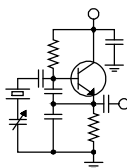


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

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I've heard it said that time is the mechanism that God created to keep everything from happening at once. That makes sense to me, but there are seasons in which it doesn't seem to be working so well, and this is one of them.

It's not like I haven't been busy before – I can certainly recall times in the past when I had big, demanding projects going on, and while those were indeed busy times, they tended to be more... linear. That's about the best way I can describe them.

Right now, I have just a couple of projects in the works, both in the planning stages, but because of supply chain issues and long/unpredictable lead times, they are anything but linear. I am having to anticipate sequences and timing when there is no accurate way to do so, and that's both a little scary and somewhat overwhelming. It's anything but comfortable. To borrow a Three Dog Night lyric from my misspent youth, "That ain't no way to have fun."

So, what all is going on? As you might have surmised, quite a bit. A press time, we have a fully executed lease for the collocation of KLDC to the KGNU tower site in Denver. That execution came late enough that we won't make the August deadline set by our current site landlord, but that's okay – we have the right to stay put there until the end of the year.

The real limiting factor in terms of time on that project is winter – I'm too old and cranky to be standing outside in the snow installing, plumbing and tuning a bunch of diplex filters and ATUs. We also have another factor – KGNU is a community non-commercial station and their big fund-raising pledge drive is in October, so we do need to be done before that starts.

With delivery of the components and hardware expected to be here in August (hopefully before), September will be our target. That's usually

when we get the best weather of the year, too, not too hot and usually not much cold and snow.

The other big project is the relocation of our Buffalo studios to a new leasehold in Amherst, NY, a northeast suburb of Buffalo. We have secured some really nice space and have about the next twelve months to get it built out and our operation moved.

That may seem like a lot of time, but it's not, not in the current environment. Labor shortages, supply chain problems, and having to deal with the local building authority are all wild cards. Everything may fall right into place and we may be done and ready to move in November, but don't bet on it.

General contractors are frustrated, often caught in the middle between material shortages, labor shortages and high demand. They can't afford to stand around waiting on material when they could be working on another project for which materials are available. As the client and lessee, we are at the mercy of all these factors, and they are impossible to predict. In recent months, we've seen lead times on equipment go from in-stock to 60 days or more overnight. And we're told that things are not getting any better.

The Buffalo project doesn't just consist of a studio buildout and move, although that is the bulk of it. It also consists of a microwave network, with a 23 GHz link from the new leasehold to a nearby state-owned tower. From there, an upper-6 GHz link will take us to the WDCX-FM tower in Boston, NY south of Buffalo. There is also an inter-site upper-6 link from Boston to the WDCZ(AM) site in Hamburg.

Most of that network will have to be built out in the dead of winter, which won't be fun. We do plan to get the Boston-Hamburg bi-directional link done this summer – or fall – depending on when we can get the equipment and antennas (it has all been ordered) and a tower crew to install and path it. More wildcards.

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The good news is that a lot of the early pieces of these projects are coming together – leases, agreements, designs and plans. But there are a lot of moving parts, any one of which could get monkey-wrenched at any time and throw the whole schedule

out the window. About the best we can do at this point is plan with contingencies and be prepared for whatever changes come.

The New York Minutes By Brian Cunningham, CBRE Chief Engineer, CBC – Western New York

Hello to all from Western New York! I would like to thank everyone who reached out last month to me about my recent health scare. Your calls and emails were greatly appreciated! I am on the rebound (slowly) but I am certain that my doctors can get me back to good health in time. I still have to take some days slowly, as I seem to run out of energy quickly at times, but overall, I feel a little better each day.

Not long after the “incident,” I contracted some sort of lung/chest virus that kept me gasping for breath at times, coupled with excessive lung congestion and a very nasty cough. It was bad enough that I had to cancel my nuclear stress test on my heart until the coughing and congestion subsides. Hopefully within the next couple of weeks I will be able to re-schedule this final test and see if my heart has sustained any damage. Continued prayers would be greatly appreciated!

