Case Study - Ryan Salmon- Marine Engineer (funded 2010-20)

Vasi Southern, Hamble, Hants.

www.vasi-southern.com

In this report I will be outlining the tasks I have worked on since my mid-year report to you and linking in how training at Paragon Skills has had a positive impact with the jobs I have worked on. I will also outline my interests, enjoyments, and challenges associated with my job role; summarising all key knowledge learnt and telling you how I think it will benefit the wider marine industry.

Since my last report; I have worked on a great deal of jobs and have learnt an immense amount of knowledge compared to what I knew before. From the months of April to August I was furloughed due to covid-19 so unfortunately I could not work; however, I was taking part in college teams calls where we were taught many things including the basics of electricity, ohms law, and material properties.

During the month of September I took part in an exhaust manifold installation, vibration dampening tasks; which included installing rubber mounts on an electrical box, an outboard

service; which was my first ever one, and I did this on my own as a challenge to see if I could carry out the task having not done so before. I also took part in troubleshooting unburnt fuel coming out of an exhaust where I learnt about the different coloured smoke that could come out of an exhaust; and what each colour means, corresponding to an engine problem. I took part in shaft alignment, a pre delivery inspection, a head strip down, and exhaust lagging replacement; where I learned the importance of covering up as much hot exhaust as possible. The reasoning behind this is because if there was a situation where hot fuel were to be sprayed across the engine bay; if it were to touch the exhaust, it would more than likely cause a fire. This is extremely dangerous as it could get out of hand quite easily because once fibreglass starts burning, it does not stop easily due to the chemicals and resins within its base 'makeup'. I also took part in a leak inspection for an outdrive unit which we tried fixing just by tightening the studs which ran through the transom; however, this did not fix the problem as you will find out in next months jobs. Lastly in this month I took part in an aqua drive removal and had forklift training.

During October I took part in injector seat and seal replacements, engine mount replacements, and genset fault finding; as at first we thought it was problems to do with the fuel pump, however after some tests and checks we realised that it was in fact the actuator which was not being engaged, however the actuator had continuity running to it, meaning that it was PCB problems further up which was not telling the actuator to engage the fuel pump. This month I also took part in an aqua drive instalment, fuel pump and injector replacement, and an oil leak inspection; which turned out to be a blocked crank case ventilation filter which just needed cleaning. Finally, this month we continued with what started off as a leak inspection, however quickly turned into an outdrive removal and re seal, but to do this we had to disconnect everything from the engine, and shift it forward to allow us room to disconnect the outdrive.

During November I took part in disconnecting everything from an engine which would keep it attached to the boat in some way shape or form, in preparation for engine crane out, I then helped directing the Hiab for the engines to be craned out; and once out had a massive clean-up of the bilge. I also took part in a crane engine installation which gave me an insight into the automotive industry, as its previous engine had dropped a valve for unknown reasons. So, we had to order in a recon engine and swap over all ancillary parts and then reinstall into the crane ensuring all systems were connected back up together.

In the month of December I took part in the removal and installations of heat exchangers, aftercoolers and oil coolers, when removed each of these were serviced using rydilime, and were sanded down and spray painted before being reinstalled back onto the engine. I also took part in a bravo 3 drive steering removal in which you had to take apart in a certain order to ensure the shaft did not get wedged in. Lastly for this month I carried out a winterisation, which is extremely important for boat owners when leaving their boat over the winter, as this stops components from freezing up and cracking due to the water that is inside some engine components.

During January I carried out shaft and prop removal due to major engine vibration, as the shafts were extremely bent and were sent off for straightening. I also carried out water pump and stern seal removal and replacements, along with draining down and scraping out

our parts washer, so we could reseal the valves on it and refill with new fresh cleaning additives. I also investigated a generator PCB failure as it kept getting shorted out as the wires coming off of it to the dc switch were extremely burnt out. I Found out afterwards that it was most likely the loom as the PCB had been changed 3 times and this PCB looked as if it were in perfect working order as there were no scorch marks on the part that was expected to be burnt out. When replacing PCB's Cummins recommend that you change the loom along with it and this had not been done the previous 3 times by previous engineers. I also took part in a bravo 3 rebuild and investigated a coolant leak, which turns out was coming from a turbo coolant feed where it had 3 sealing washers on the banjo bolt instead of 2 which was causing the leak.

