

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	Top of Thread	<a href="#">LIST</a>
--------------------------------------	-----------------------	---------------	----------------------

**From:** nuke ([larrysb@aol.com](mailto:larrysb@aol.com))  
**Date:** 3/5/2001 6:15 AM  
**Subject:** **Voodoo, caps, forming and tone**

New electrolytics need not be "formed". Period. If they need forming, find a new supplier because you have defective parts!

Burn-in. Many parts will settle in after a short burn-in period. This is mainly to weed out infant mortality. Once a short burn-in has happened, the curve of failures levels off to a low flat curve.

For the most part, electrolytics are stable very rapidly. Metallized films may experience a period of self-healing in the first hours of operation. Minor pinholes in the film from production will self-heal in short order under voltage. This is actually a feature of metalized film capacitors.

One thing you have to realize is that electronic parts are stable and do not require extended run in, forming or anything else. Otherwise there wouldn't be an electronics industry at all. Products of all kinds are churned out by the millions every single day from the same parts as used in guitar amps (even "high end" ones) and NONE of them require hours of forming or anything else.

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
--------------------------------------	-----------------------	--------------------------	----------------------

**From:** tommy ([tommy@thewho.com](mailto:tommy@thewho.com))  
**Date:** 3/5/2001 1:59 PM  
**Subject:** **Re: Voodoo, caps, forming and tone**

I tend to agree. I only reform, over the course of a few minutes, when the cap is like 10 years old or something. And I monitor leakage current through a 10K resistor while doing it to let me know if it is healing or not. Never had any problems. On new caps I just ramp up over about a minute, when I check the amp wiring on initial power-up and check tube voltages as I bring it up the first time.

Chris

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
--------------------------------------	-----------------------	--------------------------	----------------------

**From:** Lew Collins ([Lewguitar@aol.com](mailto:Lewguitar@aol.com))  
**Date:** 3/5/2001 2:11 PM  
**Subject:** Has ANYONE done a REAL test????

Seems to me somebody needs to build two simple amps from scratch. Maybe a pair of tweed Deluxes or even a pair of tweed Champs. Use identical trannies and parts. Power up one nice and slow over the course of hours or a day or so to "reform" the caps. The other amp, just pretty much plug it in to the wall and let it warm up.

Then have a good guitarist plug in a guitar and have at it and see which amp sounds and responds better.

That's the ONLY way to separate the BS from the hype. It's all about MUSIC.

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** kg  
**Date:** 3/5/2001 2:48 PM  
**Subject:** i'll test 'em.

i'll tell you what, lew.

i've got a bunch of pulled ecaps from old radios/etc. i'm talking 20, 30, 40 years old here. most of them are multisection paper wrapped types. today i will:

- a) test the caps for leakage using dmm.
- b) test the caps for esr using esr meter.
- c) test the caps for capacitance using cap meter.
- d) rig up a hv supply, and apply FULL working voltage to the caps through current sense resistor.
- e) monitor and record charging current during application of hv.
- f) graph the I vs. T characteristic.
- g) post it on the web.

by all rights, i should see MASSIVE leakage currents as these really old caps reform. this is an extreme test of the phenomena, after all... i would not expect ANYONE to get a 40 year old electrolytic cap and put it in an amp.

i'm going to eat breakfast first and then get started.

ken

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Lew Collins ([Lewguitar@aol.com](mailto:Lewguitar@aol.com))

**Date:** 3/5/2001 3:10 PM

**Subject:** Great, but maybe that's not the REAL test....

The REAL test, in my mind, is does one way or the other create a better, more responsive musical instrument? The amplifier is, as we all know, a musical instrument...not just an electronic device.

Maybe I can get Brother Bruce to build couple of tweed Deluxe clones. Or better still, a couple of AC15 clones since I already own a tweed Deluxe.

To me, that's the only way to tell if one method or the other creates a superior musical instrument.

I mean, if a guy built two acoustic guitars side by side from wood from the same tree, only one was kiln dried and the other slow dried, you could give them both to a master guitarist like Leo Kotke and see which one he preferred.

It would be nice to do the same blind test with two identical amps, but one slowly burned in and the other just powered up.

