

Building Better Locomotives

or at least making them more maintainable

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DCC Sound Course

Mick Moignard?

- Modeler of D&RGW & RGS, 1951, in HO_n3
 - HO Scale, 3 foot gauge, 10.5mm track
- DCC user since 2000
- DCC Sound since 2005
- Parsons Lumber Company – Camp 93
 - One of the first Sound layouts on the show circuit 2005-13
- Soundtraxx Factory Trained 2012
- Tutor at Missenden Railway Modellers
 - DCC Sound course!
- Small business specialising in DCC Sound installation
 - Which is where the source material for this clinic comes from

More Maintainable Locomotives

- I see a lot of locomotives:
 - Far Eastern Brass, from 1950 through to the present, mostly HO models of US prototypes, also some O-Scale and some HOn3.
 - Some of the older ones have open-frame Pittman or KTM motors that are similar to the old Triang X04 – and have all of its shortcomings.
 - Some Korean made models of UK prototypes, mostly O Scale
 - UK Kit builds in OO, EM, P4
 - British made proprietary models – Poole Farish in N, Hornby pre-China
 - European made Lima and Jouef – least said about these the better
 - Austrian made Roco and Atlas
 - Chinese made plastic and diecast HO locomotives, mostly HO Scale
- Some of them are easy to work on to install DCC and sound
- Some are not
 - And these are the subjects of this clinic

Why does this matter?

- It makes the locos easier to work on, for such tasks as maintenance as well as installing DCC and sound.
- Such work can be done faster and with less frustration
 - If you're paying for the work to be done, that is less cost
- The risk of damage to the locomotive or its paintwork is minimised, whether you do the work or someone else does
- The loco will get maintained more often, and better
 - Which will extend its useful life
 - And make it more dependable when in use.

Slotted-head brass screws

- Some of them are only a little harder than butter
- First time you put a driver on it:
 - Half the head comes off
 - Or the whole head breaks off
 - Or the slot is already so deformed that you can't unscrew it.
- You end up getting the remains out with pliers or drilling it out and retapping the hole
- Very difficult to re-fit in confined spaces
 - Which abound in some kit designs
- Models made by Korean manufacturer Samhongsang suffered particularly from this problem (for UK modellers, think RTR Brass 57XX and 97XX Panniers here)
 - So do more than a few kit builds.

Other Brass Screw issues

- Brass crosspoints also tend to be made of hard butter
 - Fortunately they're not very common
- Brass screws screwed in very tightly many years ago, and now frozen solid
 - Risk of it breaking and then needing to remove the remains; see earlier
- Screws left way too long; using a screw half an inch long in a hole with 2mm of tapped holding ground
 - Take ages to remove and replace
 - Plus the risk that there is something in that space
 - Ever screwed a long screw into a hole where there is a sound decoder on the other side?

More stupidities with screws

- Every screw in a loco is a different size/different thread type/different head to the next one
 - Hornby and particularly Bachmann very prone to this disease
 - Also beware shouldered screws which are hard to replace like-for-like if you lose them.
- Screw heads hidden under soldered-in brake gear
 - Made worse with large slotted heads and the screws left over long
 - Have to unsolder the brake gear to get the screws out
- Models mailed/delivered to me with all the screws out!
 - Not always safe in a bag
 - No idea which goes where
 - And often some missing

The worst...

- Soldered in studs with nuts to hold pieces together
 - Please - don't do this, even if the kit instructions call for it
 - Need a nutdriver to get the nuts off
 - Much harder to put it back together
 - Again, often hidden with brake gear - making it 10 times harder to get apart and back together again
- And it's no harder to solder a nut in place instead of the bolt head, or to add a little extra thickness of metal and tap the hole.
 - And **so much easier** to reassemble the model

Equally bad...

- Tenders in steam locos which can't be disassembled, apart from removing the wheels
 - Which may require unsoldering the brake gear first
- When the tender is the only place for the decoder to go
 - Or you have a handrail come loose that really needs to be soldered back from inside.....
- Please ensure that the body can come off the frames
 - Or that the tender floor is not a solid piece of metal
 - Simple to do with three or four screws
 - Makes painting it all much easier too.
 - Goes for coaches and other rolling stock too.

