جامعة الدوحة
للعلوم والتكنولوجيا
UNIVERSITY OF DOHA
FOR SCIENCE & TECHNOLOGY

AEMA3322 – Maintenance Engineering

Fall 2024

Project Report

Topic: Development of a CMMS for Preventive Maintenance of Equipment in the Maintenance Pilot Plant

	First Name, Last Name	ID
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Group #: 4

Submission Date: 17/11/2024

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1. Introduction

The Maintenance Engineering project provided an opportunity to gain experience in understanding and managing the maintenance requirements of industrial equipment in the Pilot Plant located in Room 9.1.43. The project aim was to develop a Computerized Maintenance Management System (CMMS) for selected equipment in the Pilot Plant. As part of the project, our group selected six industrial equipment: Micro Motion Mass Flow Sensor, AMI Heat Exchanger, Fisher Type 2052 Control Valve, Heatrod Elements Heater, Aqua Cooling Chiller, and Lowara Pump.

Our work involved researching maintenance manuals and manufacturer guidelines to understand each equipment's preventative maintenance requirements. This information was utilized to enter data into the COGZ software and used to generate preventive maintenance work orders for a two-week period. We also made a CAD layout of the pilot plant, mapping the arrangement of equipment for visualization. This project deepened our understanding of industrial maintenance practices, developed our teamwork, research, and technical documentation skills in the field of maintenance engineering.

2. Plant information:

Purpose:
The Maintenance Pilot Plant located in Room 9.1.43 is a sophisticated, two-floored facility designed to simulate industrial processes and support the study, education, and practice of maintenance, operation, and troubleshooting of industrial equipment. This facility serves as a learning environment for students and professionals, providing hands-on experience and a deeper understanding of real-world industrial systems and their maintenance requirements.

Description:
The plant has three standard tanks and one large storage tank, which serve as reservoirs for fluids used in simulated processes, such as heat transfer and flow systems. These tanks are used to demonstrate the principles of fluid storage, transfer, and circulation. Multiple pumps facilitate the movement of fluids through the system, simulating the operational challenges encountered in industries like oil and gas, water treatment, and chemical processing. These pumps are also critical for learning the principles of fluid mechanics and pump maintenance.

An overhead crane is installed for safe and efficient handling of heavy equipment and machinery components. The facility features multiple actuators and control valves, which are used for regulating fluid flow and pressure within the system. The sensors installed throughout the plant monitor parameters such as temperature, pressure, and flow rate, ensuring precise control and data acquisition.

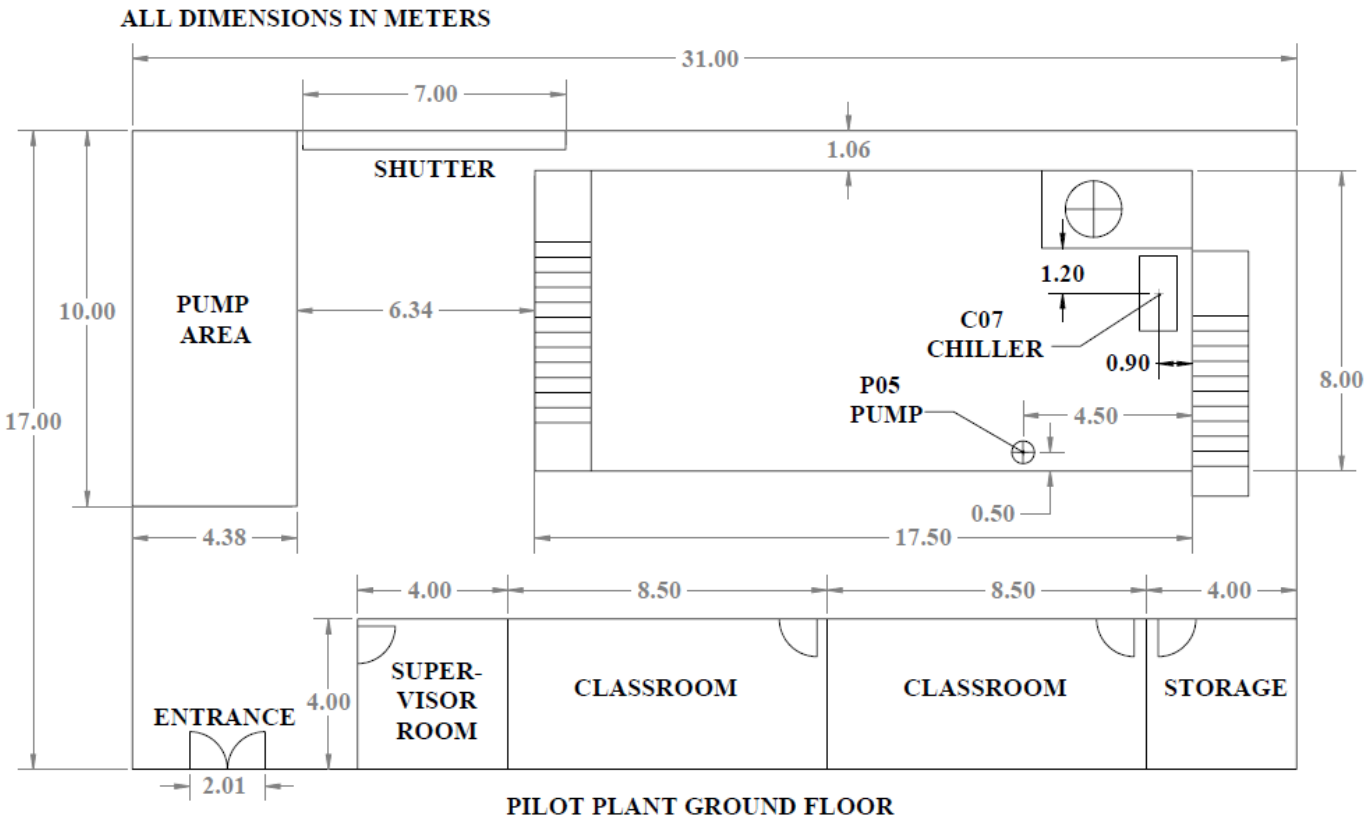
The plant includes heat exchanger, heater, and chiller, which are used to study heat transfer, fluid temperature regulation, and cooling processes. These components are crucial for understanding thermal dynamics and maintenance tasks required for such systems. The inclusion of a PID (Process and Instrumentation Diagram) controller provides an advanced setup for teaching control system dynamics, allowing for the tuning and optimization of automated processes.

