				1,0 h					
Yeast filter					1,0 h				
Fermenter						1,0 h			
Filling lines							2,0 h		
BBT								1,0 h	
Brewhouse									2,0 h

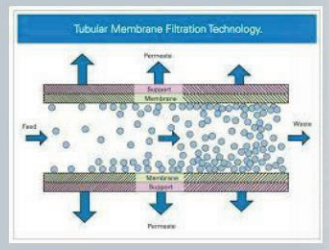
This is daily schedule for 40,000 hl annual capacity. Single loop CIP is sufficient. Fully automatic CIP is recommended.

MICROBIOLOGICAL STABILIZATION

For microbiological stability, flash pasteurizer is recommended. It is more efficient than tunnel pasteurizer, use far less energy and it is less invasive for beer. Flash pasteurizer could be combined with nitrogenation and carbonation for final product stability.

Example of combined unit: CIP, flash pasteurizer, sterile filtration, carbonator, and nitrogenator

PROCESS FLOW

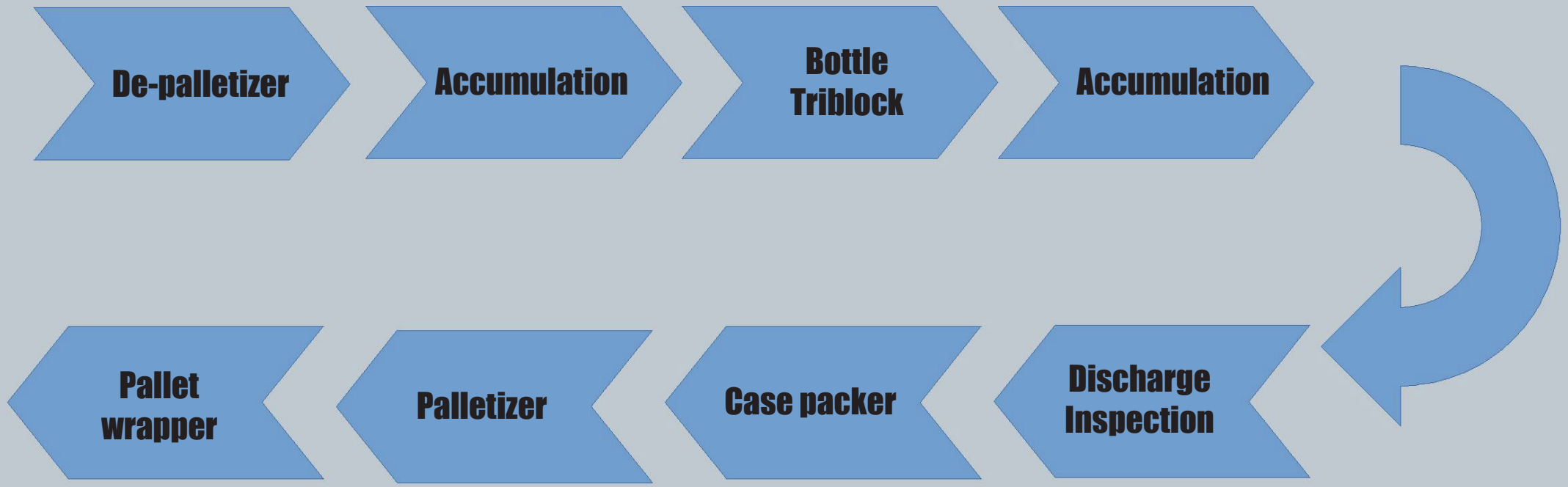
Fermentation	Maturation	Yeast separation	BBT	Pasto Carbo Nitro	Packaging
					 