In March, we canceled our T-1 fiber-optic STL and opted to deliver WLZG-FM audio to the transmitter site via internet using a set of Worldcast codecs that the Denver cluster donated to us. Amanda programmed the units up and shipped them to me for installation on March 8th. They sounded great, but we experienced numerous audio drops, a second or two in duration, several times a day. I tried making adjustments in the units’ programming, but was unable to stop the audio drops, evidently due to packet loss on the internet. Don Jr. purchased a set of Tieline Bridge-IT XTRA codecs (which have forward error correction to ride out the packet loss). I installed them on Tuesday the 29th, and this took care of the dropout issues. The station sounds

excellent, and we have the Worldcast units to fall back on in case of a failure with the Tieline units.

We have experienced several commercial

power outages in Rochester as of late, which is uncommon, especially at the WLZG transmitter site.

The first occurrence happened on Saturday, March 26th. The only result of the outage was that I had to make a trip over to Rochester to restart the HD-2 stream and the WDCX(AM) internet stream.

The second power loss occurred the afternoon of April 18th. I was able to get the WLZG-FM Continental transmitter back online via the Burk. Ditto for the BE Fmi-206 HD transmitter, but the HD-2 would not come back on.

Once I arrived at the WLZG-FM transmitter site, I found that the Fsi-10 IBOC signal generator had failed. The front panel touchscreen was out. I tried to access the configuration menu via the web GUI, but it was to no avail.

Certain that the unit had simply lost its brains, I attempted to perform a re-installation of the OS. Once this completed, a second attempt to log into the unit failed again. I phoned Richard at BE technical support and reported what I had done thus far, and he recommended that the signal generator be sent back to the mother ship for repair. They usually do a pretty quick turnaround on this type of repair, but it’s been over a week at this writing with no update from BE.

At WDCX(AM), we lost power at the transmitter site on March 20, which resulted in a tripped main breaker on the Nautel ND-5 transmitter.



There's nothing worse than driving 1-1/2 hours to flip a breaker back on!

One other incident of a power outage occurred at the WDCX-FM transmitter site on the afternoon of April 21. Other than taking the HD-2 stream down, no other damage was noted after the power was restored.

Earl Schillinger phoned me on the afternoon of April 8, reporting that the audio was extremely low, with sporadic drop-outs on 990 WDCX. I was monitoring the radio during the trip over, and I was approximately a mile away from the site when the audio suddenly came back on! Once I arrived, I checked everything in the audio path and could not find what caused the audio to drop.

I waited around the transmitter site for a couple of hours, but the problem did not arise again, until about 10:00 PM on Saturday the 16th. Once I arrived at the transmitter, I began to back-trace the audio from the transmitter's input all the way back to the STL output. There was no audio present, but the Moseley STL and the DSP-6000 showed no faults, and the signal readings were normal.

Thinking we had possibly lost the main audio channel in the DSP-6000, I ran over to the WLZG transmitter site where the head-end of the STL is located and switched the inputs to the aux channels, then drove back to the AM transmitter site and did likewise, but still no audio! I did not have a schematic on-hand for the digital encoder/decoder, so troubleshooting the audio section of the DSP's was impossible. I switched the audio outputs back to the main channel and drove back to the WLZG transmitter site and did likewise.

Out of desperation, I did a power cycle on the Moseley 6010 transmitter and the DSP-6000, and the audio came back! Apparently, one of the units was in a funk mode and not able to pass audio. It is unclear whether it was the composite in/out of the STL transmitter or the DSP-6000, but we were back on the air! We have not experienced any other anomalies since, but I suspect that I have not seen the last of this.

One other issue I am currently battling is the audio for the WDCX HD-2 stream. After substantial troubleshooting, I found that the problem is in the DSP-6000 encoder/decoder. The main channel is crystal clear, but the auxiliary channel sounds like frying bacon. I recently located an older set of schematics for these units and will have to switch to our back-up STL to pull the units for troubleshooting. I suspect that one or more of the NE5532/NE5534 op-amps has failed. I do have some spare units lying around that I can scavenge for parts. I initially suspected the power supply causing the problem, but with the main audio channel operating properly, that would rule out the power supply being the problem.