During February I stripped down a gearbox for the first time since my previous college, this gearbox had been completely submerged in water and had milky emulsified oil throughout, after stripping down it became clear that the gearbox was unsavable, however it did give me a better insight into how all the gears and clutch plates work together with rotary and planetary gears, to squeeze up against each other to force the shaft to spin in 2 different directions. I also took part in an engine and outdrive installation for a high-performance speed boat, and a generator panel insulation removal and installation, where a lot of measuring and noting down was taken; as once scraping all glue off of the generator panels, there was no way of working out where to re-stick the new sound proofing, so it was extremely important to measure accurately to prevent the sound proofing from having any chances of being overlapped. Lastly this month I removed some batteries from a boat to be taken away to be charged, as where it was stored there was no shore power available.

In March I installed a sea fire extinguisher system after having an online training course, replaced some exhaust elbows, and installed some rope cutters onto a shaft. I also took part in exhaust hose removal, oil cooler restoration, and alternator and belt replacement. Finally this month I took part in an engine instalment and shaft alignment, which was a lot harder than previous shaft alignments as it was for a V driven gear box, so there were a lot more parameters to keep in mind as you have to first align the gearbox with the hole through the vessel, and then use extremely minor adjustments to align the shaft through both the hole in the hull and the hole straight through the gearbox; ensuring the shaft is in the centre of each hole making no contact whatsoever with any surfaces, and on top of this you have ensure a stern and shaft seal is set up correctly and slid down the shaft before it gets to the gearbox as it is extremely tight so once it hits the gearbox there is no budging it and the shaft has to be pulled back out.

In the month of April I started to do engine services on my own without the need of anyone else to watch over me, and was introduced to upkeep which is an app we use to keep track of all our jobs and do job write ups on. I also took part in water inlet hose removal and installation along with an engine cooling system refit and a turbo restoration. Lastly for this month I took part in an engine ECM replacement and recalibration.

In May I took part in a water pump removal, reseal, and refit, another aqua drive instalment, and a circulation pump installation where I learnt that you must always pressure test the coolant system afterwards; as if not installed properly there could be leaks, and when filling up with coolant will cause a massive mess in the engine bay. As due to coolants

viscosity and texture, it is really good at finding leaks in the cooling system.

Please note, all jobs I have listed here are all new jobs that I have come across, as I have carried out many engine, generator, and Zeus drive services, and I have also had a lot of experience in propellor, shaft, and cutlass bearing removals and installations. Another repetitive job is shaft alignment and engine mount replacements as I have done quite a few of those too. Please check bottom of document for pictures relating to jobs carried out.

Training at Paragon Skills has helped massively with my job activities, for example they have taught us about the different marine use materials and their properties; and the advantages and disadvantages that they might have depending on their application. This gives me a much better understanding at work as I now know why certain materials are in use in certain systems/components; and knowing their properties helps me understand how much force can be applied and in what way I can apply it, when needed to; without damaging the component.
In Paragon we have been making many things such as plates with different shapes and holes cut out of them, drill gauges, a fixing block which consist of 2 mild steel plates and a nylon plate in the middle with a card gasket, with an assortment of holes for nuts, bolts and studs. At the moment in Paragon we are making our own G clamps and all these items are assessed for accuracy within tolerance to a technical drawing we have followed; this coincides with work as it really puts into perspective the extremely close parameters in which the engineering world works in, furthermore this has helped me at work assess damage to components, as it has helped me understand how small some tolerances can be and that even the smallest damage on some components can mean that they are unable or unsafe to be used. And knowing the properties of these materials can help me work out what exactly has caused the damage depending on what the damage is, whether it be corrosion of some kind, or scratches, or scores.