7-14 days	7-14 days	200 hl / 4h	One shift	60 hl/h	40 kph + 200 cpm

KEGGING

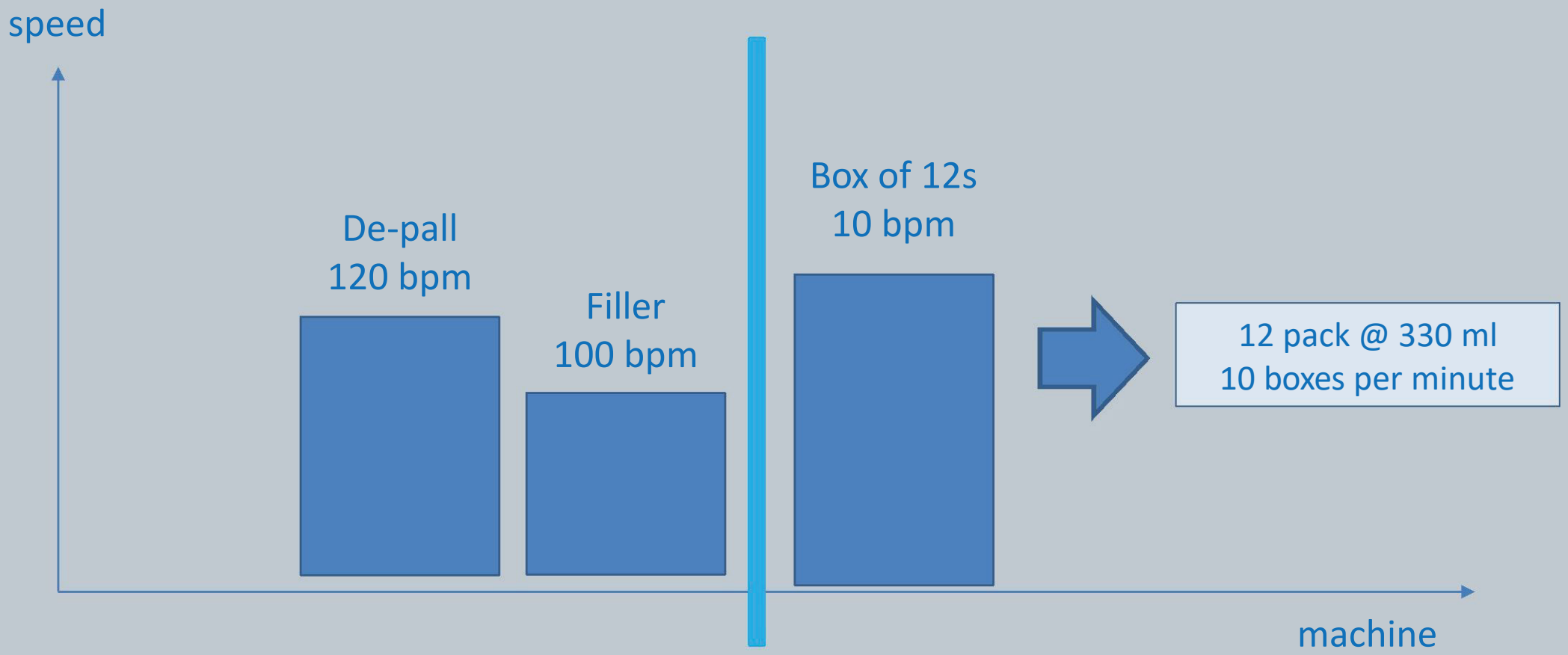
KEG production is estimated to 50% of volume with 50ltr keg. With 200 hl per shift, this is 10,000 litres per shift or approximately 200 keg per day. For 5 hours of production, this requires 40 keg per hour machine. Due to high variety of beers, it is recommended to use machine with pre-cleaning head to guarantee removal of all yeast sediments. Combination of caustic and acid is recommended. Minimum 2 cleaning heads must be used. Ideally, three cleaning heads with one filling head.