One other issue that was resolved this month was a tower light outage on tower #5 in the WDCX(AM) 6-tower array. I found that the photocell was defective and ordered a replacement from Pam Leffler at SCMS. On Tuesday the 5th, I changed out the controller, located approximately 10 feet up on the tower, and all is working again!

That about wraps up another month (or two) here in the great northeast, and until we meet again here in the pages of *The Local Oscillator*, be well, and happy engineering!

The Motown Update
by
Mike Kernen, CSRE
Chief Engineer, CBC-Detroit

Of Mice and Men?

Steinbeck wrote his controversial novel based upon Robert Burns' poem, "To a Mouse." Burns wrote, "The best laid schemes of mice and men often go awry." I've always subscribed to this notion – no matter how good our systems are, one must plan for failures.

When it comes to the utility power grid, it's just not all that good, and inasmuch as severe weather cannot be avoided, nor can the attendant power failures... Not to

foreshadow a summer storm season with widespread or frequent power failures – may that not be the case!

By installing generators and UPS systems into our facilities, we equip our stations for future outages. We, too, now have the associated war stories.

Among my favorites are the ones where for whatever reason, a UPS shuts itself down and doesn't bypass, killing power to the connected equipment. I'm a fan of irony, and I find it ironic that the only



purpose of being for any UPS system is to ensure that its load NEVER be without power.

This happened to me for the first time on a UPS that was protecting our station's audio automation system... (sigh). At that time, I was sure that issue was isolated, that is, until it happened again. Over time, I presumed UPS designers would surely evolve, understanding the role of their units, rigorously engineering them to "five nines" reliability and to failsafe. Well, it's not happened yet! They still perform this vile act, sometimes brought on by engaging in their built-in self-test routines. The test fails and their output momentarily drops, sometimes in a painful never-ending cycle!

For the above reasons, I've developed my favorite UPS brands and system types. I'm no fan of the little 'looks like a plug strip' UPSes. I also don't like units that have limited or no status indicators – how does one know what they're doing? That said, small, below-the-desk units are fine for the boss's PC, but please don't let him plug in his laser printer! Its fuser takes a good amount of power and will overload most small UPSes. Who really needs to print when the power goes out, anyhow?



The 150 kVA 480 VAC flywheel UPS at Crawford's WPWX site in Burnham, Illinois is housed in this standalone, self-contained shelter. It features dual HVAC units and bypass switching.

Double Conversion UPS

My favorite type of UPS is the online or double-conversion type. These are generally high-dollar systems that can consist of several large cabinets sitting in a dedicated utility room.

Such units have one or more strings of batteries (called jars) that can look a lot like car batteries. They have their own hardwired power distribution and can be connected to service an entire facility's technical loads.

They work by rectifying the incoming electricity, which continually charges their battery

string(s) and supplies the load via an inverter. In short, the inverter's input, the rectifier's output, and the battery string(s) are all connected in a parallel circuit. There is no transfer switch, therefore no delay at the time of a utility power event.

This form factor highly isolates the connected load from the utility. The highly stable inverter is the only source for the connected gear.

Once utility power returns, the rectifier resumes charging the battery string(s) and the load never sees the event. A bypass cabinet is included for servicing and fault recovery.

Continuous battery health monitoring is routinely employed measuring the cells' internal resistance to predict individual cell's end-of-life.

Cost, size, and installation are the constraining factors of most such systems, but they are available in rack mounted form factors too. Double conversion types are favored in data centers.

Line Interactive UPS

Next are line interactive UPS systems. These can be much smaller, less expensive, and protect discrete loads but have the advantage of surge suppression and voltage regulation while in standby. They can protect the load from utility abnormalities. They can boost or buck voltage and correct line frequency but do require a relay transfer to the battery powered inverter during a power failure.

