HMC-3
ISO 9001: 2015

# HEAVY MECHANICAL COMPLEX-3

**ISO 9001: 2015**

(Product Range, Capabilities, Facilities)

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## Introduction

Heavy Mechanical Complex-3 (HMC-3) is one of the leading organizations in engineering sector of Pakistan with the ultimate goal of self reliance, indigenisation, import substitution and to provide technical support to the industrial sector in the country. Sophisticated, hi-tech and precise manufacturing distinguish HMC-3 from other organizations.

It has the following capabilities/ facilities:

- Design, engineering and development
- Fabrication
- Welding (Automatic & Manual)
- Machining (CNC & conventional)
- Quality assurance and control
- NDT and material testing
- High pressure high temperature test loop
- Heat treatment

## Statement of quality policy

Our vision is to become a leading manufacturer of quality engineering products in Pakistan and committed to make every individual at HMC-3 quality conscious at every step to provide engineering products conforming to customers agreed specifications, applicable statuary and regulatory requirements. In pursuit to excellence a quality management system has been established to demonstrate commitment to quality which is reviewed periodically for continual improvement.

## Goals and objectives

The main aim of HMC-3 is to enhance the design, manufacturing, inspection and testing capabilites to produce hi-tech equipment, parts and components for upcoming hydel, thermal, nuclear power plants and alternate energy projects, besides meeting the needs of other organizations of the country working in oil & gas, energy and industrial sectors.

## Design and engineering

Design and Engineering capabilities of HMC-3 are of international standard and have been established over a long period of time. A team of qualified and foreign trained engineers from different disciplines such as mechanical, metallurgy, chemical, instrumentation & control, information technology, etc are working in this department. All the equipment are designed in accordance with the relevant international codes and standards like ASME, AWS, API, GB, AISC etc. Manufacturing drawings and equipment specifications are checked and reviewed before being forwarded for the production activities. Design & Engineering set-up is equipped with modern tools and most advanced engineering software to undertake the detailed engineering design and development of process and mechanical equipment for power plants, in particular, and chemical plants and other engineering sector, in general.

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***Design & Engineering division has expertise that includes but not limited to the following:***

## Process Equipment:

- Heat Exchangers, Condensers & Evaporaters etc
- Pressure Vessels
- Spherical Vessels
- Process Columns
- Storage Tanks
- Boiler Drums
- Water Treatment / QMW plants
- Vacuum Chambers
- Isostatic Presses
- Industrial Stacks
- Piping

## Mechanical Equipment:

- Material Handling Equipment; Cranes of all types (EOHT, Gantry, Jib)
- Industrial Furnaces
- Workshop Equipment
  - Roller Supporters
  - Welding Positioners
  - Transport Bogies etc
- Precision Parts
- Tooling for Power Plants
- Shielding / Special Purpose Doors
- Steel Structures / Jigs & Fixtures

## Power Plant Equipment:

- Pressure Retaining Equipment
  - Safety Class 1
  - Safety Class 2
  - Safety Class 3
- Personnel Air Lock Doors

Evaporator for a Desalination Plant
(Length 16.5 m, Diameter 3.3 m)

Personnel Air Lock Door

25 Ton Welding Positioner

Heat Exchanger

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## Fabrication Facilities

With the modern and comprehensive set of fabrication facilities, HMC-3 can produce medium to heavy as well as simple to complicated mechanical equipment and components. The fabrication set-up comprises of Pressure Vessel and Light Fabrication Shops which are equipped with 150 tons material handling facility, dish end forming, rolling, tube bending, tube expansion, cutting and welding facilities.

Fabrication of Stainless Steel Vessels (Diameter 4 m)

Expansion of Heat Exchanger Tubes

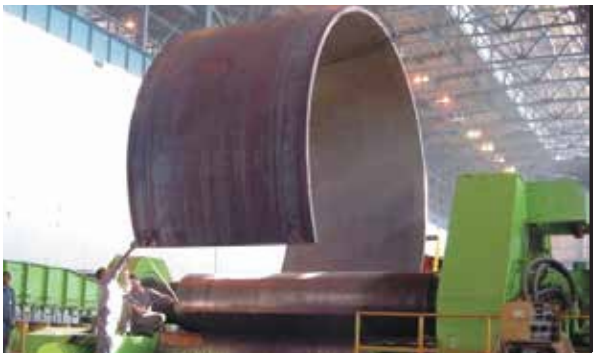
## Forming Facilities

### Dish End Forming:

Set of dishing press and flanging machine make it possible to cold-form torispherical, ellipsoidal and hemispherical dish ends of diameter up to 6.5 meters with plate thickness of 32 mm for carbon steel and 24 mm for stainless steel in accordance with ASME codes. Dish ends and other similar components as per customer specified shapes/profiles can also be formed.

