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CLIENT: **TAKEDA**	
PROJECT **BURITI EPCMV PROJECT**	

DRUG PRODUCT
CHILLED GLYCOL SYSTEM (PROCESS)
DESCRIPTION REPORT

1	25MAY2022	ISSUED FOR CONSTRUCTION AS PER N+1	PTC	MPA	MSS
0	18AUG2021	ISSUED FOR CONSTRUCTION	MPA	LFF	MSS
A	28JUN2021	90% DD ISSUE	LID	CCO	MSS
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1. REVISION HISTORY

Rev	Reason For Change
A	90% DD ISSUE
0	FLOWRATES AND DIAMETERS HAVE BEEN UPDATED. AS WELL AS CALCULATIONS. ALL DATA WERE UPDATED ACCORDING TO IPS INFORMATION. EQUIPMENT TC-6404 WAS ADDED.
1	AS PER N+1 UPDATE

2. PURPOSE

This document is intended to describe the process characteristics for the Chilled Glycol System (Process), Building 7A – Final Drug Product – FDP, intended to Buriti Project, located at Hemobrás site in Goiana – Pernambuco state, Brazil.

3. REFERENCE

The following documents were used as reference:

Item	Number	Process Equipment List – Building 7A
01	PRD-MEC-CLC-003	CHILLED WATER SYSTEM (PROCESS) CALCULATION REPORT
02	7A-M-0-5-45	P&I DIAGRAM DRUG PRODUCT CHILLED WATER GENERATION SYSTEM
03	7A-M-0-5-46	P&I DIAGRAM DRUG PRODUCT CHILLED WATER LOOP DISTRIBUTION SYSTEM (1/2)
04	7A-M-0-5-53	P&I DIAGRAM DRUG PRODUCT CHILLED WATER LOOP DISTRIBUTION SYSTEM (2/2)

4. PROCESS DESCRIPTION

The Chilled Water Generation System was designed to meet all the equipment in building 7A and will be located on the second floor.

The thermal load required for this building is 122 TR. To meet this thermal load, the generation system will have the following equipment:

- 1 chiller of 150 TR (one chiller operating);
- 1 primary pump (one pump operating);
- 1 buffer tank;
- 1 make-up system;
- 1 air separator;
- 1 chemical dosing system with:
  - a chemical dosing tank;
  - a chemical dosing pump;
  - a spill containment pallet.

- 1 secondary pump (one pump operating).

The distribution system for process equipment was designed for chilled water service, but with the possibility for future implementation of a glycol mixture to replace chilled water.

The chilled water system will have the following conditions:

Chilled water supply = 5 °C / chilled water return (glycol) = 9.0 °C

If this temperature will not sufficient to keep the process working correctly, the installation shall be prepared to operate with Propylene Glycol.

In this case, the chilled water system will have the following conditions:

Chilled water supply (glycol) = 1 °C / chilled water return (glycol) = 5.0 °C

To guarantee a balancing and a good distribution, static balancing valves were considered throughout the system:

- At by-passes at the end of the distribution headers;
- At the beginning of the distribution headers;
- At the process equipment inlet;
- At the chiller´s outlet.

4.1 CHILLER

The chilled water system will have one chiller (PCH-7A-1) of nominal capacity of 150 TR (one cjiller operating).

The simultaneous peak load is 1,462,013.0 BTU/h (368,667.0 kcal/h) and it is equivalent to 122 TR.

So, the chiller has an oversizing of 18.4 % (28 TR) of thermal load, where the excess of flow rate is diverted to a future expansion (tie-in).