Standby UPS

The most common type is the simple standby UPS. These can be small and cheap and can still save your bacon during a power outage. I only trust these in the most basic situations. Naturally, I still have them polka-dotting offices and prod rooms, but they certainly aren't for mission critical applications. Use them to protect edge switches, workstation computers, etc. – and unless you have a sizable one, no laser printers!

Flywheel UPS

Certainly, the most exotic type of UPS is the flywheel. A flywheel UPS uses no battery, instead relying on a synchronous motor-generator connected in parallel with the utility and the load and mechanically connected to a massive balanced flywheel turning at high RPM.

At the instant power fails, the flywheel's inertia begins supplying energy to the common shaft of the motor-generator which essentially changes it from a motor that spins the flywheel into a generator that feeds the connected electrical load. Of course, the flywheel's speed will decay quickly, so a system

like this is only suitable to cover the brief period while another source (say a diesel generator) starts and comes online. They can be remarkably effective and are becoming popular for areas where utility power fails often.



This UPS battery swelled and deformed so much that we almost had to toss the UPS it was in.

Monitor it!

Though they should, not all UPS systems have adequate enunciation capability. Some have only a simple beeper or a few LEDs. At a minimum you need an LCD display and at best a network interface that can notify via email or text message. Not knowing your units' status is tantamount to not having UPSs at all. An unmonitored UPS at a remote site is scarcely better than having the load connected directly to the utility. The unit's battery will eventually fail, and you'll only know it because something you wanted never to lose power and bought the UPS for, has indeed lost power.

To this end, I've been buying network management cards for our UPSes not already equipped, from eBay. Typically, they're pulled from some decommissioned data center and sold by a tech recovery specialist. Naturally, they should be reset to factory defaults prior to joining them to a network. Resetting them not only enables DHCP so you won't accidentally duplicate an already used network address, but it clears out old logs and email notification settings left by the former user. Next, update them to the latest firmware revision. They work great and for

about \$35ea. rather than the roughly \$400 for one new, they are a great buy.

Batteries!

Unless you are new to this, you've undoubtedly had a battery fail inside a UPS. From 60 lb. sealed lead acid (SLA) to miniature lead acid jell cells, all have a lifespan which is influenced by many things. Rate of charge, depth of discharge, ambient temperature, all decide a battery's useful life. In general, 3-5 years should be the outside.

In a recent failure I found a gel cell had deformed and bulged so much that we had to pry it out of the UPS cabinet.



A UPS battery bank at an American Towers site.

In a string like the one pictured, software can detect trends in battery performance. The makers of Cellwatch say their software "...continuously monitors the entire battery system, including string and cell level voltage; ohmic value; current; and temperature throughout the charge, discharge and float periods." Data is then used for notifying the user to replace a specific cell (jar) before it ever causes a problem.

UPSs are important frontline defenses in a computerized environment. Be grateful they exist and ignore them at your own risk.

In Burns' 1785 poem, he talks of regret after destroying the home of a mouse while plowing his field. Reading it, I'm reminded that we are not always able to see what's coming, and like a mouse, we're small and vulnerable.

News from the South

by

Stephen Poole, CBRE, AMD
Chief Engineer, CBC–Alabama

Looking at past issues of the *Oscillator*, it's obvious how quickly time flies. For example, it has been two years since a severe storm knocked loose one of the guy wires on tower #5 at WXJC in Tarrant. Has it really been that long? And while I was peering through old issues, I ran across a few other spring season tidbits – Cris built a fiber-optic isolator for monitoring tower lights; Mike Kernan joined the company in Detroit; things like that. My, how the years fly.

We had more severe storms in April. That's something else I noted as I traveled down memory lane: in spring, we get severe weather.

The big event occurred 11 years ago, on April 27th, 2011, when dozens of strong tornadoes came through Alabama. The death toll was over 200, entire communities had been destroyed, and God miraculously protected our facilities. We went without power at both WDJC-FM and WXJC-FM (then called WYDE-FM) for days. This meant that we had to haul fuel to the transmitter sites. In WDJC-FM's case, the road up Red Mountain was completely blocked by fallen trees, and we had to hand carry 5 and 10 gallon jugs of diesel to keep the generator running.