CANNING LINE - REQUIREMENTS

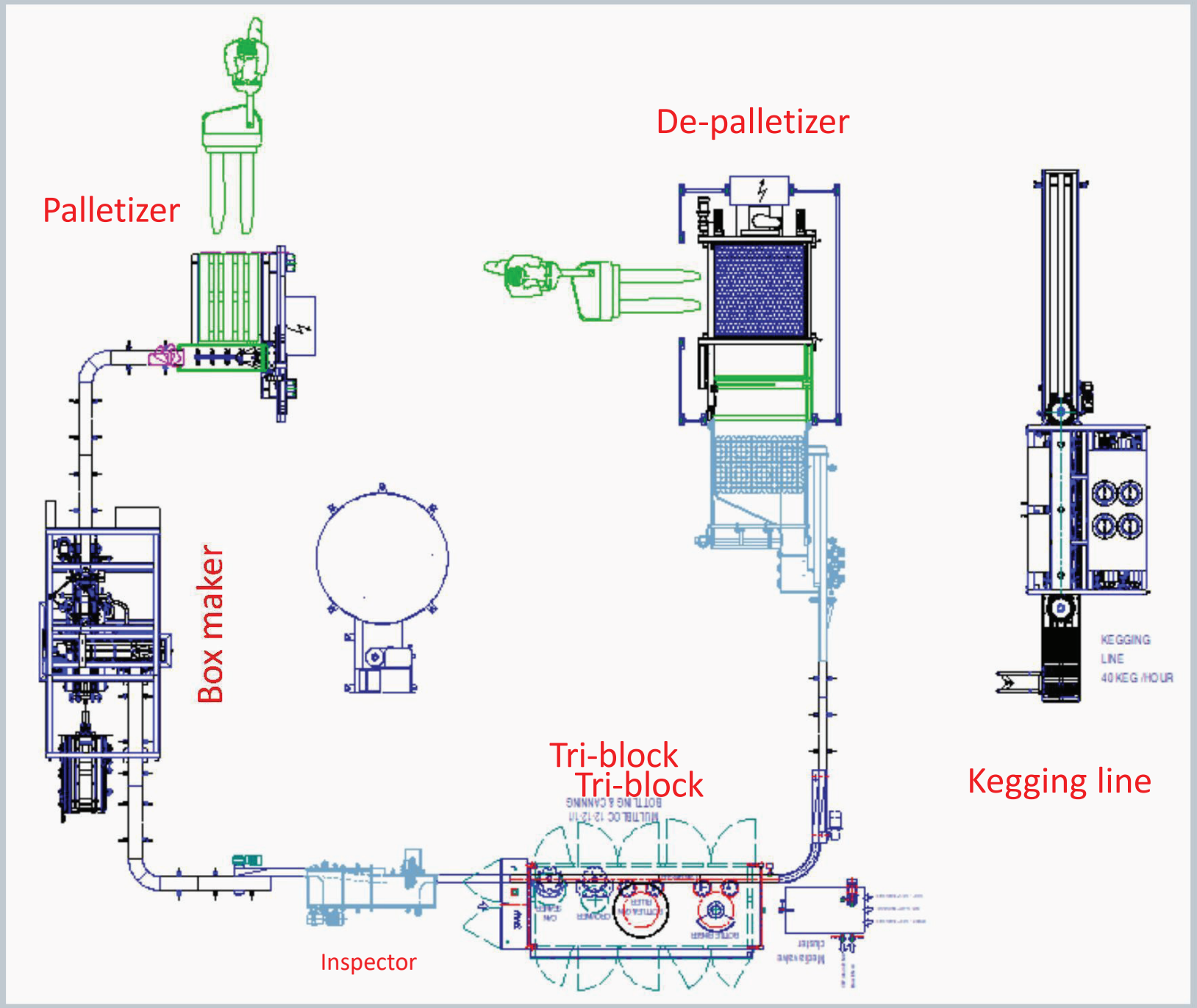
Expected bottle production be 50% with 330 ml. With 200 hl per shift, this is 10,000 litres per shift or 30,000 cans of 355 ml. For 7 hours of production, this requires 80 bottles per minute. Half of capacity is possible for initial phase with double shifts when maximum capacity is reached.



INDIVIDUAL MACHINE CAPACITY – 100 CPM



MACHINES CAPACITIES ARE CALCULATED BASED ON V-GRAPH WITH INCREASE OF 7-12% WHAT IS MINIMUM GOOD ENGINEERING PRACTICE



LINE LAYOUT BOTTLING AND KEGGING 100 BPM 40 KPH 18X15 METRES

DE-PALLETIZER

High-level bottle de-palletizer. Pallet with bottles is lifted to fixed high level conveyor and swept to it. Interlayer is automatically removed and stored in size magazine. Bottles continuous to conveyors.