The plant is equipped with a shutter system for secure access to machinery and operational areas. This contributes to the safe learning environment while simulating industrial workplace conditions. The overall setup helps students to gain hands-on experience with a variety of real-world equipment and processes, preparing them for roles in industrial operations, equipment maintenance, and system troubleshooting.

For further guidance and inquiries, the plant is supervised by Mr. Riad Friakh, an expert in Industrial Instrumentation from the College of Engineering & Technology. He can be contacted via Office: 09.1.44, Phone: 55574415 / 44952305, or Email: riad.friakh@udst.edu.qa.

Figure 1 Pilot Plant

Figure 2 Pump Area



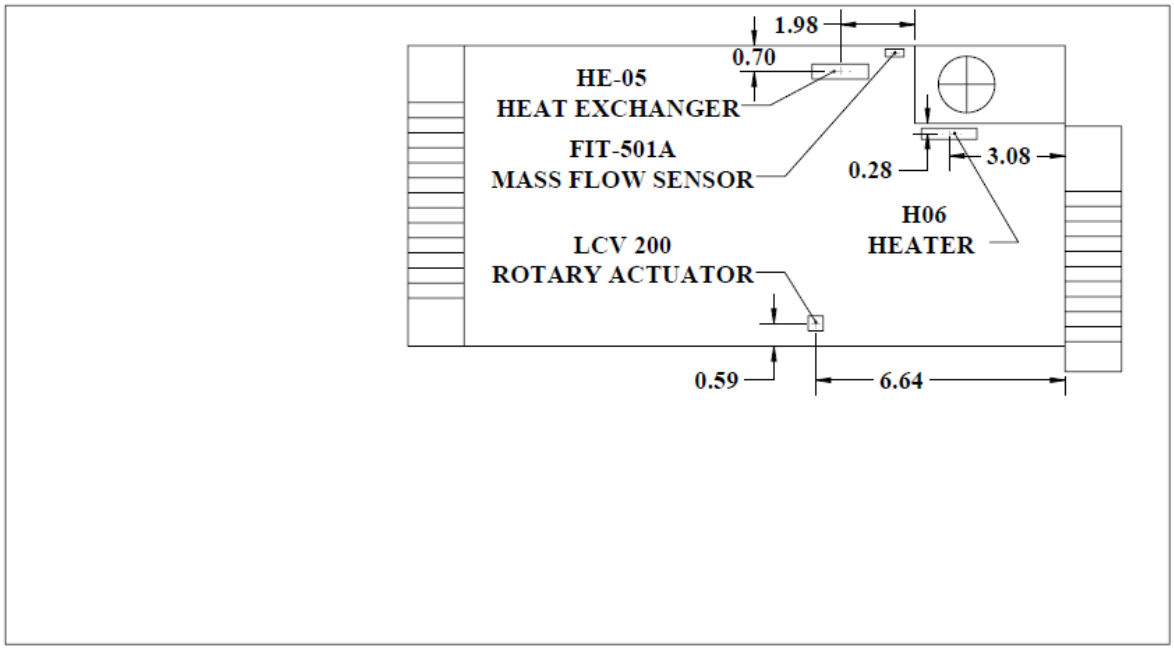


Figure 3 CAD Layout of the Pilot Plant

3. Equipment List:

A. 1.FIT – 501A EMERSON MICRO MOTION MASS FLOW SENSOR

Figure 4 FIT –501A Mass Flow Sensor

Table 3-1 FIT-501A Equipment Description

Equipment Number:	FIT – 501A
Description:	This is a mass flow sensor used to measure the mass flow rate of fluids. It's commonly applied in industrial environments for accurate flow measurement of fluids.
Model:	R100S128NCANEZYZZ
Serial Number:	15038658
Year of Manufacturing:	2018
Manufactured By:	Micro Motion (a part of Emerson), Made in the Netherlands

Table 3-2 FIT-501A Spare Parts List

No.	Part No.	Description
1	FUSE5A	5 AMP FUSE FOR CENTLEC BOOSTER AMP
2	KITHDWRBRDMT	MOUNTING HARDWARE KIT
3	UI9739DISP	UI DISPLAY
4	KITHDWRSCRMOD	TRASNSMITTER MODULE MOUNTING SCREWS

Vendor: GlobalSources Industrial Services
Address: Industrial Area Road Doha, Zone 56, Street 900 State of Qatar, P.0.Box: 10360
Contact: Phone- +974 4468 5501, E-mail- admin@globalsources.qa

Purpose:
Primary Function: Measures mass flow rate accurately for various industrial applications.