Use Better Fasteners

- Use steel crosspoint head screws
 - They are easily available in sizes down to M1 (and below if you really need it)
 - Screws tend to stick to the screwdriver and can be placed in holes much easier and faster than slotted heads
- M1.4 and M2.0 are all you need for 4mm scale
- Learn how to drill clearance and tapping holes and tap the threads
- Assemble your kit built loco assemblies with these screws
- Makes painting and maintenance much simpler, because it's so much easier to get the screws in and out again.

Loco wiring things to avoid

- Insulated joints done with masking tape
 - It will dry out and fall off
 - And you will then get a short circuit which will fry your decoder
- Baring half an inch of wire to make an attachment to something
 - 2 or 3mm is all you need, especially when the insulation will shrink back with heat
 - And its easier to control the wire strands
- Wiring a loco with solid wire
 - It will break, in the end
 - And don't use it as a restraint for the motor
 - If you need a torque arm, use a properly mounted torque arm.
- Wiring a loco with wire too thick
 - It just gets in the way
 - See using solid wire above
 - 28 or 30AWG is fine for small scales – and in 7mm for all except pickup and motor wires.
- Wiring the entire loco with black wire.
 - Look at the NMRA recommended wire colours,

More loco wiring no-nos.

- Soldering wires with low-melt solder
 - It will, in the end, break
 - If you haven't already gotten a cold joint
 - Always use proper electrical/electronic rosin-cored solder
- Soldering wires with acid flux
 - Even Worse: soldering to a decoder with acid flux!
 - Acid flux will rot the wires and any PCB it comes in to contact with
 - **Don't, ever, never, do this**
- Leaving decoder wires way too long and unrestrained
 - Ready to get caught in the gears
 - Don't make them so short though that you can't get it apart for maintenance
 - Miniature plugs & sockets are available (1.27mm and 1mm pitch)

More stuff to avoid doing

- Installing lead weights with white glue
 - Worse; gluing lead shot with white glue
- Lead reacts with PVA (PolyVinylAcetate) to form lead acetate, in the presence of moisture
 - white glue contains water as the solvent
 - How humid can your railway room/shed/loft/storage space get?
- Lead acetate is less dense than lead
 - Which means it swells
- It will burst your model open, probably at the soldered seams
 - Not today, and not tomorrow, but it will happen, probably within two or three years
- Attach lead with double-sided tape, or Evostik/Bostick/Uhu type solvent glue, or with superglue.

More stuff to avoid

- Repairing brass locos with Superglue
- Sadly, Far Eastern brass locos, like any other, can get damaged. Parts fall off or get broken.
- They get reattached with superglue...
 - again and again, because superglue isn't the way to repair them
 - And the superglue gets splurged out all over the model too
- The only cure is to resolder them
 - And the superglue needs to be cleaned off first.
 - Ever inhaled the fumes of heated up dried superglue?
- Solder clean, fast and hot, and you'll be able to do it with no or minimal paint damage.
 - Especially if you can do it from inside (see earlier).

Yet more things that don't endear me to a model

- Locos that can't be disassembled for DCC install or ordinary maintenance without using a soldering iron to dismantle parts
- Locos and tenders that can't be disassembled at all (yes, they're more common than you might think)
 - Some manufactures will add detail parts that are glued to both chassis and body....
- Kits where the designer has not considered maintenance or after construction DCC fitting
 - Or even makes DCC fitting void the warranty - and yes, these do still exist!

Other things that make DCC Sound hard to do

- Mechanisms that are too noisy
 - DCC Sound requires the mechanism to be essentially silent
 - Silent mechanisms will always work better, too
- Common cause of mechanical noise is gear ratios that are far too high
 - because the builder/designer thinks that crawling at one sleeper an hour is important
 - Because the motor in use runs so fast or has so little torque that 100:1 gearing is required to prevent it being useless
 - 20:1 and a 7000rpm high-torque motor will always give a better result
 - Far less noise and occupies less space.

And finally

- Weathering jobs completed without cleaning the wheels afterwards
- Don't just clean the wheel treads of the drivers
- Clean the pickup areas on the back or flanges
- Clean the pickups too!
- And clean all the non-powered non-pickup wheels as well.

Build better locos

- Consider design and building for easier maintenance
- Use sensible fasteners and use them properly
- Make our models easier to get apart for maintenance, painting and DCC installation
- Keep your internal wiring neat
- Don't cut corners

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