Optionally, pallets could be loaded automatically. Also, top frame could be removed automatically, if used. Straps could be removed automatically, if used.

Nominal speed: 250 bpm
Minimum conveyor accumulation: 2 minutes
Minimum accumulation area: 2 square meters

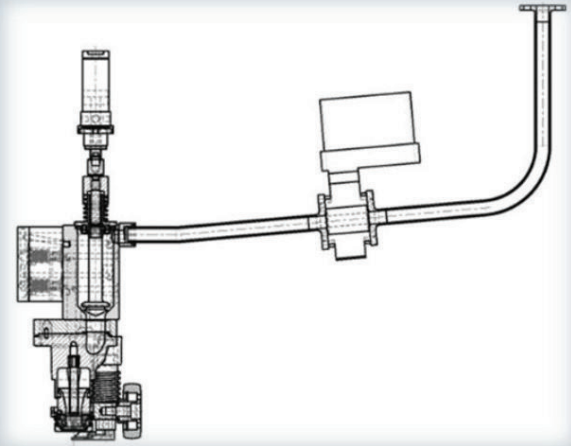
Dimension of Pallets to be specified.

FILLER

Counter pressure, volumetric, electronic filling machine. Filling volume is metered with electromagnetic flow meter. Back pressure control is with electronic valves. Absolute control over CIP with valve-by-valve detail analysis. Automatic height adjustment.

Foaming system is integrated. It is recommended to keep filler in sterile chamber and use flash pasteurizer.

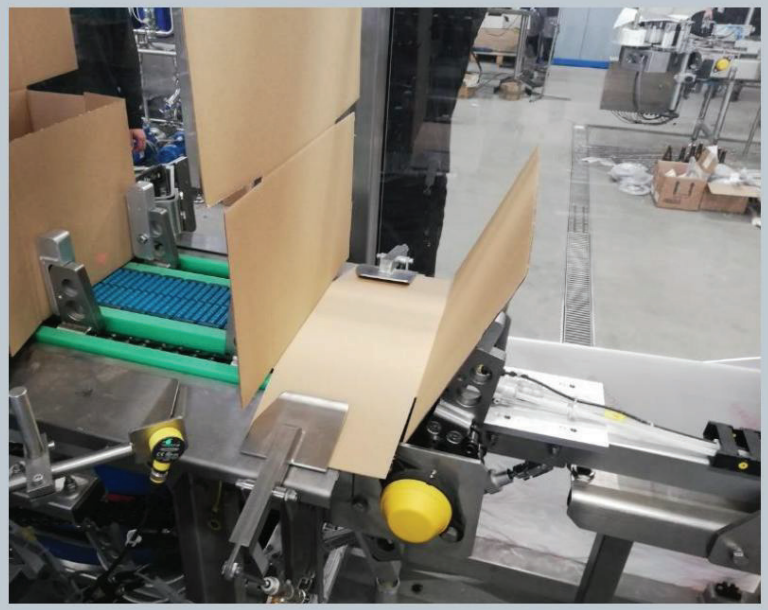
For 100 bpm, 24 filling valves is recommended. For 50 bpm, 12 filling valves are needed. Number of valves allows filling with higher temperature and for wider range of beer types.



CLUSTER / TRAY PACKER

Type of box must be defined first. Cheops case packers are hot melt systems for different case types. Cardboard is picked up from magazine and inserted onto a chain conveyor where bottles are loaded. Carton is wrapped around cans and sealed using hot glue.

