Preface

This travel report is about the successful Vulcanus study tour 2011. This year the destination was Italy: Trieste and Venice. In the morning of the 4th of July a group of 14 Vulcanus members gathered at Schiphol airport to start an interesting week. The group was a little bit nervous to showing up in time, so 10 minutes in advance of the agreed time the last two participants where already phoned if they were able to get the flight.

Every year Vulcanus organizes a study tour abroad. The marine industry is an industry which is not limited to our Dutch borders. With these study tours we try to give an impression of some different sides of the industry to our members. We visit companies which can be a potential future employer for the students. It is an informative week where students can expand their professional vision. Next to the informative side there was also room to explore the cultural sights and of course the Italian nightlife.

To make this Vulcanus Study tour a great success I would like to thank the following people. First I would like thank our sponsors. Without their financial help there was not a Vulcanus Study tour 2011 possible. Secondly I would like to thank my fellow board members Kasper, Stef and Mike. They put a lot of effort in the organization for this week to make it a success. If you want to make a phone call to Italy and also want to talk with the right person you need a lot of patience. Thirdly I would like the companies we have visited, everywhere we were friendly received. The people who gave us a presentation or factory tour were all very enthusiastic and tried hard to answer all our questions. Fourthly I like to thank our staff members Prof. Stapersma and Dr. Grimmelius for the advices, contribution and last but not least their driving skills. At last I like to thank our group of students. With their enthusiasm and their difficult questions during the company visits, the Italians won’t forget Vulcanus for the coming years.

I hope that this report gives a good view about this week and that it brings some good memories back to the participants. Hopefully it can be a good inspiration source for the future Vulcanus boards when they start organizing new study tours.

Kind regards,

René Nuijten
Chairman Dispuut Vulcanus
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About VST 2011.

Dispuut Vulcanus is a student association for Master students with the specialism Marine Engineering, Marine Diesel Engines or Mechanical Systems and Integration. Vulcanus provides excursions to companies inside the Netherlands as well as a one-week international business tour each year. Mainly through currently working, previous student-members Dispute Vulcanus has good contacts with several companies.

During this business tour companies that are related to the Marine Engineering business are visited to get acquainted with some companies in the sector. But of course also to find out about new technologies on the market, to get useful information for your graduation project, to see some nice things in the country, and last but definitely not least it is very much about having a good time with your fellow students. The last few years the business tour went to Germany, France, Sweden and Norway and the United Kingdom. This year we went to Italy, to be more precise Trieste and Venice. Were some interesting marine companies are located.

Through the document and on the last page of this document you will find which companies made this trip possible. Because this trip could not take place without the support from our sponsors, so:

Thank you very much!
Participants.

The group the VST 2011 consists out 15 persons. 2 staff members, 1 PHD student, 1 Master student from the Dutch Royal Navy and 11 TU Delft Master students.

From left to right: Douwe Stapersma, Wei Shi, Bas Kwasieckyj, Renee Naaktgeboren, Vincent Oldenbroek, Joppe Osté, Benny Mestemaker, Hugo Grimmelius, Kasper De Ruyck, Stef van den Bergh, René Nuijten, Mike Loonstijn, Frank van Es, Joost Drijver and Maarten Sanders.
Monday, 4th July: Journey to Italy.

It was a Monday morning where scattered people from all over Holland (and Spain) congregated at Starbucks at Schiphol Airport, at the decent Christian time of 11:00. The reason for this: the VST 2011 starts here! Everybody was quite on time, so there was no rush checking in and go to the gate. After some coffee and a sandwich we boarded the plane and departed to Venice. Personally I don’t have much to say about the flight itself, because like some others, I was asleep until the landing. I didn’t notice much, so the only thing I can say that it probably was a smooth flight.

Our welcoming committee consisted of Vincent, who arrived earlier from Madrid where he studied for the last few months. We were complete! Let’s go! Get the vans! Wait… Italiano style reservations. Although the booking was done quite well, the lady at the counter still had some problems. Yes ma’am, 18 people. Yes, 2 vans. Yes, René really is 25 years old, not 17. Yes, July 4th is after June 18th, his birthday. When we finally got the vans we went directly to Trieste, where we had the whole evening for unpacking and dinner. It was good that we had the whole evening, because ordering food from the ‘tourist menu’ really did take all evening to arrive. It was lovely though, these Italians sure know how to cook! Something we could validate over the next few days.