Secondary Functions: Can also be used for monitoring fluid temperature and pressure conditions within the specified limits.

B. HE-05 AMI EXCHANGER LTD. HEAT EXCHANGER

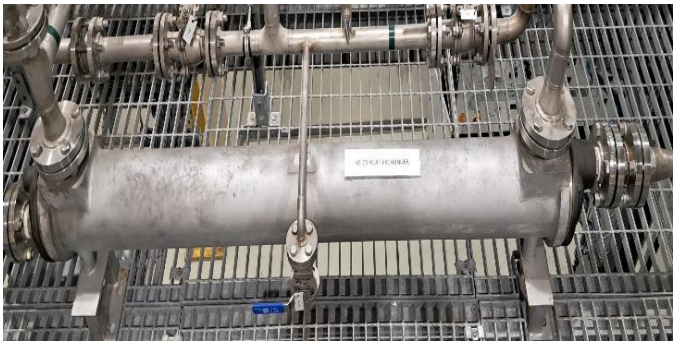



Figure 5 HE-05 Heat Exchanger

Table 3-3 HE-05 Equipment Description

Equipment Number:	HE-05
Description:	A heat exchanger used for transferring heat between two fluids, commonly applied in industrial cooling and heating processes.
Model:	50L
Serial Number:	17184
Manufactured By:	AMI Exchanger Ltd.

Table 3-4 HE-05 Spare Parts List

No.	Part No.	Description
1	APVSR6AG	ENDPLATE GASKET PRESSURE PLATE

Vendors: Hotline Trading LLC
Address: P.O. Box: 120866, Al Qusais, Damascus Street, Flat No :302 Dubai, U.A.E.
Contact: Phone- +971 42582117, E-mail- manuel@hltllc.com

Purpose:
Primary Function: Transfers heat between fluids to regulate temperature in systems.
Secondary Functions: Enhances system efficiency and maintains optimal operating conditions.

C. LCV 200 FISHER TYPE 2052 SIZE 1 CLASS 30 A

Figure 6 LCV 200 Rotary Actuator

Table 3-5 LCV 200 Equipment Description

Equipment Number:	LCV 200
Description:	A control valve used to regulate fluid flow, commonly used in industrial process control systems for precise flow adjustments.
Model:	Fisher Type 2052, Size 1, Class 30 A
Serial Number (S/N):	F001838669
Year of Manufacturing:	2018
Manufactured By:	Emerson Process Management

Table 3-6 LCV 200 Spare Parts List

No.	Part No.	Description
1	GE51941X012	SPARE PARTS KIT

Vendors: Teyseer Industrial Supplies & Services Co. W.L.L.
Address: Building No: 121 (Gate No 55), Street No: 105, AL Wakalat Street, Industrial Area
Contact: Phone- 4458 5437, E-mail- tissco@tissco-qatar.com
P.O. Box: 40523

Purpose:
Primary Function: Controls fluid flow within the process system, allowing for precise regulation.
Secondary Functions: Can assist in pressure management and maintaining system stability.

