

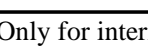


## Chemical Consumption List for Cooling Tower Package (81-W-501)

Code 1	<input checked="" type="checkbox"/> No Comment/Approved No comment and the document is released for Manufacturing.					
Code 2	<input type="checkbox"/> Approved With Comments VENDOR shall correct, revise and resubmit the document. The document can be released for Manufacturing if changes incorporated.					
Code 3	<input type="checkbox"/> COMMENTED VENDOR shall correct, revise and resubmit the document by the date specified. The document shall be revised under the Status of "R: Revised Issue". All corrected documents shall be resubmitted before starting the Manufacturing Process In this case, VENDOR shall not proceed with subsequent work until receiving Code 1 or Code 2 or No Code-No Comment from Contractor /Owner.					
Code 4	<input type="checkbox"/> Not Accepted (Rejected) VENDOR shall re-work/re-design/re-specify the contents of the documents according to the comments/ reasons for rejection. All corrected documents shall be resubmitted before starting the Manufacturing Process In this case, VENDOR shall not proceed with subsequent work until receiving Code 1 or Code 2 or No Code-No Comment from Contractor. Vendor shall re-submit the documents with upper revision.					
NO CODE	<input type="checkbox"/> NO Code (Only for "FOR INFORMATION" Documents and "As Built DWGs") Document has been submitted for Contractor 's Information (FI). Consistency, completeness and correctness of document content is Vendor/Sub-Contractor's responsibility Contractor will implement the comments on the electronic copy of Vendor/Sub Contractor documents and resend it back to Vendor/Sub-Contractor under the Comment Sheet Form (attachment 4). The codes [review notes] (as described above) will be signified on the Cover of Documents and also inside the Comment Sheet Form by Contractor.					
Above checking results by PSP shall in no way relieve Vendor of any liability, obligation and responsibility out of the purchase order and the mutual agreement in writing						
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CV	PC	PI	EL	SA	HV	TL
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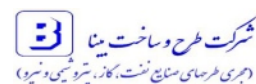
04	24-FEB-2025	R	Issued for Information	A.M.	A.M.	M.J.	A.K.
03	09-FEB-2025	R	Issued for Information	A.M.	A.M.	M.J.	A.K.
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Rev.	Date	Status	Purpose of Issue	PRE'D	CHK'D	APR'D	AUT'D



# PROPANE DEHYDROGENATION PROJECT (PDH)

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Item	Process Description	Figure	Unit	chemical name
1	Biocide	0.325	m <sup>3</sup> /hr	LO-201 / 204
2	Corrosion inhibitor	0.014	m <sup>3</sup> /hr	LO-403
3	dispersant	0.009	m <sup>3</sup> /hr	LO-101
4	Sodium carbonate	0.018	m <sup>3</sup> /hr	-----
5	Sodium Hypochlorite	0.150	m <sup>3</sup> /hr	-----

#### 1. chemical consumption

##### 1.1 dispersant Package



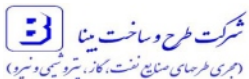

##### 1.1.1. Dispersant dosage calculation (continuous dosing operation)

Dispersant improve effectiveness of chlorination. Its block deposit formation of suspended microorganism.

In order to deal with this disadvantage, the chemical treatment program requires the addition of dispersant that will disperse the slime in the water. by removing slime mass. The dispersant accomplishes the following:

- Allow the hypochlorite solution to come in contact with and kill more bacteria.
- Reduce the potential for scale and fouling because less of the matrix is available for buildup.
- Reduce the possibility for the existing of anaerobic corrosive bacteria with grow under the biomass where the oxygen is deleted.

Two injection pumps, one in service and the other one is as standby (1+1) has been foreseen to inject dispersant within basin-sump interconnecting channels. The injection flow rate will be adjusted with stroke knob on pump by operator. Consumption of dispersant dosage range is 50-100 ppm, and based on 89.8 m<sup>3</sup>/hr blow down water in accordance with water analysis obtained from chemical manufacturer.

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Dispersant consumption at Normal condition (24hr) will be:

- Dispersant consumption per hour =  $100 \times 10^{-6} \times 89.8 \times 10^3 = 8.98 \text{ kg/hr}$
- Dispersant dosing rate =  $8.98 \text{ kg/hr} \approx 9 \text{ kg/hr}$

As per physical specification that submitted with LOUITS CHEMICAL density of Dispersant is  $1 \pm 0.1 \text{ kg/lit}$  so volumetric and mass flow rate figures are considered the same.

- Volumetric Dispersant dosing rate  $\approx 9 \text{ lit/hr}$

## 1.2. Corrosion Inhibitor Package

### 1.2.1. Corrosion inhibitor dosage calculation (continuous dosing operation).

For prevention of corrosion protection and protection of carbon steel, anti-corrosion chemical is used.

Two injection pumps ,one in service and the other one is as standby (1+1) have been foreseen to inject corrosion inhibitor in basin to sump interconnecting channel. The injection flow rate will be adjusted with stroke knob of pump by operator. Consumption of corrosion inhibitor is designed 50-150 ppm, selected 150ppm, based on  $89.8 \text{ m}^3/\text{hr}$  blow down water in accordance with water analysis obtained from chemical manufacturer.




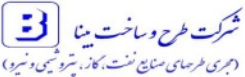

Corrosion inhibitor consumption at Normal condition (24hr) will be:

- Corrosion inhibitor consumption per hour =  $150 \times 10^{-6} \times 89.8 \times 10^3 = 13.47 \text{ kg/hr}$   
=  $14 \text{ kg/hr}$

Corrosion inhibitor dosing rate =  $14 \text{ kg/hr}$

As per physical specification that submitted with LOUITS CHEMICAL chemical supplier density of corrosion inhibitor is  $1 \pm 0.1 \text{ kg/lit}$  so volumetric and mass flow rate figures are considered the same.