There are many jobs in which I have enjoyed throughout my time in the marine industry; among my favourite of those is engine and generator services, as for the most part they are fairly straight forward, and I find renewing all the parts then giving it a nice run up extremely satisfying; especially if there has been a couple of hiccups on the way. Another job I particularly enjoy doing is spray painting components. I also enjoyed installing new sound proofing on the inside of the generator panels, as it allowed me to measure and mark up each panel and make a little drawing for each.
I find fault finding and leak inspections very interesting as it allows me to use more of my brain for the job, as it enables you to get fully emersed in what you are doing as you are actively problem solving on the job, and once you have worked out the problem, when you either fix it there and then or later on, it is very satisfying as you have actively found the problem and corrected/fixed it.
Within this job I have found many things challenging and could list almost endlessly, however the main thing I have had trouble with is any electrical based problems, and that's not because I am incapable of splicing wires or switching out capacitors or using a voltmeter; but because my knowledge on electrics is still fairly limited, I have had a some training on the basics of electricity and have been taught all the components that may be in electrical circuits and what they do; however with electrics you can be taught as much as you want but until you go out there and get more and more experience with electrical

troubleshooting you will not get better at it. Due to most of our jobs being mechanical based, electrical fault-finding skills will come more evident as time goes on and I gain more and more experience in that field.

One of the main things I found extremely difficult when I first started was installing impellers, as they are extremely fiddly and do not want to go into water pumps without putting up some sort of fight. However, since having a lot of practice removing and installing them, I have found a knack for getting them in and now I do not mind doing them; as I used to dread having to fiddle around with the impeller when carrying out a service but since finding the knack for them, I do not mind them so much; although that isn't to say that they have stopped putting up a fight to get into the water pump.

To list all knowledge and skills developed since being here would take pages as I have gained an immense amount of experience doing all sorts of different kinds of jobs. My base knowledge of engines has been good enough for a while now that I have been doing Cummins courses online; which give details of specific engine models, where their lubrication systems run through the run ways and into the main oil galleries; where their coolant systems run through, and any specific specialist knowledge required to know to be able to effectively carry out maintenance on those engine models. I have also been through Seafire and Mercruiser diesel training; showing my base knowledge of mechanical and electrical engines and systems, is good enough to be able to take an ample and effective understanding of what I have been taught to then be able to apply it real time within jobs.

One of the main developments I have found is that I am a lot more independent and can go out and do jobs on my own, even if that means talking to customers and answering any questions that they may have; which is something that completely scared me when I first started, as I was afraid that I would get asked questions I did not know the answer to, but now for the most part I can either answer the questions, or give my best judgement on things and double check and get back to them.
I have also improved on being able to competently use tools without feeling cack-handed, even in the most awkward positions and places I have since been a lot more fast and effective using tools when carrying out maintenance.

The main knowledge I have gained is all the small tips and tricks that come hand in hand with each job; and every small problem or hiccup you come across in every job I have found ways around it. Another main skill I have majorly improved on is my fault-finding skills, as depending on the circumstances, I now have a much greater knowledge and can give better guesses on what the cause may be. For example; when resealing the water pump in the month of May, when coming to put it back on the generator and running it up, the generator would run for 17 seconds and then shut off. This told me that there was either low oil pressure or a faulty oil pressure switch, so I located the oil pressure switch and found I had knocked the connection off by accident. When I had first started, I wouldn't have had a clue if that had happened to me and I would not have been able to make the generator run.

Another improvement in knowledge I have noticed is component recognition, as when I first started, I was only used to Cummins shaped components and where Cummins usually mount their components to the block, so when I came across other engine brands and

models, I found it hard to locate certain components as I was used to Cummins shapes and positions. However, since starting I have worked on a range of different engine brands and I have since gotten a lot more confident in being able to recognise any component on any engine.

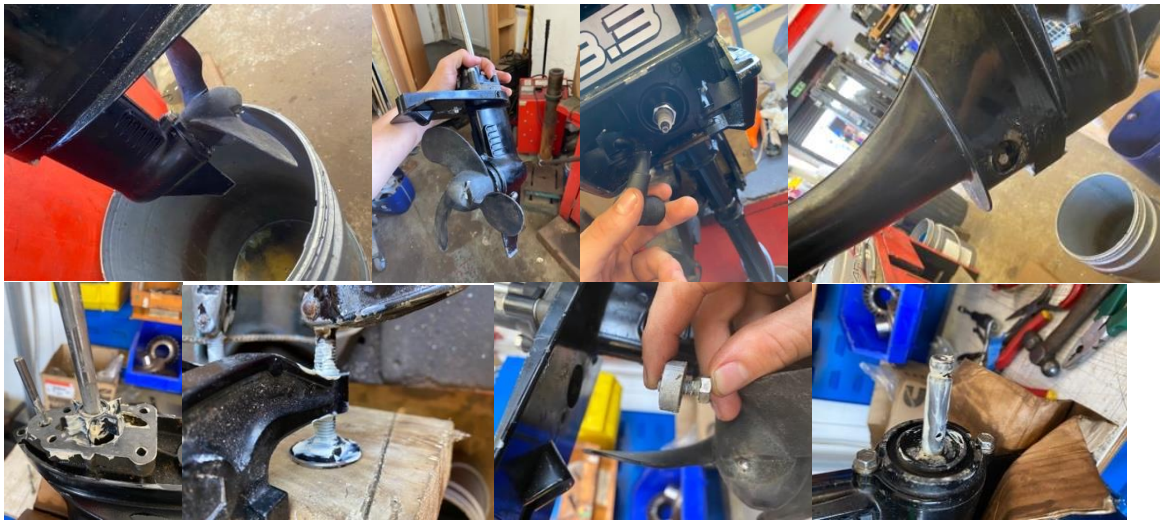
Those are just some of the main knowledge and skills I have developed, it's hard to put down all key knowledge as every bit of knowledge is key in the marine industry, as there is a lot that can go wrong at any given point no matter how much experience you may have.