D. H06 HEATER HEATROD ELEMENTS

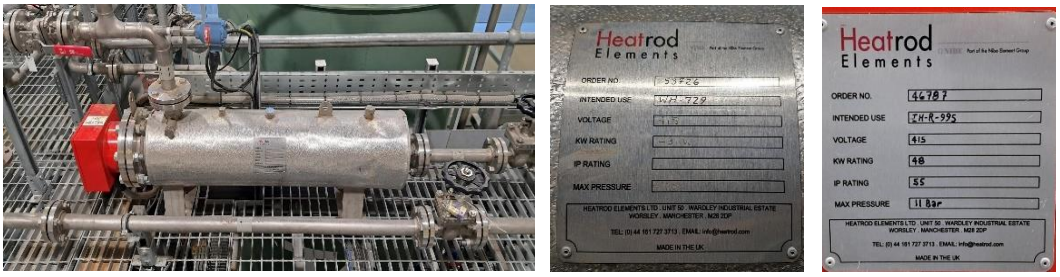


Figure 7 H06 Heater

Table 3-7 H06 Equipment Description

Equipment Number:	H06
Description:	An industrial heating element used to generate and transfer heat within a system, often applied in heating processes requiring high thermal output.
KW Rating:	48 kW
Order No.:	46787
Manufactured By:	HeatRod Elements

Table 3-8 H06 Spare Parts List

No.	Part No.	Description
1	HRI1224A	HEAVY DUTY INDUSTRIAL IMMERSION
2	1/4INCH BSP	IMMERSION HEATER O-RING

Vendor: Master Heat Technologies
Address: PO Box: 17115, 1st Floor, Office No. 2, Shahama Complex, Zone 55, Street 180, Building 45, Aziziya, Doha, QATAR
Contact: Phone- +974 5535 9440, E-mail- info@masterheattechnology.com

Purpose:
Primary Function: Provides heat for industrial processes requiring consistent and controlled thermal energy.
Secondary Functions: Can assist in temperature regulation and maintain optimal conditions for other system components.

E. C07 AQUA COOLING CHILLER

Figure 8 C07 Chiller

Table 3-9 C07 Equipment Description

Equipment Number:	C07
Description:	A cooling chiller used for industrial processes to regulate and maintain low temperatures, typically applied in environments requiring controlled cooling.
Model:	CFT.045/ETS.HW
Serial No.:	E05BM1138
Year of Manufacturing:	2018
Manufactured By:	Hitema International

Table 3-10 C07 Spare Parts List

No.	Part No.	Description
1	36694952009	PREVENTIVE MAINTENANCE KIT
2	1302987000	INHIBITOR (COOLANT)
3	1100434000	4 CONTAINERS (5-GAL CONTAINER) REFRIGERANT

Vendor: MP Qatar Trading W.L.L.
Barwa Village, Building No: 15, Office No: 21, Al Wakra. P.O. Box: 35306, Doha-Qatar
Contact: Phone- (+974) 4477 0579, E-mail- mpqteam@mpqatar.com.qa

Purpose:
Primary Function: Provides cooling for process systems to maintain stable and regulated temperatures.
Secondary Functions: Enhances energy efficiency and protects equipment by preventing overheating.

F. P05 PUMP LOWARA

Figure 9 P05 Hydraulic Pump

Table 3-11 P05 Equipment Description

Equipment Number:	P05
Description:	A pump used for fluid transfer in industrial applications, commonly applied in water circulation and transfer systems.
Power:	2.09 kW
Code:	1016LD191
Seal:	Q1BEGGE
Year of Manufacturing:	2018
Manufactured By:	Lowara

Table 3-12 P05 Spare Parts List

No.	Part No.	Description
1	150760640	IMPELLER
2	KL01AFP	KIT MECHANICAL SEAL
3	KL02ACK	KIT O-RING

Vendor: Al Ali Mechanical Services
East of Industrial Area, Zone 56, Street 100, Building 19, Unit 8, Doha-Qatar
Contact: E-mail- info@alalimechanicalservices.com, Phone- +974 44505031

Purpose:
Primary Function: Transfers and circulates fluids within the system.
Secondary Functions: Can be used to maintain pressure in pipelines and systems.

4. Maintenance requirements:

1. FIT – 501A EMERSON MICRO MOTION MASS FLOW SENSOR

Task No.	Description	Frequency	Duration	Downtime
1	Calibration to ensure Measurement accuracy.	Quarterly	1.5 hr.	2 hr.
2	Cleaning Surface and Ensure connections are secure	Monthly	0.5 hr.	0.5 hr.