This past April was nowhere near as bad as

in 2011, but we nevertheless lost power more than once at WDJC-FM and WXJC-FM. Both Alabama Power and Cullman EMC use remote monitoring

now; they're very good about picking up an outage almost as soon as it happens. Todd even receives text messages from Alabama Power with updates. We can also go to their websites and they'll show the outage area with an estimated time to repair.

Red Mountain had already suffered other power outages earlier in April, one storm after another, and we hadn't been able to refuel the generator yet. For the last outage, the alerts from the power

company kept saying, "We still haven't determined the problem yet." The estimated time to repair kept slipping, from 6PM to 9PM; then to 11PM. The generator had already run for a while, and I was getting nervous. Our Red Mountain site is the STL nexus for all of our stations, with microwave signals going from that site to all of our others. A complete power failure would have been a disaster.

Figure 1 is a picture that Jack took of the fuel level on the Red Mountain generator before the most recent power outage. That's how low we were! But thank the Lord, Alabama Power managed to get the power back on by late that evening.

Todd then called for a refuel; it turns out that the company that we use had been sold to another, larger company, and we had to resubmit a credit application. Elizabeth McGuire out in Denver did a great job working with Todd to straighten out the paperwork. Within a couple of days, we finally topped that generator off with diesel, ready for the next round of storms. Whew!

Backup STLs

We have a Moseley StarLink on order to serve as a backup for our STL signals from the 120 Summit studios to Red Mountain. All of our other sites, the ones that receive microwave links from Red, have backup internet service. But just to keep me excited, during the severe storms, we kept getting notices from Spectrum that one or another internet



Figure 1 - NOT what you want to see with severe storms coming!



Figure 2 - Tunneling into the Omnia through an old laptop.

link was down. Nail-biting time, for sure!

As long as we have some kind of internet or data service at the site, we can figure out a way to get audio to it. In 101's case, once Spectrum came back up, I was able to go into a laptop that I've left at the site using a SSH "tunnel." I used that to check on both the transmitter and the Omnia 11, to confirm that we were getting audio.

In the past, we've even used that "back door" to reprogram the APT codecs to accept packets over the internet. Figure 2 shows me checking our Omnia 11 through the SSH "tunnel." It's slower than frozen fungus – not as bad as dial-up PC Anywhere; anyone here remember that klunker? – but several seconds between screen updates. Hey, it beats being off air!

Security, Ad Infinitum

The Chrome browser on my Android brings up a Google page when I start up. In addition to the usual search box, there will be a bunch of headlines that I can scroll through, clicking on any story that catches my interest. It's interesting to see what they think I'm interested in, but that's for another article. (I have never rented a jet, probably never will rent a jet, but I still get stories all the time about how to rent a jet. Emails, too.)

One of the headlines mentioned that the Security Gurus (capitalized out of reverence) are starting to really focus on web frameworks and other like packages. These definitely make your job easier – designing a web site with a Content Management System (CMS) framework like WordPress or Joomla – but nowadays, these things are often asked to do things that they were never intended for.

These frameworks have grown huge and

unwieldy, with file after file of PHP, Python, Javascript and you name it running on your web server, most of which the average web developer never even gives a second thought. All they care about is adding a plugin or module that will make it easy to do what the boss wants on the website. And you can no doubt make some really slick-looking web stuff nowadays.

But that particular article about security concerns with these frameworks confirmed what I've quietly wondered about for some time. At the very least, each time we add a plugin to WordPress, for example, that increases the exposure. Not only is there a real possibility of conflicts – two plugins might decide to do the same thing and then start arguing about who gets first crack at it – but security can be compromised.

Just to name one good example, I have been astonished at the number of plugins that will simply set (or tell you to set!) "world-writable" permissions on a folder. Anyone can read or write a file in that folder. They do this because it's the easy way out: in Linux-land, you simply enter "chmod 777" and call it a day. That way, you don't have to hassle with support calls from puzzled users: "How come I keep getting a 'file access error' on this web page?"