As for slowly formed caps lasting years longer...who knows? Most of us have only been serious about amp building for a few years...not 30! I've got a '70 50 watt Marshall with all original caps throughout...it still SOUNDS fine. Those caps weren't slowly reformed and powered up when the amp was built 30 years ago. Neither were all the old Fender amps.

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Mark Lavelle

**Date:** 3/5/2001 5:07 PM

**Subject:** Bottom line, maybe, but not a real test....

I agree that the way an amp sounds is the most important issue, but unless you're going to perfectly match \*every\* component in the two amps (including lead lengths, layout, soldering quality, etc.) and then do a double-blind playing/listening test you're not going to get a useful answer to this cap forming question. Measuring the actual behavior of the caps themselves under amp-like conditions is the best data you will ever get.

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Cap'nCritic, MindCrunch

**Date:** 3/5/2001 6:07 PM

**Subject:** The whole point

The point I'm making is that formed caps may outlast non-formed caps. I agree that you may not hear a difference in tone and that it may not always have to be done. With ceramics it is used as a safety precaution here before they leave the plant.

Man, can you imagine how some kid wandering into this BBS will feel when he comes in for a question? Intimidated maybe? What library or school have you been to where the professors dwell on minutia to the point where you get sick and want to leave? Sometimes it's hard enough to ask while remaining anonymous. This place is supposed to be the promised land. What a disappointment at times...I imagine this is what my ancestors thought of America when they arrived.

I will continue to watch these official, double-blind tests unfold in silence.

Regards to all,  
Frank

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Bryan James ([Bjames@james-gang.org](mailto:Bjames@james-gang.org))

**Date:** 3/5/2001 6:50 PM

**Subject:** Re: The whole point

first for the schools. i had several teachers that would dwell on minutia to the point i was sick and even an algebra teach that would mark my work wrong because i didn't do it the way he taught it in class. though my was more advanced and simpler than what he was teaching. i even tried to point out why do the problem in 15 steps when i can get the answer and 5 and clearly have an understanding of algebra. took that one allway up the chain to fight for the a i desire not the d he wanted to give me cause i didn't do it his way.

the moral is there is more than one way to do something. and reforming caps is not the save all glory thing that it's made out to be. in fact how much live in the caps are we talking about. am I or others trying to stop people that our reforming caps from never doing it again. no. it's just pointing out that it's not nessicary. and for the new comer that would wonder into the field i would want him no that the jury is still out on the subject and that while some are pretaining that reforming caps is the holy grail. (which they are) there are others saying wait a minute. where it may be a could idea it's not nesicary to the extreme they are pretraying it.

if reforming a cap before using it only adds on a year to a cap that well work fine for ten years then it's a waste of time.

so far i have seen not quantified facts that reforming caps well give you longer life span and better tone. to me it sounds like snake oil. if a cap needs to be reformed it's not worth my time. i just by a new cap that i can just pop in.

all I'm asking is don't sell it as the end all fix all that others have been saying. if you want to recommend it, that's fine. but the way it was said in the other thread that you must do it and everyone who disagree's with it is being childish and stupid.

-Bryan

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
<b>From:</b> kg			
<b>Date:</b> 3/5/2001 6:51 PM			
<b>Subject:</b> peer review can be harsh, but it works.			

*Man, can you imagine how some kid wandering into this BBS will feel when he comes in for a question? Intimidated maybe?*

i should hope that someone "wandering into this BBS" will at least get an answer based in fact, in empirical evidence and experience. a question posed as a question is NEVER answered harshly, at least not that i have noticed.

*What library or school have you been to where the pfofessors dwell on minutia to the point where you get sick and want to leave? Sometimes it's hard enough to ask while remaining anonymous. This place is supposed to be the promised land. What a disappointment at times...I imagine this is what my ancestors thought of America when they arrived.*

the fact of the matter is that this is a peer review process--and that process is PROVEN to be one of the only ones that will continually refine itself. all of scientific progress has been based in peer review, which is why important papers have to be published. if the theory is wrong, and someone else points it out, then the theory must be revised. sometimes feelings get hurt, but the bottom line is the TRUTH.

ken

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Cap'nCritic, MindCrunch

**Date:** 3/5/2001 10:54 PM

**Subject:** Re: peer review can be harsh, but it works.

KG,

I entirely agree. I am what you would consider a weekend tinkerer. I am no electrical engineer by trade nor do I want to be. I'm more mechanically inclined anyway. I'm simply a guy who loves to play my guitar. Honestly, I've only built one amp-and it's a clone-but I did it from scratch. Thanks to alot of the people here on this board, it went smoothly. I must admit that I enjoyed building it as much as I do playing it.

