

# Mitsubishi Heavy Industries Compressor International Corporation's Pearland Works in Texas, USA



## Mitsubishi Heavy Industries Compressor Corporation

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In April 2015, Mitsubishi Heavy Industries Compressor Corporation (MCO) established its first overseas production base (Pearland Works) in Pearland, which is located in the southwestern part of Houston, Texas in the United States. The purpose of opening the Pearland Works is to provide one-stop services to our customers in the Americas, which covers compressor/turbine production and various types of services. As a symbol of the revival of U.S. manufacturing following the shale revolution, the Pearland Works has been greeted with high expectations among local people involved.

## 1. Background of construction of Pearland Works

In 2010, the compressor business department of Mitsubishi Heavy Industries, Ltd. (MHI) was separated and MCO was founded as a company specializing in compressors. The main factory in Hiroshima has provided compressors and turbines, in the name of either MHI or MCO, to plants in more than 60 countries. MHI Compressor International Corporation (MCO-I) was founded in 2012 in the U.S. to accelerate the development of a globalized business, and our business in the country has expanded at a high pace. The construction of the Pearland Works was decided with the aim of reinforcing our business activities in the U.S., as well as accommodating the strong demand from our customers in the U.S. who wanted a local service base to obtain support for the stable operation of their plants.

Houston, Texas is one of the four biggest cities in the U.S., and Pearland is located in the southwestern area of the city. Industrial establishments are concentrated along the coastline of the Gulf of Mexico in Texas and its neighboring state, Louisiana. Among these establishments are chemical plants with MCO compressors in operation.

## 2. Facility overview of Pearland Works

The Pearland Works is situated close to the south end of Beltway 8, which is a loop highway running around the city of Houston. It is also near the southern end of Houston where an industrial complex of the major chemical plants of our customers is located. Therefore, if required, it is possible to drive to our customers quickly, which is a major geographical advantage.

An air-conditioned factory with five bays and an office building were constructed on a site of roughly 100,000 m<sup>2</sup> (Figure 1). These bays are allocated/used for either production or the provision of servicing. The overhead cranes with a maximum load capacity of 300 metric tons installed in the production bays enable the manufacturing of large compressors (Figure 2). In June 2015, our first compressor made in the U.S. was completed and shipped successfully (Figure 3). The factory has been continuously engaged in production.

The service bays are equipped with state-of-the-art machines such as large lathes and five-axis machining centers, as well as various types of testing equipment such as rotor balance machines. The Pearland Works is thus capable of dealing with diverse service needs.

In the office building, we are proceeding with the plan of setting up an operation training facility for our customers, whereby the Pearland Works will be a one-stop factory capable of handling a variety of needs in terms of both hardware and software.



Figure 1 Front view of Pearland Works



Figure 3 The shipment of the first product of Pearland Works



Figure 2 Exterior (left) and interior (right) of Pearland Works

### 3. Characteristics of factory construction in Houston

As shown in Figure 4, the construction of the Pearland Works was completed within a short period of approximately one year after the commencement of construction. To erect a factory in a short time span, we chose a type of construction contract and a construction method that are commonly known in Houston but are firsts for MCO.