2. HE-05 AMI EXCHANGER LTD. HEAT EXCHANGER

Task No.	Description	Frequency	Duration	Downtime
1	Inspect: Visuals checks for leaks	Monthly	0.5 hr.	0 hr.
2	Cleaning to prevent fouling	Yearly	6 hr.	8 hr.
3	Inspect Gaskets and Seal, and replace if necessary	Semi-annually	3 hr.	4hr.

3. LCV 200 FISHER TYPE 2052 ROTARY ACTUATOR

Task No.	Description	Frequency	Duration	Downtime
1	Inspection: Visual Inspection for wear, leaks and alignment.	Weekly	1.5 hr.	2 hr.
2	Replace worn out gasket	Yearly	2.5 hr.	3 hr.
3	Cleaning of valve components to prevent clogging	Monthly	1 hr.	1.5 hr.
4	Replacing Diaphragm	Yearly	2 hr.	2.5 hr.

4. H06 HEATER HEATROD ELEMENTS

Task No.	Description	Frequency	Duration	Downtime
1	Inspection: Check for wear, corrosion, and electrical connections	Daily	0.5 hr.	0 hr.
2	Cleaning to remove dust or contaminants	Quarterly	2 hr.	4 hr.
3	Insulation checks to ensure safety, prevent heat loss and maintain efficiency. Electrical connection inspection to ensure no loose or corroded connections	Semi-annually	1 hr.	2 hr.

5. C07 AQUA COOLING CHILLER

Task No.	Description	Frequency	Duration	Downtime
1	Inspection: Visual inspection for leaks, unusual noises, and general wear.	Monthly	1.5 hr.	2.5 hr.
2	Cleaning of coils, filters, and other components.	Quarterly	4 hr.	6.5 hr.
3	Coolant level check to ensure optimal cooling efficiency.	Daily	0.75 hr.	1 hr.
4	Check for secure and corrosion free connections.	Yearly	0.5 hr.	0.75 hr.
5	Pump Motor Lubrication.	Year	2 hr.	2.5 hr.

6. P05 PUMP LOWARA

Task No.	Description	Frequency	Duration	Downtime
1	Inspection: Visual Check for leaks, unusual noises, and alignment.	Monthly	1.5 hr.	2 hr.
2	Cleaning to prevent clogging or build up	Quarterly	1.5 hr.	2 hr.
3	Seal and Bearing check: To prevent leaks and wear	Semi-annually	1.5 hr.	2 hr.
4	Electrical connections: Check for secure connections	Semi-annually	0.5 hr.	0.5 hr.
5	Check condition of impeller	Yearly	2 hr.	2.5 hr.

5. Reference Links

1. FIT – 501A EMERSON MICRO MOTION MASS FLOW SENSOR

    a) https://www.emerson.com/documents/automation/installation-manual-micro-motion-g-series-coriolis-flow-density-sensors-en-9545242.pdf

    b) https://www.emerson.com/en-us/catalog/automation-solutions/measurement-instrumentation/flow/micro-motion-coriolis/coriolis-spare-parts?fetchFacets=true#facet:&partsFacet:&modelsFacet:&facetLimit:&searchTerm:&partsSearchTerm:&modelsSearchTerm:&productBeginIndex:0&partsBeginIndex:0&modelsBeginIndex:0&orderBy:&partsOrderBy:&modelsOrderBy:&pageView:grid&minPrice:&maxPrice:&pageSize:&facetRange

    c) https://web-material3.yokogawa.com/IM01U10B00-00EN-R.pdf

    d) https://www.globalsources.qa/index.html

2. HE-05 AMI EXCHANGER LTD. HEAT EXCHANGER

    a) https://dascohex.com/wp-content/uploads/2022/11/13.-Installation-Manual-for-ST-H-Ex2022_English.pdf

    b) https://www.ami-exchangers.co.uk/

    c) https://www.ami-exchangers.co.uk/products/spare-parts/

3. LCV 200 FISHER TYPE 2052 ROTARY ACTUATOR

    a) https://www.emerson.com/documents/automation/instruction-manual-fisher-2052-diaphragm-rotary-actuator-en-123354.pdf

4. H06 HEATER HEATROD ELEMENTS

    a) https://www.heatrod.com/industrial/industrial-flow-heaters

    b) https://manuals.plus/heatrod-elements/ss7-incoloy-immersion-heater-manual

5. C07 AQUA COOLING CHILLER

    a) https://neurophysics.ucsd.edu/Manuals/Neslab/CFT-25%20Recirculating%20Chiller.pdf

    b) https://www.hitema.ir/wp-content/uploads/2020/01/ENR-DOC.pdf

    c) https://mp-qatar.com/products/hvac/chillers

    d) https://www.johnsoncontrols.com.au/-/media/jci/be/united-states/replacement-parts-and-supplies/chiller/files/new/2018/baltimore-parts-genuine-parts-catalog.pdf?la=en&hash=53322CBC3B0F0054E66696BB4F4503EB4C6C06E5