I think that charging someone for the "burning in" process would be nothing short of theft. But I find it makes for an interesting discussion and the debate process makes for good science. Good evening.

Frank

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** SpeedRacer ([Joe@ObsoleteElectronics.com](mailto:Joe@ObsoleteElectronics.com))

**Date:** 3/6/2001 12:20 PM

**Subject:** Re: peer review can be harsh, but it works.

FWIW I agree with KG..

I think this BBS is one of the \*least\* intimidating places (not to mention most open minded) on the net to discuss these kinds of issues, and the \*best\* place to cut through the hype and BS and try and find some fact.

A great example was Randall Aiken actually measuring signal caps to determine if orientation matters.. That was very helpful, and the concept leaped from "urban legend" to something that actually can work for you. I think anyone making a bold statement like "this is the right way to do XYZ" should expect (dare I say encourage?) a quest for empirical evidence.

If we can't ask WHY without hurting feelings, there is another problem at large IMHO.

Another case, and I'll get personal here 😊 was when Stephen and I started making transformers. There were a number of folks who called me on that, saying the OT didn't make a difference, or the brand Z that they were using was perfect. It confused me a little, but at the same time I knew these were valid opinions, and I did my best to answer questions about what we were doing differently, and to let the OT's speak for themselves. If there is a difference worth having, others will hear it.

Again, if we can't ask "why?" we may as well fall victim to \$500 interconnects on our 1960A's and linear crystal wire..

and lastly..

*What library or school have you been to where the pfofessors dwell on minutia to the point where you get sick and want to leave?*

What libray or school have you been to where the prof makes some bold statement flying in the face of many other experienced individuals and cannot / will not support it with any hard evidence except for a flippant "I'm right, trust me I know better" kind of explanation. I think we could all agree that's an absurd scenario.

Peer review is good for everyone IMHO.

A little humility doesn't hurt either. 😊

We've managed to have peaceful discourses here on everything from Religion to PI types, tube brands, famous circuits, fancy parts vs cheap ones.. solid vs stranded.. we'll survive this one. There is nothing personal going on here. If there is good evidence that forming new bought filter caps is a good thing I'm sure everyone would do it tommorow. But when a large number of experienced folks, including the manufacturer themselves (who \*may\* know a thing or two about their own products and how they work) disagree with the first individual making the claims, isn't it pretty normal to ask WHY? It should be expected IMHO.

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Richie{~}==:::

**Date:** 3/6/2001 1:49 PM

**Subject:** Re: peer review can be harsh, but it works.

Speedracer: your quote..

"There were a number of folks who called me on that, saying the OT didn't make a difference"

There were a number that said,there IS ALOT to do with the OT too..LOL

As for the caps.i have some cap links with a bunch of tech info,i'll see if i can dig up anything on reforming them. But like many here i usually don't mess with this. I think for the OTs.. i'm sure there are many now that are very glad you are making these!!!

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Trace ([voodooamps@aol.com](mailto:voodooamps@aol.com))

**Date:** 3/5/2001 7:06 PM

**Subject:** Re: The whole point

*The point I'm making is that formed caps may outlast non-formed caps...*

May outlast and do outlast are two very different things. Jason's declaring that forming caps will make them last longer and that's very deceiving to a new DIY'er or a newbie.

*I agree that you may not hear a difference in tone and that it may not always have to be done.*

There's no difference in tone and no facts or proof that it will make caps last longer. Would you honestly want to be charged \$40-\$60 (or whatever the cost would be) for having your caps formed if it didn't make any difference? Most people would never return again to get amp work done.