This being a study tour, did we actually learn anything in this first day of travel? Well, one thing is that a Fiat Ducato is a great way to travel (sitting in the back at least) with good air conditioning, drinks at the terrace are more expensive than at the bar but you do get a lot of snacks with it and that Patrick Kluivert – Dutch Football’s all time top scorer – also just flies economic. Charming fellow.

Written by: Bas Kwasieckyj

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Tuesday Morning, 5th July: Wärtsilä.

Italia S.p.A., Trieste

On Tuesday the 5th of July, on the second day of the Vulcanus Study tour 2011, we brought a visit to the Wärtsilä assembly, research and test centre in Trieste, Italy. The evening before we did our welcome tour through Trieste, so for some people 9am was a little early, but the heavy rain woke us all up. It was a kind of a challenge to reach the cars with dry shoes, because the streets were filled with water. Welcome in Italy!

At the Wärtsilä premises we were welcomed by old Vulcanus member Patrick Baan director concepts & solutions. He introduced us to the business Wärtsilä is in. All of us know that they produce diesel engines and thrusters, but what was new for some of us is that they also focus on complete ship design now and that they are a major player in power plant design. The factory in Trieste is the biggest in Europe with a 550.000 m² area, of which only 1/5th is in use. In this factory primarily medium speed engines with bore from 26 to 64 centimetres are assembled.

After the general presentation on the company and the factory in Trieste we had a presentation about the challenges Wärtsilä meets nowadays with the emission legislations. Generally there are two ways to meet the strict regulations on NOx and SOx emissions:

1. Use exhaust gas after treatment
2. Switch to LNG as a fuel

Two examples of promising exhaust gas after treatment technologies are the closed loop fresh water scrubber with NaOH addition for SOx removal, and the Nitrogen Oxide Reducer (NOR) which is a selective catalytic reducer which uses ureum as a reagent. These topics raised some questions from our group about the combination of these technologies, about possible backpressure problems for the diesel engine and the possibility of an underwater exhaust.

The second option is to switch to LNG as a fuel. With this solution all emission regulations are met at once. A reduction of 100% on particulates, 100% on SOx, 85% on NOx and 20% on greenhouse gases can be reached. Diesel engines need major changes to run on gas. There are also some disadvantages of the use of gas, of which the enormous increase in tank volume is the most important. The volumetric energy density of gas is about 1.8 times lower than diesel fuel, and the tanks are much bigger and need to be cylindrical. In total you need about 3.9 times the tank volume of a diesel tank to have the same energy storage with LNG.

After a short break, Gino Rizzetto, Engine Performance Manager, continued with a presentation about new engine technologies for improvement of engine performance. He mentioned:

1. **Flexible valve timing**, for lower NOx emissions and smoke and faster transient reactions. Also higher engine efficiencies are reached.
2. **High pressure 2-stage turbocharging**, to reach pressure ratios up to 8. High charge air pressures allow extreme Miller timing, which is good for NOx reduction, and still have high engine efficiency.

3. **Optimizing combustion process**, which includes changes in chamber and piston top geometry, changes in the number of injector holes (for lower NOx) and applying common rail technology to control the injection rate shape. Common rail technology offers timing flexibility and pressure flexibility, which together enable optimal NOx or sfc tuning at all loads.

Gino Rizzetto also gave a clear presentation about the working principles of the Dual Fuel (DF) engine, which can run on both diesel fuel and LNG. In gas mode, 1% (energy) MGO is injected as a pilot fuel to start the combustion. To have a proper combustion of the gas, a λ control is necessary. Too lean mixture can cause misfiring and too rich mixture causes knocking of the engine. A pressure sensor in each cylinder detects if combustion is good.

After the very interesting and enlightening presentations we got a lunch in the canteen, and we had a guided tour around the factory in the afternoon.

*Written by:* Frank van Es
Tuesday Afternoon, 5th July: Wärtsilä factory tour.

After the morning presentations we had lunch and were able to stretch our legs during the tour through the Wärtsilä factory and their research factory. So after enjoying the Italian lunch consisting of pasta Bolognese, goulash and salad, it was time to prepare for the factory tour. Meaning we had to gear up with safety shoes and helmet, not really matching our suits.