The chiller has the following instruments:

EQUIPMENT	FLUID	INLET LINE		OUTLET LINE	
		INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
PCH-7A-1	CHILLED WATER	TIT-980075	Temperature Indication High Temperature Alarm Low Temperature Alarm	TIT-980080	Temperature Indication High Temperature Alarm Low Temperature Alarm
		FIT-980075	Flow Rate Indication Low Flow – shut down the chiller	XV-980080	Automatic Valve to be closed when the chiller is shutted down
		PIT-980075	Pressure indication	PIT-980080	Pressure indication
		PDSHL-980051 – High Differential Pressure or Low Differential Pressure shut down the chiller			
	COOLING WATER (1)	TIT-980052	Temperature Indication High Temperature Alarm Low Temperature Alarm	TIT-980056	Temperature Indication High Temperature Alarm Low Temperature Alarm
		-	-	XV-980056	Automatic Valve to be closed when the chiller is shutted down

EQUIPMENT	FLUID	INLET LINE		OUTLET LINE	
		INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
		-	-	FIT-980056	Flow Rate Indication Low Flow – shut down the chiller
		PIT-980052	Pressure indication	PIT-980056	Pressure indication
		PDSHL-980053 – High Differential Pressure or Low Differential Pressure shut down the chiller			

Notes:

1. For cooling water system, see the Description Report (PRD-PRO-MDE-008 - Drug Product – Cooling Water System Description Report).

4.2 PRIMARY PUMP

The primary pump (P-PCH-7A-1) is centrifugal and was designed for a flow rate of 1,900 LPM (114 M3/HR) and a manometric height of 18 mcl. For this operating condition the pump was selected with a motor of 9.2 kW.

The primary pump operates at a fixed speed for the design condition and for the maximum condition. The excess flow rate for the other conditions of the system will be directed to supply the Chiller through the Buffer Tank where the overflow occur from the cold side to the hot side of the tank.

The pump has the following instruments:

EQUIPMENT	SUCTION LINE		DISCHARGE LINE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
P-PCH-7A-1	TIT-980061	Temperature Indication High Temperature Alarm Low Temperature Alarm	-	-
P-PCH-7A-1	PI-980063	Pressure Indication	PI-980068	Pressure Indication
	SC-980063 – Speed controller for start-up of the pump			

4.3 BUFFER TANK

The Buffer Tank (BT-7A-1) was designed for an autonomy of 3 minutes to guarantee the thermal load when the chiller shuts down, considering that the chiller´s supplier recommended the minimum stabilization time of 2 minutes.

The tank was divided in two sides (cold side and hot side).

The design flow rate of the chilled water system considered for the sizing of the tank was 1,900 LPM (114 M3/HR).

That way, the buffer tank will have a total volume of 12 M3 (6 M3 each side).

The buffer tank has the following instruments:

EQUIPMENT	COLD SIDE		HOT SIDE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
BT-7A-1	LG-980070	Level sight glass	LG-980069	Level sight glass
	LIT-980052	Level Indication High Level – close the make-up valve LV-9800227) and stop de dosing pump (BM-7B-1) Low Low Level – open the make-up valve LV-9800227) and start de dosing pump (BM-7B-1)	LIT-980051	Level Indication High Level – close the make-up valve LV-9800227) and stop de dosing pump (BM-7B-1) Low Low Level – open the make-up valve LV-9800227) and start de dosing pump (BM-7B-1)
	-	-	FIT-980060	Flow Rate Indication Low Flow Alarm
	-	-	PIT-980060	Pressure Indication
	-	-	TIT-980060	Temperature Indication High Temperature Alarm Low Temperature Alarm

4.4 MAKE-UP SYSTEM

The make-up system will monitor and maintains system pressure, replacing water whenever there is a loss in the system.

The control of the replacing water is made by the level of the buffer tank (LIT-980052 and LIT-980051 – for cold and hot side), that opens or closes the make-up line valve (LV-9800227) whenever the level of the tank fluctuates.

4.5 AIR SEPARATOR

The air separator is used to eliminate continuously the air dissolved at the chilled water. It is used to avoid noise problems, corrosion, pump cavitation and mechanical breakdowns.

It was designed for the flow rate of 1,900 LPM (114 M3/HR) and will be installed at the primary pumps suction line.

The pressure drop of the air separator, considering the flow rate and the diameter of the line is 0,04 bar, according to the supplier information.

4.6 CHEMICAL DOSING SYSTEM

The chemical dosing system is efficient to prevent slime generation, scaling, corrosion and to remove already formed slimes of the chilled water system.