*Man, can you imagine how some kid wandering into this BBS will feel when he comes in for a question? Intimidated maybe?*

I should hope not! 😊 99% of the posts on this BBS are very kind. Most people post that have nothing to hide post their name, email address and also sign their name at the bottom of the post. When people do not it makes everyone wonder about the credibility of that post.

This is the best BBS of it's kind on the web. It's no good for a newbie to think that forming caps is the "right" way to go when there's no proof.

*What library or school have you been to where the pfofessors dwell on minutia to the point where you get sick and want to leave?*

If we're dealing with facts then what's to argue? It's not philosophy we're talking about here. If it was I would agree with you. The amp world has sooo much myth and hype that it's not funny. Why continue to let people think they should pay to have their caps formed when there's no

proof it has advantages of any kind?

*Sometimes it's hard enough to ask while remaining anonymous.*

Why would you post anonymously anyway? Questions get answered no matter how small or easy they are. I've seen guys answer the same question dozens of times and they are ALWAYS nice about it.

*This place is supposed to be the promised land. What a disappointment at times...I imagine this is what my ancestors thought of America when they arrived.*

I guess it depends on what ancestors you are referring to(?) American is just like any other place meaning it's not perfect. No place on earth is perfect. The Ampage is definitely the nicest amp BBS that I've ever come across.

For what it's worth  
Trace

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
<b>From:</b> Rebel420 ( <a href="mailto:giorfida@drifteramps.com">giorfida@drifteramps.com</a> )			
<b>Date:</b> 3/5/2001 7:12 PM			
<b>Subject:</b> Re: The whole point			

*Jason's declaring that forming caps will make them last longer and that's very deceiving to a new DIY'er or a newbie.*

not to mention, those caps, no matter how you stack them, will most likely outlive your first 'homebrew' anyways... I know myself, the amps I build I'm CONSTANTLY rebuilding!

*Would you honestly want to be charged \$40-\$60 (or whatever the cost would be) for having your caps formed if it didn't make any difference?*

most WORKING musicians wouldn't even be willing to pay to get the caps replaced unless they caused a catastrophic failure anyways!! (not to mention, most people who DIY, do it because we are too cheap to pay someone to do what we KNOW we can do!)

*99% of the posts on this BBS are very kind. Most people post that have nothing to hide post their name, email address and also sign their name at the bottom of the post.*

not to mention, that if some people post something that could be taken wrong, or insulting,

usually follow up with a 'no malice intended' type disclaimer... very friendly people... for the most part... you do get the occasional arsehole on here, but they are few, and far between, and usually self-destruct pretty quickly anyways

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
--------------------------------------	-----------------------	--------------------------	----------------------

**From:** Jim ([nightrider24NOSPAM@hotmail.com](mailto:nightrider24NOSPAM@hotmail.com))  
**Date:** 3/5/2001 6:17 PM  
**Subject:** **Re: Great, but maybe that's not the REAL test...**

It might be even better to wire in 2 sets of caps with jumpers into one amp. One set could be 'burnt in' slowly before playing. The other set just powered up and played. Toggling between both sets in one amp would eliminate any variables between 2 separate amps. -Jim

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
--------------------------------------	-----------------------	--------------------------	----------------------

**From:** Stephen Conner ([steve@esru.strath.ac.uk](mailto:steve@esru.strath.ac.uk))  
**Date:** 3/5/2001 5:22 PM  
**Subject:** **the only real test is a blind one**

Remember it would need to be a blind test- so the player doesn't know which amp is which. Ideally it would be double-blind; the guy taking the results doesn't know either. THAT's the only way to separate experimenter expectancy from the facts. (You think Eric Johnson would actually notice if somebody swapped the screws in his fuzz face without telling him?)

Steve C.

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
--------------------------------------	-----------------------	--------------------------	----------------------

**From:** Lew Collins ([Lewguitar@aol.com](mailto:Lewguitar@aol.com))  
**Date:** 3/5/2001 5:39 PM  
**Subject:** **Eric Johnson uses rubber bands!**

He doesn't like the tone of screws holding on his battery cover...really! And I'll bet he COULD tell.

I don't know if I could. But I can adjust the bias on Fender amps by ear (sometimes right on)...just ask Bruce.