### Plate Rolling:

Plate bending and rolling up to thickness of 120 mm (cold) and 250 mm (hot) carbon steel plates having width up to 400 mm.



### Other Forming Facilities includes:

- Tube bending machine
- Section forming machine
- Thread forming machine

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## Welding Facilties

The state-of-the-art welding facilities within HMC-3 can weld intricate jobs of stainless steel, carbon steel, mild steel and aluminum base alloys for almost every engineering & manufacturing as well as processing industries.

### Major Welding Equipment / Systems:

***Automatic Saddle Type Nozzle to Shell Welding System:***

This automatic system can weld nozzles of diameter 200 mm to 1100 mm, and height 150 to 700mm.

***Automatic Orbital TIG Welding Machine for Tube to Tube Sheet Weld Joints:***

This machine is used for tube to tube sheet welding joints of steam generators, boilers and pre-heaters. It can weld tubes of diameter 10 to 62mm.

***CNC Narrow Gap Welding Station:***

This Station can weld up to 350 mm thick steel plates with narrow gap weld joints. It has a working range of 8 m in horizontal & 8 m in vertical planes. It can rotate + 180°.

***TIG/ MIG Nozzle Cladding Station:***

This equipment is used for cladding of nozzles and flanges. Working length is 1000mm and minimum internal diameter is 100mm.

***Available Welding Processes:***

- Gas Tungsten Arc Welding (GTAW/TIG)
- Submerged Arc welding
- Submerged Arc strip cladding
- Shielded Metal Arc Welding (SMAW)
- Flux Core Arc Welding (FCAW) & MIG/MAG

## Machining Facilities

***CNC Vertical Boring and Turning Mill:***

It can machine jobs up to diameter 16m, height 6.5m and weight 320 tons. The positioning accuracy on X/Z axis is ±0.012 mm/m & repeatability accuracy is ± 0.08 mm. It also has milling and grinding attachments.

***CNC Vertical Turning and Milling Center:***

It has Table diameter of 2.5m and can handle a workpiece of diameter 2.8 m and height 2.1m. The positioning accuracy is ± 0.015 mm/m. It can handle jobs up to 30 tons.

***CNC Moving Column Milling and Boring Machine:***

It has X, Y, Z and V strokes up to 12m, 6m, 1.6m and 1.6m respectively. The positioning accuracy is ±0.015 mm/m & repeatability accuracy is ±0.01 mm. It can handle jobs up to 150 tons.

***Other Facilities Include:***

- CNC precision boring and milling
- CNC table type milling & boring
- CNC horizontal machining center
- CNC precision sinking EDM
- CNC vertical machining center
- Radial drilling machines

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## *Quality Assurance & Control*

HMC-3 applies the latest Inspection and Testing techniques to verify quality levels of all the incoming materials and outgoing products in accordance with the applicable codes and standards. A group of qualified, foreign trained and experienced engineers & technicians assures that all the manufacturing processes are in conformity with the quality requirements.

### *Certifications:*

ISO 9001 certification for Quality Management system of HMC-3 is a major mile stone, manifesting its firm commitment to meet the quality standards required by codes and regulations. A system of regular audits assures its compliance as well as results in continuous improvement.

International Standard Organization (ISO)

American Society of Mechanical Engineers (ASME)

American Petroleum Institute (API)

The National Board of Boiler and Pressure Vessel Inspectors

***HMC-3 has also been certified by the International organizations like:***

- American Society of Mechanical Engineers **(ASME):** ***U,U2,A,S& PP stamps***
- The National Board of Boiler and Pressure Vessel Inspectors : ***R Stamp***
- American Petroleum Institute (API) Licenses:
  ***12D-0036***
  ***12F-0055***
  ***12J-0015***

HMC-3 is the first engineering organization that has been certified by Pakistan Nuclear Regulatory Authority (PNRA) to produce Nuclear Safety Class 1, 2 & 3 equipment and components in Pakistan.