- Volumetric corrosion inhibitor dosing rate  $\approx 14 \text{ lit/hr}$

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### 1.3. Biocide package

Biocide package provides excellent control of microbiological growth & disinfection. It has the following feature.

- Easy operation
- Moderate cost
- High efficiency for different organics
- Disinfection

#### 1.3.1. Biocide dosage (Shock, 240 min in each 2 weeks)

Two types of biocides will be dosage sequentially for avoiding biological adaptation. biocide will be shock dosage per 2 week. (Two biocide shall be dosage with shock wise. Type one for first month and type two for the next month).

Two injection pumps , one in service and the other one is standby (1+1) have been foreseen to inject biocide.

Consumption of biocide is designed based on 100ppm, based on 13000 m<sup>3</sup> water hold in piping and basin.

Biocide consumption at Normal condition will be:

$$\text{Biocide consumption} = 100 \times 13000 = 1300000/1000 = 1300 \text{ kg}$$

$$\text{Retention time: Hold up water / circulating water} = 13000 \text{ m}^3 / 30000 \text{ m}^3/\text{hr} = 26 \text{ min}$$

$$\text{Mass flow rate for dosing pump in 26 min} = (60 / 26) \times 1300 = 3000 \text{ kg/hr}$$




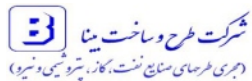

$$\text{Mass flow rate for dosing pump in 240 min} = (26 / 240) \times 3000 = 325 \text{ kg/hr}$$

$$\text{PUMP CAPACITY (each pump)} = \text{DOSAGE@ RETENTION TIME} = 325 \text{ kg/hr}$$

As per physical specification that submitted with LOUITS CHEMICAL chemical supplier density of biocide is 1±0.1 kg/lit so volumetric and mass flow rate figures are considered the same.

- Volumetric biocide dosing rate ≈ 325 lit/hr

### 1.4. Sodium Hypochlorite Package

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#### 1.4.1. Sodium hypochlorite dosing calculation (continuous operation)

Sodium Hypochlorite package provides excellent control of microbiological growth & disinfection. It has the following feature.

- Better heat transfer
- Easy operation
- Low cost
- Effective for different organic compound with high efficiency
- Disinfection

Two injection pumps , one in service and the other one is as standby (1+1) have been foreseen transfer Calcium Hypochlorite in basin to sump interconnecting channel. The injection flow rate will be adjusted with stroke knob of pump by operator.

Sodium hypochlorite commercial is liquid with 10% concentration. Consumption of Hypochlorite dosage range is 0.3-0.5 ppm, and based on 30000 m<sup>3</sup>/hr circulating water in accordance with water analysis obtained from chemical manufacturer.

Hypochlorite consumption at normal will be:

- Hypochlorite consumption per hour =  $0.5 \times 10^{-6} \times 30000 \times 10^3 / 0.1 = 150 \text{ kg/hr}$




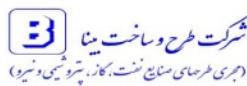

As per physical specification that submitted with LOUYS CHEMICAL chemical supplier density of sodium hypochlorite is  $1 \pm 0.1 \text{ kg/lit}$  so volumetric and mass flow rate figures are considered the same.

- Volumetric sodium hypochlorite dosing rate  $\approx 150 \text{ lit/hr}$

#### 1.5. Sodium carbonate Package

ALK control should be carried out in cooling water for the control metallic corrosion.

So ALK control will be done with adding sodium carbonate and / or calcium hydroxide.

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Since in chemical dosing system we need minimum 50 ppm alkalinity, so we will add 50 ppm alkalinity to the system by adding sodium carbonate .

#### 1.5.1.Sodium carbonate Dosage (when required)

When the acid is injection over of required size or makeup water pH is low , sodium carbonate should be inject for neutralization pH (pH should be 7.5 – 8.3) Two injection pumps one in service and the other one is as standby (1+1) have been foreseen to inject Sodium carbonate in basin to sump interconnecting channel. The injection flow rate will be adjusted with stroke knob of pump by operator. Consumption of Sodium carbonates (20%) designed 40-60 ppm, selected 40ppm, based on 89.8 m<sup>3</sup>/hr blow down water in accordance with water analysis obtained from chemical manufacturer

Sodium carbonate consumption at Start up Condition (24hr) will be:

$$\begin{aligned} \text{Sodium carbonate consumption per hour} &= 40 \times 10^{-6} \times 89.8 \times 10^3 / 0.2 = 17.9 \text{ kg/hr} \\ &= 18 \text{ kg/hr} \end{aligned}$$

Sodium carbonate dosing rate = 18 kg/hr

As per physical specification that submitted with KIMIA LOTUS CO. chemical supplier density of Sodium carbonate is 1±0.1 kg/lit so volumetric and mass flow rate figures are considered the same.

$$\text{Volumetric Sodium carbonate dosing rate} \approx 18 \text{ lit/hr}$$

Note 1: The chemical's calculated figures are provided based on normal practice dosage and chemical manufacturer LOUITS CHEMICAL obviously; fine biocide on the amount of dosage shall be done on water laboratory analysis.

Note 2: Chemical dosage amount has been calculated based on water analysis and sent to laboratory and result of both water data demanded the same dosage rate from LOUITS CHEMICAL report.



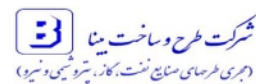
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Note 3: for chemical injected in cooling tower start up, operator must inject the required amount of chemicals using laboratory data as well as the opinion of the chemical supplier (HEFAZAT ROSOB IRAN).