The system is composed for one chemical dosing tank (TK-7A-4), one chemical dosing pump (BM-7A-2) and one spill containment pallet (CN-7A-4).

The chemical dosing system has the following instruments:

EQUIPMENT	INSTRUMENT	FUNCTION
TK-7A-4	LSL-9800237	Low Level Alarm
BM-7A-2	HS-9800227	Stops and starts the pump (LSH-980051 / LSH-980052 – LSLL-980051 / LSLL-980052)
CN-7A-4	LSH-9800236	High Level Alarm

4.7 SECONDARY PUMP

The secondary pump (P-PCH-7A-3) is centrifugal and was designed for a flow rate of 1,900 LPM (114 M3/HR) and a manometric height of 21 mcl. For this operating condition the pump was selected with a motor of 11 kW.

The secondary pump will forward the chilled water until the process equipment of building 7A.

The pump is controlled by a differential pressure transmitter PDIT-9800163, maintaining constant the pressure drop of 1.38 bar at the main distribution header. The instrument is installed at a distance of 2/3 of the main distribution pipe total length, to guarantee a good control.

The pump has the following instruments:

EQUIPMENT	SUCTION LINE		DISCHARGE LINE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
P-PCH-7A-3	TIT-980086	Temperature Indication High Temperature Alarm Low Temperature Alarm	-	
P-PCH-7A-3	PI-9800160	Pressure Indication	PI-9800163	Pressure Indication
	SC-9800163 – Speed controller of the pump (PDIT-9800163)			

4.8 BALANCING VALVES

Along the chilled water system, balancing valves were considered to guarantee a balancing and a good distribution, as below:

- At by-passes at the end of the distribution headers;
- At the beginning of the distribution headers;
- At the process equipment inlet;
- At the chiller´s outlet.

The manual valves will be manually adjusted in the field, the valve must be adjusted to the design condition, according to the numbers of turns to be defined by manufacturer, according to the dimensioning performed in the Calculation Report.

4.9 CONSUMERS

EQUIPMENT	TAG	FLOW RATE (M3/hr)	INLET PRESSURE (BARG)	OUTLET PRESSURE (BARG)	Dp total (Note 1) (BAR)
Depyrogenation Tunnel	TE-1102	5.0	2.12	0.51	1.61
Lyo nº1	LYO-1105	13.3	2.16	0.63	1.54
Lyo nº2	LYO-1106	13.3	2.11	0.75	1.36
WFI Still	MES-6401	14.4	3.16	2.03	1.14
Clean Steam Generator w/Sample cooler	CSG-6501	1.5	3.16	2.03	1.12
Point of Use Cooler to Wash Sink	TC-6402	7.2	2.22	0.78	1.44
Point of Use Cooler to Buffer Prep	TC-6403	7.2	2.23	1.03	1.20
Point of Use Cooler to Clean Equipment	TC-6404	7.2	2.86	1.61	1.25
Autoclave	AT-9002	10.0	2.19	0.80	1.38
Autoclave	AT-9001	10.0	2.20	0.75	1.45
Utility Panel for 50L Formulation Vessel No. 2 (Maint.)	UP-3802	2.3	2.33	1.01	1.32
Utility Panel for 50L Formulation Vessel No. 3 (Maint.)	UP-3803	2.3	2.34	1.05	1.30
Utility Panel for 50L Formulation Vessel No. 4 (Maint.)	UP-3901	2.3	2.28	0.88	1.40
Utility Panel for 50L Formulation Vessel No. 5 (Maint.)	UP-3902	2.3	2.29	0.92	1.38
Formulation Vessel TCU	TCU-3903	2.3	3.18	2.12	1.07
Sample Cooler	TC-6501	0.4	2.47	1.15	1.32
Sample Cooler	TC-6502	0.4	2.50	1.22	1.27

Notes:

1. Total pressure drop considering 0,5 bar at the valve, 0,5 bar at the equipment, and the rest at the balancing valve, as shown at the calculation report (PRD-MEC-CLC-003 – Chilled Water System (Process) Calculation Report).