Nominal speed, clusters: 20 – 40 per minute
Nominal speed, trays: 20 per minute



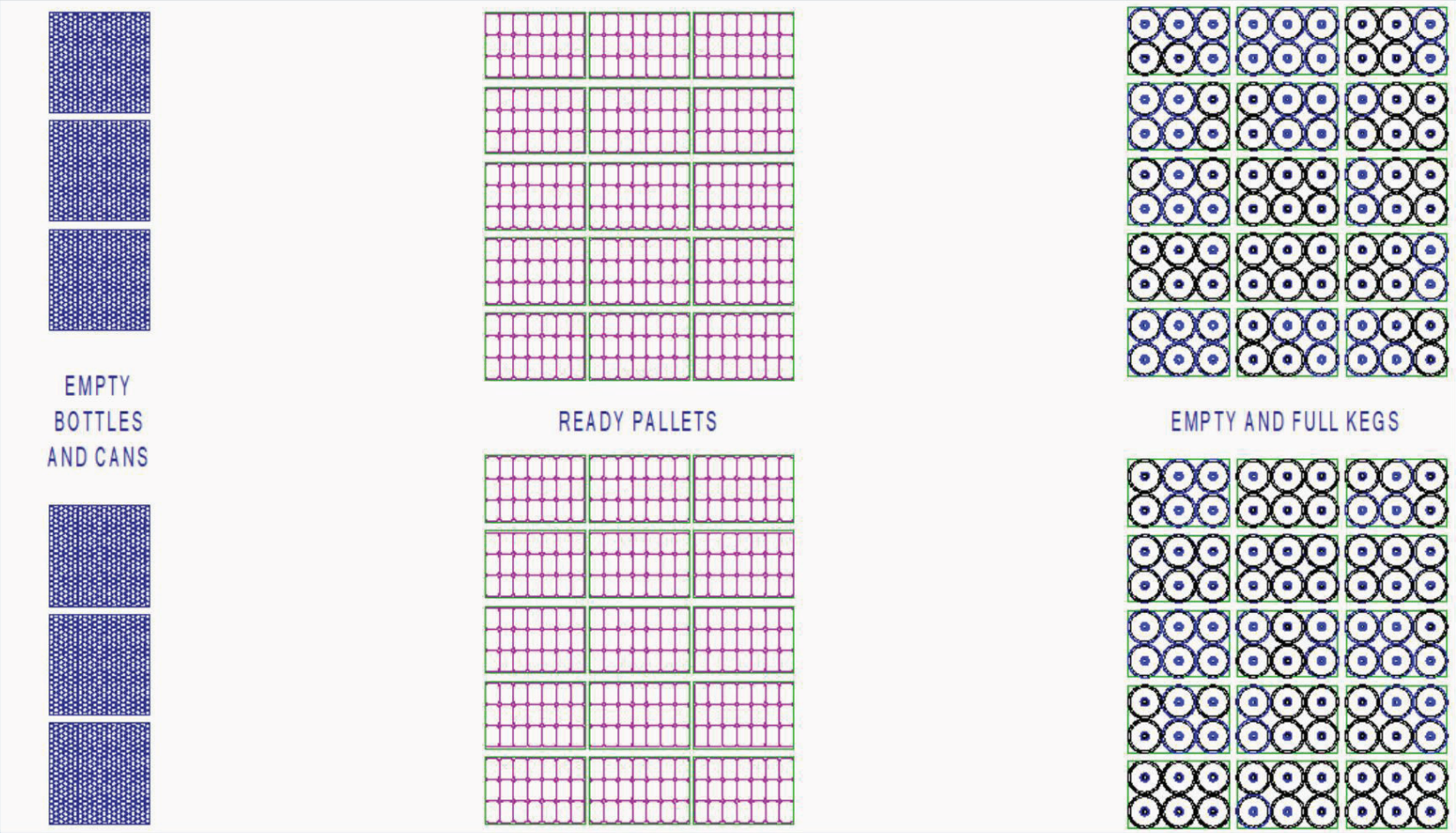
CONVENTIAL PALLETIZER

For this speed, conventional palletizer is recommended. As all packaging formats ends with one box size with 12 bottles with same diameter. Palletizer works with rows – this means it picks up two or three trays depends to stacking patter in time. Rows create complete pattern on pallet.

Nominal speed with is: 10 trays per minute

Same arm what picks up trays can load interlayers, when used. For lower line speed, this machine can operate semi-automatically, this means, operator position empty pallet, machine palletize, and operator removes full pallet.

WAREHOUSE



Sufficient warehousing area is needed. Not only for empty cans, ready pallets and kegs, but also for packaging material – clusters, trays, film for pallet wrapper etc. Total warehousing area needs to be calculated based on sales model and number of SKUs. This example is therefore illustrative.

contacts

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