6. P05 PUMP LOWARA

    a) https://spark.xylem.com/f_SparePartList.aspx?Params=NLCjo8Bc2eDhX5aeOU6WE0R6RUJXiybW

    b) https://www.xylem.com/siteassets/brand/lowara/resources/manual/001080194en-esv.pdf

    c) https://www.xylem.com/en-qa/products--services/genuine-parts/genuine-lowara-parts/

    d) https://www.alalimechanicalservices.com/water-pumps.html

7. Work Share table

	Contribution
Abdul Wadood Fathah	• Selected equipment from the maintenance pilot plant. • Researched maintenance needs for each piece of equipment by finding their manuals and interviewing plant supervisors. • Entered Data for the selected equipment into the COGZ maintenance management software. • Prepared Project report, summarizing the findings of the maintenance project. • Created a detailed CAD drawing of the pilot plant layout.
Deefa Daben	• Selected equipment from the maintenance pilot plant. • Researched maintenance needs for each piece of equipment by finding their manuals. • Entered Data for the selected equipment into the COGZ maintenance management software. • Prepared Project report, summarizing the findings of the maintenance project.
Raziuddin Syed	• Researched maintenance needs for each piece of equipment by finding their manuals. • Entered Data for the selected equipment into the COGZ maintenance management software.
Alaa Beshir	• Researched maintenance needs for each piece of equipment by finding their manuals. • Entered Data for the selected equipment into the COGZ maintenance management software. • Prepared Project report, summarizing the findings of the maintenance project.

8. Appendix:

Work Orders Generated using COGZ
See Attached File.

Preventive Maintenance Work Order

WORK ORDER NO... 50,496

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4AGRP4 KHALED**
EQUIPMENT.....GRP4 CHILLER C07 AQUA COOLING CHILLER
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... CFT.045/ETS.HW SERIAL..... E05BM1138
MANUFACTURER.HITEMA INTERNATIONAL LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

	SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS
		APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!			
*	1	INSPECTION: VISUAL INSPECTION FOR LEAKS, UNUSUAL NOISES, AND GENERAL WEAR.			
*	2	CLEANING: CLEANING OF COILS, FILTERS, AND OTHER COMPONENTS.			
*	3	COOLANT LEVEL CHECK TO ENSURE OPTIMAL COOLING EFFICIENCY.			
*	4	CHECK FOR SECURE AND CORROSION-FREE CONNECTIONS.			
*	5	PUMP MOTOR LUBRICATION			

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT	GENERAL MAINTENANCE KIT	COMMENTS	
PART: GRP 4 366 94952 009	PREVENTIVE MAINTENANCE KIT		
PART: GRP4 11 00434 000	4 CONTAINER (5 GAL CONTAINER) REFRIGERANT		
PART: GRP 4 13 02987 000	INHIBITOR (COOLANT)		

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!! WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

Preventive Maintenance Work Order

WORK ORDER NO... 50,485

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4AGRP4 KHALED**
EQUIPMENT.....GRP4 FLOW SENSOR FIT – 501A EMERSON MICRO MOTION MASS FLOW SENSOR
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... R100S128NCANEZYZZ SERIAL..... 15038658
MANUFACTURER.MICRO MOTION LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 2 CLEANING SENSOR SURFACE AND ENSURE CONNECTIONS SECURE _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT:	MAINT. KIT	GENERAL MAINTENANCE KIT	COMMENTS
PART:	GRP4 KITHDWRSCRMOD	TRASNSMITTER MODULE MOUNTING SCREWS	
PART:	GRP4 KITHDWRBRDMT	MOUNTING HARDWARE KIT	
PART:	GRP4 UI9739DISP	UI DISPLAY	
PART:	GRP4 FUSE5A	5 AMP FUSE FOR CENTLEC BOOSTER AMP	

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!! WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

