MUC Engineering

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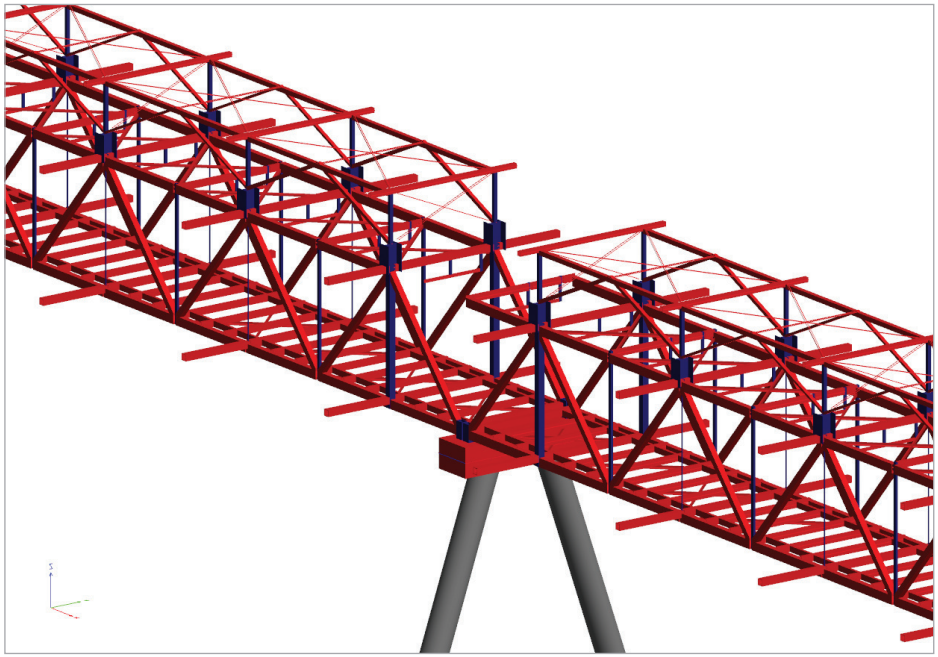
After being established in 1981 M.U.C. (Meeuwsen- Udink- Consultants) has been involved in design and execution works for all kind of infrastructural projects in the Netherlands and abroad. To accommodate some of our large projects in the Middle East, Ingenieursbureau M.U.C. has opened an office in Fujairah in the United Arab Emirates under the name MUC Engineering. The company started its operations in Fujairah in 2004.
MUC Engineering is a completely independent advisory engineering and consultancy company, active in the field of civil/marine engineering.

Activities of the company are amongst others: foundation engineering, coastal and hydraulic engineering, the structural sector and mechanical engineering.
MUC Engineering works as a design, engineering and consultancy company for building contractors, port authorities, the government, other engineering offices and private companies. The operations are executed for about 400 different clients, companies and institutes around the globe.



Software: Scia Engineer

Offshore Trestle - Fujairah, United Arab Emirates

Vopak Horizon Fujairah Ltd. (VHFL) operates the first independent onshore oil terminal outside the Arabian Gulf, on the East coast of the United Arab Emirates in the Emirate of Fujairah - one of the world's largest bunkering centres. The VHFL oil terminal is designed to handle products including naphtha, gasoline, gas oil, jet fuel, kerosene, condensate, methanol, methyl tertiary butyl ether (MTBE), fuel oil, and crude oil.
The terminal can accept tankers of up to 175.000 DWT. VHFL is currently planning to expand its oil terminal under "Phase 6 Expansion Project" by additional storage tanks, and pipelines interconnecting VHFL Berths 1, 2 / 3, 4 / 5, 6. The expansion plan involves both onshore and offshore works. The offshore work involves land reclamation works, construction of new piping trestles (or strengthening existing trestles) and jetty piping works.
The petroleum products come from ships berthed at existing jetties of VHFL. The existing berths are fitted with Marine Loading Arms, piping and all fittings and accessories required for a good oil terminal facility.

The offshore contract has been assigned to Athena S.A. Within the scope of this contract additional piping, fittings and strengthening of the existing trestle have to be provided. Some sections of the existing trestle structures are not capable of carrying the additional pipeline loads.
Athena S.A. has assigned MUC Engineering to carry out the civil design work for the offshore trestle.
The design work comprises verification of structural performance of the existing trestle, design of additional pipe racks and strengthening, and verification of pile capacities.

The new pipe rack tier on top of the bridges of Trestle #1 shall provide extra strength to these bridges and additional load of self weight and piping. Preceding installation of this new frame, initial stresses are present in the members of the bridges. To take these stresses ("load history") into account within the structural evaluation of the bridges, Trestle #1 shall be analyzed with FEM software that has staged construction abilities:
Construction Stage 1 shall represent the

- Existing conditions of the Trestle, which are used to determine initial stresses in the members.
- Within Construction Stage 2, the new frame has been mounted on the existing bridge. Stresses in the members shall be determined by applying all new loads taking into account the strengthened structure and the initial stresses from Stage 1.

The construction stage analysis of the 1.0 km long offshore trestle has been carried out using Scia Engineer. The following loads have been considered in two different stages:

Loads in Stage 1

1. Dead load (self-weight of the existing structure, marine growth on piles, existing piping works, load of the facilities for electro-mechanical operations, weight of the product inside the pipes, etc.).
2. Live load (pipe friction load of the existing piping).
3. Environmental load (Thermal load on the existing structure).

Loads in Stage 2

1. Dead load (self-weight of the new structure, new piping works, load of the facilities for new electro-mechanical operations, weight of the product inside the new pipes, etc.).
2. Live load (live load on trestle deck and new pipe friction load).
3. Environmental loads (wind load, wave load, current load and thermal load).
4. Accidental load (seismic).

Wind, wave, current and seismic loads are applied only in Stage 2 on the whole structure, whereas all other loads are applied based on their period of occurrence (whether existing or new). The loads are determined based on project specifications.

The analyses of the trestle with new pipelines for several load combinations have been carried out using the Scia Engineer structural analysis program. The Design Checks for the structural members were performed according to Eurocode 0 to 8.

From the model output it was concluded that all the steel members (existing and new) are within the allowable stress/capacity limits for the new piping load.

Offshore Trestle

Fujairah, United Arab Emirates

Project information

Owner	Vopak Horizon Fujairah Ltd.
General Contractor	Athena SA
Engineering Office	MUC Engineering
Construction Period	From October 2010 to November 2011
Location	Fujairah, United Arab Emirates

Short project description

This project is about the design of trestles included in the plans to expand an existing oil terminal. Some sections of the existing trestle structures were not capable to carry additional pipeline loads. MUC Engineering was assigned to carry out the civil design work for the offshore trestle. The design work comprised the verification of the structural performance of the existing trestle, the design of additional pipe racks and strengthening and verification of pile capacities. From the model output of Scia Engineer it was concluded that all the steel members were within the allowable stress/capacity limits for the new piping load.