Although I am still a long way from being qualified; I think my apprenticeship is benefiting the company as their training and skills is being passed onto me, making me more independent and efficient at carrying out jobs; which in turn benefits the company. The one major thing that sticks out for benefitting the company is the fact I can independently do engine and generator services as we always have them to do so I can actively make the company money by doing those jobs independently.
My apprenticeship has helped the local economy as I have done work on SERCO vessels in the Portsmouth navy base, which are taxi boats for the naval base employees, this generates services within the navy base and forces money to be spent within the marine industry making it more beneficial. I have also changed and calibrated ECMs on a police vessel which benefits the local economy greatly as it gives more safety and security out on the waters.

Another way my apprenticeship has benefitted the marine industry is simply just the fact that knowledge has been passed down to me; as one day I can then pass that same knowledge down to a new apprentice so he/she can learn and grow their skills and understandings. It is these practices which keep the marine industry going, the passing down of knowledge so that new people have the opportunity to gain experience while doing work for the marine industry.

My goals for the near future are to finish my apprenticeship and become a fully qualified Cummins engineer by completing all training; online and at the Cummins training site; so I can specialize in the upkeep and maintenance of Cummins engines. I would also like to get more confident with electrics so I can happily troubleshoot electrical problems and have a better understanding of the things that could go wrong in any electrical system. My long term goal has always been to eventually go work on a cruise ship as an engineer so I can travel the world while doing the job I love; however, I have ties in the UK so I am not too sure if it will ever happen but if it does it will not be for a very long while.

September



Outboard service

Aqua drive removal

October

Engine mount replacement

Leak inspection (Outdrive removal and reseal)

Oil leak inspection

November

Bilge clean up




Crane engine parts swap over and installation

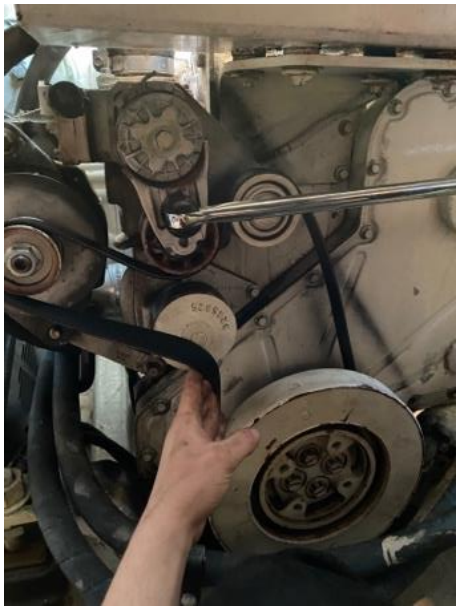
December



After cooler, heat exchanger, oil cooler removal/installation

Bravo 3 drive steering removal

Spray painting



Winterisation

January

Parts washer valve reseal.

PCB failure.

Coolant leak inspection.

February

Gearbox strip down

Engine installation on high performance speed boat

Generator panel insulation removal/ installation

Battery removal for charging

March

Sea fire extinguisher installation

Exhaust elbow replacement Oil cooler restoration

April

Turbo restoration ECM removal, refit, and recalibration

May

Aqua drive instalment

Water pump reseal