* Previously Uncompleted ** PM Generated Up To Date or Due Date

Preventive Maintenance Work Order

WORK ORDER NO... 50,486

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4BGRP4 IRFAN**
EQUIPMENT.....GRP4 FLOW SENSOR FIT – 501A EMERSON MICRO MOTION MASS FLOW SENSOR
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... R100S128NCANEZYZZ SERIAL..... 15038658
MANUFACTURER.MICRO MOTION LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 1 CALIBRATION TO ENSURE MEASUREMENT ACCURACY. _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT:	MAINT. KIT	GENERAL MAINTENANCE KIT	COMMENTS
PART:	GRP4 KITHDWRSCRMOD	TRASNSMITTER MODULE MOUNTING SCREWS	
PART:	GRP4 KITHDWRBRDMT	MOUNTING HARDWARE KIT	
PART:	GRP4 UI9739DISP	UI DISPLAY	
PART:	GRP4 FUSE5A	5 AMP FUSE FOR CENTLEC BOOSTER AMP	

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!! WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

* Previously Uncompleted ** PM Generated Up To Date or Due Date

Preventive Maintenance Work Order

WORK ORDER NO... 50,487

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4AGRP4 KHALED**
EQUIPMENT.....GRP4 HEAT EXCHANGEHE-05 AMI EXCHANGER LTD. HEAT EXCHANGER
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... 50L SERIAL..... 17184
MANUFACTURER. AMI EXCHANGER LTD. LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 1 INSPECTION: VISUAL CHECKS FOR LEAKS, CORROSION, AND DAMAGE. _____ _____ _____

* 3 INSPECT GASKET AND SEAL, AND REPLACE IF NECESSARY _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT GENERAL MAINTENANCE KIT COMMENTS
PART: GRP4 APVSR6AG ENDPLATE GASKET PRESSURE PLATE

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!!
WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

Preventive Maintenance Work Order

WORK ORDER NO... 50,488

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4BGRP4 IRFAN**
EQUIPMENT.....GRP4 HEAT EXCHANGEIHE-05 AMI EXCHANGER LTD. HEAT EXCHANGER
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... 50L SERIAL..... 17184
MANUFACTURER. AMI EXCHANGER LTD. LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 2 CLEANING: TO PREVENT FOULING. _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT GENERAL MAINTENANCE KIT COMMENTS
PART: GRP4 APVSR6AG ENDPLATE GASKET PRESSURE PLATE

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!!
WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

Preventive Maintenance Work Order

WORK ORDER NO... 50,494

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4AGRP4 KHALED**
EQUIPMENT.....GRP4 HEATER H06 HEATROD ELEMENTS INDUSTRIAL HEATER
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... 48 KW SERIAL..... 46787
MANUFACTURER.HEATROD ELEMENTS LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 1 INSPECTION: CHECKS FOR WEAR, CORROSION, AND ELECTRICAL CONNECTIONS. _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT GENERAL MAINTENANCE KIT COMMENTS
PART: GRP4 HRI1224A HEAVY DUTY INDUSTRIAL IMMERSION
PART: GRP4 2 1/4INCH BSP IMMERSION HEATER O-RING

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!!
WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

Preventive Maintenance Work Order

WORK ORDER NO... 50,495

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4CGRP4 JASSIM**
EQUIPMENT.....GRP4 HEATER H06 HEATROD ELEMENTS INDUSTRIAL HEATER
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... 48 KW SERIAL..... 46787
MANUFACTURER.HEATROD ELEMENTS LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 2 CLEANING: CLEANING TO REMOVE DUST OR CONTAMINANTS. _____ _____ _____

* 3 INSULATION CHECK TO ENSURE SAFETY, PREVENT HEAT LOSS AND MAINTAIN EFFICIENCY. ELECTRICAL CONNECTION INSPECTION TO ENSURE NO LOOSE OR CORRODED CONNECTIONS. _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT	GENERAL MAINTENANCE KIT	COMMENTS
PART: GRP4 HRI1224A	HEAVY DUTY INDUSTRIAL IMMERSION	
PART: GRP4 2 1/4INCH BSP	IMMERSION HEATER O-RING	

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!! WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

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Preventive Maintenance Work Order

WORK ORDER NO... 50,497

SCHEDULED** 2/02/2026
PRIORITY.....
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4AGRP4 KHALED**
EQUIPMENT.....GRP4 HYDRAULIC PUMFP05 PUMP LOWARA
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... 2.09 kW SERIAL..... Q1BEGG E
MANUFACTURER.LOWARA LINE.....
WORK ORDER HEADER: PREVENTIVE WORK

ENTERED 11/17/2024 2:45 PM
STARTED / /
DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

*	1	INSPECTION: VISUAL CHECK FOR LEAKS, UNUSUAL NOISES, AND ALIGNMENT.	_____	_____	_____
*	2	CLEANING: CLEANING TO PREVENT CLOGGING OR BUILDUP.	_____	_____	_____
*	3	SEAL AND BEARING CHECK: TO PREVENT LEAKS AND WEAR.	_____	_____	_____
*	4	ELECTRICAL CONNECTIONS: CHECK FOR SECURE CONNECTIONS.	_____	_____	_____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MIANT. KIT	GENERAL MAINTENANCE KIT	COMMENTS
PART: GRP4 150760640	IMPELLER	_____
PART: GRP4 KL01AFP	KIT MECHANICAL SEAL	_____
PART: GRP4 KL02ACK	KIT O-RING	_____