At first we had a tour in the warehouse of the Wärtsilä factory – given by Luca De Cillia – where the components from the suppliers arrive and go through the quality checks like the cylinder head pressure tests. Another section of this part of the factory was the section for the assembly of the smaller diesel engines like marine engines.

After this part of the factory we went on to see the part of the factory where the biggest diesel engines are being build. The biggest diesel engines they build were engines with cylinder bores up to almost one meter. These engines are not for marine purposes, but only for use on power plants. They showed us how they assembled these massive engines and in which order. This goes from the manufacturing of the huge housing, which took three days in a big milling machine, to installing the intercoolers. They were also assembling dual-fuel engines here. At the end of the assembly line the big engines were installed in the testing configuration before they are being shipped to the customer.
The last part of the tour in the factory was in the research department. Here they have installed 22 different diesel engine testing configurations for research. Some are here for pure research purposes and some for the support of the development of the engines. They showed us some setups where they are testing with dual fuel engines with their mind on the new IMO emission standards (TIER III). The newest product they were working on was the 50 bore gas-spark engine. After this the interesting and hot tour was finished.

Written by: Joppe Osté
Wednesday morning, 6th July: Università degli studi di Trieste.

Another beautiful morning in Trieste; sunny weather, good breakfast and a group of well-dressed and excited students that went all the way from the Netherlands to visit the University of Trieste. The welcome at the university was very impressive, the main entrance consist of a beautiful building, prominently built on top of a mound, with old roman inscriptions and pictures on the walls. If you turn around you had the most amazing view of the city of Trieste and the blue sea.

We had a guided tour through the entrance building and discovered several faculties more upwards the hill, which was interesting and also tough because it was more than 30 degrees. We ended up at the faculty of Mechanical Engineering and went to the top floor, where the division of Naval and Marine Engineering is located. In a class room, we were given a presentation about the university in general and the division for Naval and Marine Engineering. The programs for the Bachelors (Laurea) and the Masters (Laures Magistrale) were explained and a few recent research projects were discussed, for example on parametric roll in longitudinal waves (in collaboration with Osaka, Japan) and on hull form optimization.

An Erasmus agreement exist with Delft University of Technology, but unfortunately not (anymore) in the field of Marine Engineering. This would make it difficult for a students from Delft to study at the University of Trieste or vice versa, moreover all the courses are taught in Italian, which would be another challenge.

After a short coffee break, we gained insight in the recent experiments and the available experimental set-ups of the university. The cavitation tunnel was the first stop, whereupon we started the climb to the towing tank at the fourth floor. First it sounded strange to build a towing tank on the fourth floor, however we discovered that this faculty is built upon a steep hill, which means that the towing tank is situated on ground level again. This towing tank can tow fast carriages with a speed up to 7,5 m/s and slow carriages at 1,5 m/s. The useful length of the tank is 35 meter. A demonstration was given of a current experiment and also waves were created. It was very interesting to see different approached and experiments.
than at Delft University of Technology.

The visit ended with a very tasteful lunch with typical Italian sandwiched and a lovely refreshing drink. Finally it can be concluded that we had a nice and interesting morning at the University of Trieste.

Written by: Renee Naaktgeboren
Wednesday afternoon, 6th July: 3.MAJ motori I dizalice.

On Wednesday the 6th of July we went to 3. Maj. This Company has a diesel engine factory, a production facility for large deck cranes and a shipyard. 3Maj is located in Rijeka, Croatia.

About the company

Diesel engines
The production of diesel engines has started after 1954 under license agreement from the Swiss engine company Sulzer (which is now Wärtsilä). The equipment size in the factory and the factory hall it selves has enough height to handle large to stroke engines. Yet the factory is producing the Wärtsilä RT-flex48, 50 and 58 2-stroke engines for their tankers to be produced on the shipyard. Also some of the diesel engine parts such a piston rods, engine blocks, pistons and cylinder liners are fabricated by the factory it selves and later on assembled. At the moment the diesel engine factory has built more than 220 slow speed engines. From the period 1974 – 1989 the factory has also produced 24 medium speed 4 stroke engines under S.E.M.T. Pielstick license.