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
--------------------------------------	-----------------------	--------------------------	----------------------

**From:** Gus ([gussmalley@hotmail.com](mailto:gussmalley@hotmail.com))

**Date:** 3/5/2001 5:21 PM

**Subject:** Re: Voodoo, caps, forming and tone

I the shop(not a music shop) I work in we go though thousands of caps a year in repairs. low voltage to 450 volt electros. The only caps that seemed to need forming were some of the cheap overseas ones if you applied rated voltage many would fail (350V-450V). Any quailty cap no problem. I think you only need to form the ones you would not want to use.

The shop now only uses good caps there are 2 lc102 sencore testers that get used alot. A hint on a 450v to 500v ps cap I like lower than 1.5ohms/20uf in guitar amps.

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Jason ([jlclal@aol.com](mailto:jlclal@aol.com))

**Date:** 3/6/2001 1:05 AM

**Subject:** Re: Voodoo, caps, forming and tone

nuke,

Please give us some scientific data regarding E-Caps not needing to be formed. Period. RE: Period.(that's some authoratative stuff! Whew!). Please, we are waiting. Please present us with data, hurry now! Still waiting, Nuke. No response yet. Must mean that you are an ....Blah, Blah.

"I normally don't use words like this, but Jason, Go .... yourself!" Blah, Blah, Blah. YOU WROTE THIS!

Not too cool, huh? It is a lot worse than anything that could possibly be deemed offensive that I wrote in my postings.

Jason C. Arthur

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** PeteR ([valveart@one.net.au](mailto:valveart@one.net.au))

**Date:** 3/6/2001 12:52 PM

**Subject:** Deja Vu...

This thread and the other one reminds me of another thread a while back where Mr Jamz waxed lyrical about his scope and tube biasing...we know what happened there.

Ken and Joe's comments on peer review are correct IMHO, that's the way it's always been and it's always worked. Opinions lead to belief, but only knowledge leads to truth. And truth isn't good or bad - it just simply is.

That's what is so good about this place, the mishmash of opinions, the eventual theoretical or empirical proof one way or the other and then the knowledge- in the Jamz case it resulted in Randall's wonderful bias paper.

Jason, brother, it's not what you say, it's the way that you say it that seems to be bringing you unstuck. Seems to me you need to unwind a little, have a beer or two and play your geet some. This is a place of like souls of which you appear to be one. I just don't think you've realised it yet.

It's not a competition, it's about learning. And in the end isn't that what its all about?

Disclaimer...

All this of course is just my simple and most humble opinion and has no basis in scientific fact one way or the other, until proven otherwise. 😊

PeteR 😊

[START NEW  
THREAD](#)

[REPLY](#)

[PREVIOUS](#)

[LIST](#)

**From:** Steve A. ([steve\\_ahola@yahoo.com](mailto:steve_ahola@yahoo.com))

**Date:** 3/9/2001 2:52 AM

**Subject:** I change my vote to Jason on this one...

Jason:

As you asked a few times in the other thread: "Is there a good reason for us to **not** form our electrolytic caps?"

Bruce Collins and many other people here have always recommended connecting your DIY amp to a variac on initial startup... perhaps this alone is sufficient to prevent damage to the dielectric when first powered on with a ss rectifier... especially on an amp without a standby switch.

However many of us here have not had a variac so we would plug our newly constructed amps into 120vac and hope for the best. The initial surge of 400 to 500vdc into these filter caps might possibly do some damage to the dielectric material, and this possible damage might not show up until later.

I don't think that the A/B test suggested by Lew would be that conclusive because my guess is that only 5% or 10% of the amps would be adversely affected by this phenomenon, if it is

indeed true.