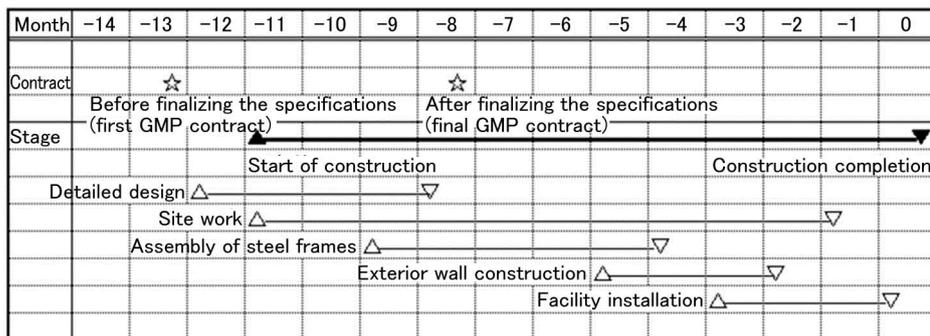


Figure 4 Construction schedule

#### 3.1 Guaranteed maximum price (GMP) contract

To not only comply with local legislation and practical situations in construction, but also build a factory with all of our required features on budget and on schedule, we contacted local consultants and decided to place an order under an “open-book (guaranteed maximum price or GMP) contract” with a local construction company, which covered the whole process from basic design to construction. In an “open-book GMP contract,” the contractor (construction company) totals the necessary costs based on the provisional specifications and an estimated bill of quantities (BQ), including the costs for subcontractors. A specific fee is added to the obtained total costs, thereby setting the maximum price for undertaking the construction project. This form of agreement allows the contractee and the contractor to share the risks of uncertainty in such a logical way that the concluded contract does not include unnecessary contingency costs. The advantages are:

- Ensuring cost transparency;
- Enabling the contract to be signed before finalizing the building specifications and/or the commencement of construction; and
- Setting the maximum price (budget) on the construction project as a contractee (MCO).

Under this GMP contract, the project was completed as planned in terms of both schedule and costs. Table 1 compares different types of construction pricing arrangements.

**Table 1 Comparison of different types of construction pricing arrangements**

| Type of contract   | Lump Sum  | Cost and Fee   | Open-Book GMP  |
|--|---|--|--|
| Pricing system   | Order collectively at a lump sum price  | Pay the actual cost and a fee  | Preset the upper limits of cost and fee  |
| Risk   | Higher for the contractor   | Higher for the contractee  | Shared by the contractee and the contractor  |
| Advantages for the contractee (May be disadvantageous from the contractor's perspective) | - Able to predetermine the upper limit of allowable price for the contract  | - Able to enter into the contract before finalizing the specifications   | - Allows the contractee and the contractor to share the advantages and disadvantages of the other two pricing systems ("Lump Sum" and "Cost and Fee") (i.e., the upper limit of the allowable price for the contract can be predetermined, and depending on the arrangement, part of the contingency costs can be returned to the contractee, if left unused.) |
| Disadvantages for the contractee (May be advantageous from the contractor's perspective) | - Order after producing the specifications (subject to delays)<br>- With many uncertainties involved, incurs extra costs in addition to the price given in the contract (not returned even if there are any savings in the end) | - With many uncertainties involved, has difficulty in predicting the total price accrued by the contract (no ceilings) | - Without drastic plans on cost reduction, the agreed price (including fees) may stay high.<br>- Potential contractors are limited to certain construction companies.  |

### 3.2 Use of tilt-wall construction technique

According to municipal ordinances, the walls of factories and office buildings are to be made of concrete for aesthetic reasons, which raised the concern that the schedule and cost for the construction of the factory would be adversely affected. However, the use of the "tilt-wall construction technique," which is commonly practiced in the U.S., enabled us to minimize such effects on the construction. In the tilt-wall construction technique, as indicated by the term itself, walls are tilted in the process of erecting a building. Specifically, concrete is cast in the ground around the designated footprint of the factory, to form concrete panels with the sizes of the walls of the factory. These panels are then raised (tilted) into position by crane and are assembled as walls accordingly. It is a dynamic construction method, taking advantage of the large site area (Figure 5). As concrete is cast horizontally, there are no characteristic round marks usually found on concrete construction in Japan. With such flat and very smooth concrete surfaces, our factory looks as elaborate as the beautiful neighboring buildings.

### 3.3 Improved disaster resistance of factory

The following precautionary measures were included in the specifications, to make the factory resistant to natural disasters specific to the region.

- Agreement for the use of a regional retention basin to compensate the lowered rainwater permeability of the soil resulting from the construction of the factory
- Precautionary measures against hurricanes (expecting a maximum wind speed of about 49 m/s)



Figure 5 Tilt-wall construction

## 4. Future direction

The announcement on the construction of a factory in the U.S. has been welcomed by our customers with such eagerness that we have received inquiries for new service contract arrangements. Now that we have the state-of-the-art facility in hand, we can proceed with business meetings for concrete planning with customers with a sense of fulfillment, and the range of our business operations has broadened.

The motto of the Pearland Works is the "Creation of products with Japan quality in the U.S. by incorporating our many years of expertise accumulated in Hiroshima into the dynamic nature of American business." With the inspiration obtained through interaction between the two countries, we will diligently aim to operate a factory that can meet the expectations of our customers.