The Study trip

Cartrip
After we visited the university in Trieste, we went by car to Rijeka. This was a very nice car trip, the people that were late last night had an extra sleep and the people awake could observe that Slovenia was also a very nice country. Later then late we arrived on the shipyard Rijeka because we were standing on the wrong end of the yard and it took some time to find the main entrance. But these search actions gave us good opportunities to look to the local living conditions. We saw that the local people love beers.

Presentations
Finally due some good driving work of Rene we arrived at the main entrance of the Shipyard 3. Maj. Unfortunately we were an hour to late, but we were at least happy that we arrived. The visit of the shipyard started with a drink followed by a technical presentation of the diesel engine factory and the shipyard it selves. The diesel engine presentation was about the historic and the development of the diesel engine factory followed by the nowadays operational description of the diesel engine.

After having the general diesel engine presentation a more interesting story about the ships production was presented. In this presentation it became clear that this yard build until the 80’s of the last century all kind of ships such as mult-purpose ships, container vessels, tankers and even in the first half of the 20th century warships. At this moment the shipyard is specialized in tankers. The production manager was telling about the production strategy and the competition problem from Asia. He was also telling that his shipyard has no fixed tanker designs and they are designing the tankers to the wishes of the customers. This means that the yard has a large ship’s engineering department for the designing of the vessels. Comparing to Asia where they have some fixed design the construction of the vessels in Rijeka will require more time and so the vessels will be more expensive. Another fact is that the technology level of the Croatian yard 3. Maj is lower than the current technology level of the Asian shipyards. The hull extension takes much more time at 3. Maj than in Asia.
Company tour
After the presentations the guided tour started in the diesel engine factory and the cranes factory. In this hall a part of the engine parts such as pistons, piston rods, cylinder liners, engine casings, exhaust gas channels are constructed the other engine parts are ordered and assembled together to a complete engine. Also this factory has four places for engine testing. On the picture on the right one complete 2-stroke engine is illustrated on a test bed. In this hall also the construction of the large deck cranes and rudders takes place.

After we went through the diesel engine factory, the guided tour continued to the shipyard’s subassembly area where all small ships construction parts are welded together to one ships section. See the picture on the right.

These completed ship sections are assembled in a dock. When the construction is 100% finished the vessel is launched and build of next to a quay. During this guided tour we had the possibility to have a tour in a vessel under construction.

Immediately it became clear that the safety aspects on the shipyards did not play such a big role. We could enter the vessel under construction even with sandals and the engine room plates where not yet assembled. The tour in the engine room was a kind of survival over not fixed wooden beams and was not safe at all. But on the end we survived all without injuries.

For the most of the Vulcanus members the tour in the engine room of the tanker under construction was very instructive due to the fact that the machinery was visible in real live. From my part of view I was glad that we had the tour in the vessel, but on the other hand my white pants was not white at all anymore. A picture of the vessel is standing on the right.

All with all the visit of the shipyard and engine company 3. Maj was in the beginning with the presentations a little boring, but the guided factory tour was very interesting. After the visit of the company we had a very nice evening with a nice swim in the neighborhoods of Rijeka followed by meat or fish diner in the city center.

Report by: Joost Drijver
Thursday, 7th July: Venice.

Unfortunately we couldn’t visit the shipyard Fincantieri. So we changed our program a little bit and visited the whole day Venice. We left Trieste at about 10am and arrived at around noon at our lovely hotel. After having the most known Italian dish, a pizza, we were ready to explore Venice! In the meantime the children of professor Grimmelius painted with chalk the Vulc anus logo on the pavement, so Venice would not forget Vulc anus was there! With our professor Stapersma leading us along the canals and bridges, we first visited the Chiesa di San Rocco (Church of Saint Roch). After that, we headed in the direction of the Ponte Rialto (Rialto Bridge). In the meantime everybody was taking pictures like real tourists, buying souvenirs and ice-creams, and some bought one of the famous venice carnaval masks! Could be once useful on a party in Delft! Then we arrived at the precious Ponte Rialto. It is one of the four bridges over the Canal Grande. The bridge was finally completed in 1591, by then architects predicted that the bridge would collapse soon, but the opposite is true! The Ponte Rialto is not an ordinary bridge, but has a lot of small houses and shops on it too. Above all it gives a perfect view over the Canal Grande, Venice’s biggest and one of the most important canals. Lots of small boats and gondolas are navigating on it, really nice to see! Next stop, the most important square of Venice, Piazza San Marco. At Piazza San Marco you have several cultural highlights. First of all the Basilica Cattedrale de San Marco. The Basilica has a great dome and from the inside completely covered with Mosaic. On the left side of the Basilica you have, Torre dell’orologio, also called the St. Mark’s Clock Tower. One of the highest towers in Venice is the Campanile di San Marco, and is one of the most recognizable symbols of the city. Next to the Basilica there is the Palazzo Ducale, the Doge’s Palace. The palace was the residence of the Doge of Venice, the supreme authority of the Republic of Venice. After having a nice view on the Lagoon of Venice and the Canale di San Marco we continued our sight-seeing tour. We crossed the Canal Grande again by taking the Ponte dell’Academia. Walked through the nice neighborhood, passed several nice squares and churches, canals we ended up in our hotel again. For dinner we ate typically Italian at the square Campo Santa Margherita. After the dinner we had a few drinks at another place at the same square and a few ones had a chat with the local youth, as Campo Santa Margherita was also the central place for the local youth in Venice. We finished the night in a small and one of the few clubs in Venice, Disco Club Piccolo Mondo! Everybody tried their moves and in the end headed back to the hotel for a good night’s rest!