WHEN WORKING ON A MACHINE MAKE SURE THAT YOU USE YOUR LOCKOUT AND TAG OUT SYSTEM!!!!! WHEN YOUR WORK IS COMPLETED TEST RUN YOUR EQUIPMENT. TEST ALL SAFETIES AND MAKE SURE ALL GUARDS ARE IN PLACE. LOOK FOR POTENTIAL HAZARDS AND CORRECT IF NEEDED. CLEAN YOUR WORK AREA AND RETURN ANY UNUSED PARTS TO THEIR PROPER LOCATIONS. NOTIFY YOUR SUPERVISOR AND MAKE OUT A WORK ORDER FOR ANY WORK THAT YOU CANNOT COMPLETE.

Comments

Approved By: _____ Inspected By: _____

Preventive Maintenance Work Order

WORK ORDER NO... 50,498

SCHEDULED** 2/02/2026
PRIORITY.....
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4CGRP4 JASSIM**
EQUIPMENT.....GRP4 HYDRAULIC PUMFP05 PUMP LOWARA
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY.
MODEL..... 2.09 kW SERIAL..... Q1BEGG E
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WORK ORDER HEADER: PREVENTIVE WORK

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DEPT GRP4 MAINT.
SHIFT DAY
STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

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* 5 CHECK CONDITION OF IMPELLER _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MIANT. KIT	GENERAL MAINTENANCE KIT	COMMENTS
PART: GRP4 150760640	IMPELLER	
PART: GRP4 KL01AFP	KIT MECHANICAL SEAL	
PART: GRP4 KL02ACK	KIT O-RING	

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Comments

Approved By: _____ Inspected By: _____

* Previously Uncompleted ** PM Generated Up To Date or Due Date

Preventive Maintenance Work Order

WORK ORDER NO... 50,492

SCHEDULED** 2/02/2026
PRIORITY..... 3
WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4BGRP4 IRFAN**
EQUIPMENT..... GRP4 ROTARY ACTUAT(LCV200 EMERSON PROCESS MANAGEMENT FISHER TYPE ENTERED 11/17/2024 2:45 PM
LOCATION..... GRP4 9.1.43 PILOT PLANT REQUESTED BY. STARTED / /
MODEL..... TYPE 2052 SIZE 1 CLASS30A SERIAL..... F001838669 DEPT GRP4 MAINT.
MANUFACTURER.EMERSON PROCESS MNGMNT. LINE..... SHIFT DAY
WORK ORDER HEADER: PREVENTIVE WORK STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 1 INSPECTION: VISUAL INSPECTION FOR WEAR, LEAKS, AND ALIGNMENT. _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT GENERAL MAINTENANCE KIT COMMENTS
PART: GRP4 GE51941X012 SPARE PARTS KIT

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WORK ORDER NO... 50,493

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WO REQUEST #.....
SUPERVISOR.....

ASSIGNED TO.....**GRP4CGRP4 JASSIM**
EQUIPMENT.....GRP4 ROTARY ACTUAT(LCV200 EMERSON PROCESS MANAGEMENT FISHER TYPE ENTERED 11/17/2024 2:45 PM
LOCATION.....GRP4 9.1.43 PILOT PLANT REQUESTED BY. STARTED / /
MODEL..... TYPE 2052 SIZE 1 CLASS30A SERIAL..... F001838669 DEPT GRP4 MAINT.
MANUFACTURER.EMERSON PROCESS MNGMNT. LINE..... SHIFT DAY
WORK ORDER HEADER: PREVENTIVE WORK STATUS:

SEQ#	DESCRIPTION	DATE	DO TIME	INITIALS

APPLY ALL SAFETY PROCEDURES BEFORE STARTING YOUR WORK.... THINK SAFETY!!!

* 2 REPLACE WORN OUT GASKET _____ _____ _____

* 3 CLEANING OF VALVE COMPONENTS TO PREVENT CLOGGING. _____ _____ _____

* 4 REPLACING DIAPHRAGM _____ _____ _____

Total Time: _____

Time	Date	Initials	ADDITIONAL LABOR	Time	Date	Initials

Part Number	Description	ADDITIONAL PARTS	Location	QTY	Used

COMPONENT: MAINT. KIT GENERAL MAINTENANCE KIT COMMENTS
PART: GRP4 GE51941X012 SPARE PARTS KIT

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