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## Testing Facilities

### Mechanical & Chemical Testing Facilities:

- CNC universal tensile testing machine
- Universal hardness testing machine
- Impact tester (Capacity: 406J)
- Optical emission spectrometer
- XRF metal analyzer
- Metallurgical microscope
- Intergranular corrosion testing facility

### Non Destructive Testing Facilities:

- Computerized X-Ray radiographic testing
- Conventional & phased array ultrasonic testing
- Helium leak & eddy current testing

### Measuring and Testing Facilities:

- Coordinate measuring machine
- Optical profile projector
- Portable laser tracker
- Industrial videoscope (for Boroscopy)
- Coating thickness meter
- Portable adhesion tester
- Surface roughness tester

*Coordinate Measuring Machine Working Volume 3x1.5x1.5 m*

### High Pressure High Temperature Test Loop

High pressure high temperature test loop is an exceptional setup available in HMC-3, which is capable to simulate the following state variables simultaneously;

- Pressure (max): 15.2MPa
- Temperature (max): 300°C
- Flow rate:
  - Main loop: 340 m3
  - Aux. loop: 20 m*/ hour
- Pump developed head: 0.45MPa
- Testsection
  - Dimensions: 6x3x18m
  - Weight: up to 20 Tons

This unique facility can be utilized in conducting tests for following equipment and components:

- High pressure pumps
- Primary instrument
- Sealed equipment
- Pressuriser (Transient Characteristic Tests)
- Thermal measuring instruments and equipment
- Electrical heating element (Endurance tests)
- Heat exchanger and other process equipment

## Heat Treatment Facilities

### 30m Annealing Furnace:

This furnace has fully computerized control for temperature & operational parameters as per heat treatment process requirements and automatic ignition system.

### Dimensional Characteristics:

- Two chambers: Stay & Moveable
- Two bogies: Front & Rear
- Chamber size: 7.5 x8.5x15m
- Load capacity: 600 tons
- Job size max: Diameter 6m
  Length 28.5 m

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### *Temperature Attributes:*

- Operating temp (Max) :1050°C single chamber
  :950 °C double chamber
- Temp control : ±10°C single chamber
  ±15°C double chamber
- Rate of temp rise :35-300°C/ hour

### *Additionally available Furnaces:*

- 12 meter plate heating furnace (Inner dimension: 12 x 4.5 x 4.5 m, max temp: 1200°C)
- Bogie hearth furnace (Inner dimension: 1100 x 900 x 800 mm, max temp: 1000°C)
- Air circulating chamber furnace (Inner dimension: 1100 x 900 x 800 mm, max temp: 700°C)
- Pit type gas carburizing furnace (Inner Dia: (00mm, Depth: 900mm, max temp: 950°C)

## *Product Range*

The design, manufacturing, inspection & testing facilities of HMC-3 can produce a wide range of mechanical equipment as well as complex & precise parts/components for power plants, chemical & processing industries and other projects.

### *Some of the equipment which can be manufactured at HMC-3 are:*

- Pressure vessels
- Heat exchanges & condensers
- Columns & distillation towers
- Heating and vacuum furnaces
- Electrical overhead traveling cranes
- High pressure piping and penstocks
- HP heaters & air pre-heaters
- Storage tanks, cylinders & flasks
- Industrial stacks
- Welding positioners and roller supporters
- Shot blasting equipment
- Special purpose doors
- Heavy steel structures
- Equipments for cement, sugar & fertilizer plants
- Equipments for oil & gas field plants, refineries & steel making plants
- Isostatic press
- Food irradiation plants
- Chemical & hydro cracking reactors
- Boiler drums, water drums and steam drums
- Stream generators
- Pressurizers
- Nuclear safety class-1,2 & 3 equipment
- Wind turbine

Knockout Drum for PPL
(Diameter 810mm,Height 5m)

Heat Exchanger for a Process Industry

Industrial Stack (Height 30.4 m)

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CNC Thermal Cutting (Thickness 150 mm)

Machining of Coal Mill for a Cement Plant

Large Stainless Shell Storage Tanks (Diameter 4 m)

Machining of Turbine Shaft for a Power Plant (Length 12m, Wt. 2.5 Tons)

Bridge Girder for a EOHT Crane
(Capacity 50 Tons, Length 20m)

Manufacturing of Heat Exchangers