Written by: Vincent Oldenbroek
Friday Morning, 8th July: Museo Storico Navale.

Friday the 8th of July Vulcanus visited the Venice Naval History Museum. The museum is located in the Campo San Biagio in the eastern Castello district, a short walk from the San Marco Basilica (“Basilica di San Marco”). The Vulcanus party took a water bus from the hotel to the Arsenale stop.

The main entrance of the museum is marked by two enormous anchors seized from Austrian battleships during the First World War.

The first floor of the museum contains a collection of Second World War artillery pieces and torpedoes. The first floor also houses an exhibition dedicated to the memory of the 18th century admiral Angelo Erno who won some minor naval engagements against Algiers and the Bey of Tunis, and who reorganized the Arsenale in a vain attempt to maintain Venetian naval power.

A large section of the second floor is dedicated to another naval hero, Admiral Morosini, who drove the Turks out of the Peloponese in the late 17th century. Despite his military achievements, Admiral Morosini is probably best known for his scandalous bombardment of the Parthenon during the siege of Athens in 1687.

In addition to the Morosini exhibition, the second floor contains an exquisite collection of ship models which are correct in virtually every detail. The collection includes military and merchant ships but the most impressive item is undoubtedly the model of the Bucintoro, the Doge’s ceremonial barge.

The third floor of the museum charts the history of Venetian trawlers and merchant vessels, and includes an extensive display of traditional fishing gear. There are also some decorative 17th and 18th century gondola prows and several silver-trimmed black hats of the kind formerly worn by gondoliers in the service of noble families. Several unusual and lavishly decorated gondolas are also displayed including one which formerly belonged to Peggy Guggenheim, the founder of the Guggenheim Museum on the Grand Canal. The museum grounds, which once formed part of the Arsenale, contain several sheds in which various historic barges are displayed.

The museum is a must see for maritime engineers and enthusiasts during a visit to Venice and with an admission fee of only 3 euros truly a bargain.

Written by: Benny Mestemaker
Friday afternoon, 8th July: flight back.

After the morning program we gathered at the hotel with the luggage. Sadly it was time to return to the Netherlands. After a short vibration in the luggage of René, “no, it is my electric toothbrush” everyone got into the van. During the ride back most of the Vulcanus members enjoyed some shut-eye, apparently we have been busy the past few days.

At the airport it was this time easier to get past the customs, the detection devises were not as sensitive as at Schiphol Airport. After a short delay it was possible to board the airplane. After boarding it became clear why there was a delay. The crew had gotten the wrong airplane, it was too big. But during checking-in everyone was assigned a seat in order from a smaller plane, thus the back of the plain was empty. Interested some Vulcanus members watched how the cabin crew counted and recalculated a new distribution of the passengers. For us it was clear that there had to be more passengers in the back. The cabin crew only came to that conclusion after following a certain protocol Afterwards the flight was fast and boring, the good kind of boring.

Report by: Maarten Sanders
Sponsors
The last pages have been reserved for our sponsors. It is thanks to them that we are able to organize this study tour. Please take a look at the companies and organizations that made this study tour possible.

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