Actually there may be other parts involved besides the filter caps... I think that practically all of the parts in a guitar amp would benefit from an initial powerup taken slow and easy. In any case, I don't see how it would do any harm (if done properly) so to repeat your question: "Why not?" Here is a slow burn-in procedure that I have written up based on your suggestions:

*All of the tubes should be removed and a tube rectifier replaced with a plug-in ss rectifier temporarily. So what voltage would you start at... 25% or 50% of line voltage? And maybe move the voltage up 5% every five minutes while monitoring the current draw. If the current seems to jump much higher than 5%, you might want to leave it at the prior setting for a few more minutes. Once you get up to 8 to 10% overvoltage, unplug the variac and maybe do a visual check of the amp to see if anything is overheating and then put the tubes in for a final break-in period. Maybe start the variac off at 90vac and increase it 5vac every 60 seconds, once again monitoring the current draw. You would be up to full voltage within 6 minutes so I don't believe that there should be any problem with the low voltage going to the filaments for just a few minutes. During this final burn-in idle bias current should be monitored and adjusted if it seems excessive, although the final settings should be made after the amp has been on full power for at least 10 minutes or longer.*

Is there any reason why we should not do a burn-in such as this with a newly constructed DIY amp? (I'm just guessing about some of the times and voltages... if someone has a better procedure, by all means post it!)

When you put a new engine in a car, you are supposed to take it easy for the first 100 miles and change the oil after 1000 miles- right? It seems like it would be a good idea to use a similar break-in procedure for our DIY amps after putting in so much of our time already.

Maybe it isn't the filter caps that are sensitive to "hard start" conditions. But it sure seems like an amp sounds different after it has been broken in for a few hours at full line voltage... there is **something** going on in the circuitry that changes from the initial powerup. Maybe not all of the time, but that phenomenon has been mentioned here enough times for me to think that there is something to it.

And as was pointed out in a previous post, perhaps "hard start" conditions are responsible for maybe 5% to 10% of the mysterious hum and noise problems reported by many of the DIY builders here. One way to check to see if a particular cap is not filtering the voltage properly would be to clip a second cap in parallel with it to see if that reduces the level of hum and noise. That may not prove that the original cap had been damaged; it might just mean that stage in the power supply could use more capacitance. But if it does solve a hum or noise problem, that is one less problem to deal with. (Now if a filter cap was shorted out, the amp would draw excessive current and possibly blow a fuse on the secondary- right?)

Now many people here like to make their amps as bulletproof as possible, so I think that a slow burn-in procedure with a variac would be in order. Maybe it doesn't have to be as slow as I suggested above... 25% power to full power over a period of a few minutes might be sufficient (as long as you are monitoring the current and it seems normal). Do this once with the tubes out and then go slowly from 90vac to 120vac with the tubes in place. But it seems to me that plugging your newly constructed amp into a wall outlet and hoping for the best is **not** the best way to do it... 😊

Any comments or flames are welcomed (as always)!

--Thanks!

Steve Ahola

P.S. To agree with nuke, it is probably true that most fresh electrolytic caps do not **NEED** to be formed, especially over a period of several hours as recommended by some people for NOS caps. But I still think that a slow burn-in would not hurt and it just might reduce some of these "mysterious" hums and noises reported every now and then.

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
<b>From:</b> jpl ( <a href="mailto:jimlorber@hotmail.com">jimlorber@hotmail.com</a> )			
<b>Date:</b> 3/6/2001 6:52 PM			
<b>Subject:</b> No Voodoo,just caps			

All,

Here are some cool links on the subject. Some from manufacturers or capacitor related sites. The last one is from a car audio mfg. but it describes the electrolytic manufacturing process. The CapCoolers look interesting for high temp applications.

<http://www.cornell-dubilier.com/guide1.pdf>

<http://www.vintage-radio.com/index.shtml>

<http://www.netcentral.co.uk/satcure/cap/esr.htm>

<http://www.aavidthermalloy.com/atp/articles/capCoolers/>

[http://www.pagesz.net/~wa4bpj/cde\\_electrolytics.html](http://www.pagesz.net/~wa4bpj/cde_electrolytics.html)

<http://www.illcap.com/LifeCalculator.asp>

<http://www.edpsciences.org/articles/epjap/pdf/1999/01/ap8043.pdf>

[http://www.sam-hwa.co.kr/product\\_e.html](http://www.sam-hwa.co.kr/product_e.html)

<http://www.niccomp.com/Products/General/Alumlyticlifeexpect.pdf>

[http://www.negia.net/~phase/wp\\_cap\\_equal.htm](http://www.negia.net/~phase/wp_cap_equal.htm)

Jim L

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