In addition to working on (and securing!) our new web-based POR system, I keep a close eye on all of our servers, updating them as often as possible and checking for blockhead moves like the aforementioned "Hey, anyone can put a file here!" stuff. (The versions of Linux that we use make this easy, because any world-writable file shows up in bright green in my directory listings. Heh.)

We've all been discussing (and implementing) security for a few months now, but I thought I'd throw that into the mix, too. After all, we don't have enough to worry about yet. (Heh again.)

Until next time, pray for this nation. I'm going to turn it over to Todd now for some excellent thoughts on virtualization.

Virtually Yours Todd Dixon, CBRE

If you been seeing the buzz word "virtualization" in conjunction with radio lately, your next thought may have been "Well, maybe Jesus will come back before then."

There's a lot to consider when planning on virtualizing every physical machine you have onto one really fast, really powerful machine. It might even surprise you that we had run the Scalix mail server instance (circa 2012 to 2020) that everybody used for a while on a virtual machine, and it hosted

somewhere around 80 accounts that varying pieces of equipment used to deliver email.

So the basic idea is that instead of having 10 machines with quad core processors, 8 GB of RAM, multiple hard drives, power supplies and other bits and pieces, why couldn't we get one machine with a 64 core processor, 256 GB of RAM and enough storage (with redundancy) to encompass all of those machines and redundant power supplies? The hardware to accomplish this is certainly here. The only true difference for us would be that instead of a physical computer, it will be replaced by a section of hard disk. Everything would be in one place, and it would certainly be easier to manage all of these machines on the one machine.

Another benefit is the ease of backing up an entire virtual machine (VM) so that if one actually

does go bad or misbehaves, you have the backup ready to be spun up in a matter of minutes and aren't waiting on a new machine (think supply chain issues).

I may be telling you what you already know, but companies like Digital Ocean and others have built their entire business on users like us being able to log into our account, choose a specialized server with a certain number of cores, RAM and storage, and within minutes the server is ready with an IP address for us to begin to set up the services that we want and need. It is truly easier than ever to accomplish this and provides a real reduction in costs overall and time managing multiple machines.

Have a great month and even if I can't be with you physically, know that I will be virtually.

The Chicago Chronicles
by
Rick Sewell, CSRE, CBNT, AMD
Engineering Manager, CBC–Chicago

“Wouldn't it be cool if...”

That phrase has either come out of my mouth or bounced around my head so many times in this position. I really do like to have a vision for making improvements in what we do and how we sound. Ever since we have installed the Wheatnet-IP system, even partially at our facilities, I have often thought that we should extend the network to our remote sites, either transmitter or remote studio.

Our first experiment came when we rebuilt our Rockford studio with the Wheatnet-IP system. Once that was completed, we decided that it made sense to get some connection between the two Wheatnet-IP systems. Since we were going over the open internet, we knew we would be limited.

So we purchased a Tieline Genie with the Wheatnet-IP card for each site. This allows us to send three stereo audio channels in each direction. This gave us the ability to not only send program, but phone callers and intercom audio to host at that studio. That worked well.

The first time a Wheatnet-IP blade showed up at one of our transmitter sites was last year. At our Kirkland transmitter site, we were undergoing a

complete makeover for our STL networks. We had to move from our dual T1 connection and went with a dual internet approach at the transmitter site and the studio as well. Once again, the Tieline Genies with Wheatnet-IP cards became the choice as we had to send three audio signals to that site. The Genies have dual internet capability, so we have redundant streams.

While we had a Wheatnet-IP blade at the remote site in each of these circumstances, the blades were in reality not really connected to the network in our studio TOC. You couldn't open the Wheatstone Navigator software and see those blades as part of the system. Of course the audio was good, but we were using audio codecs, so there was some compression on the connection.

The dream was to actually use the Wheatnet-IP blade at a transmitter site without the audio codec. Years ago, we tried to do this with our 18 GHz ethernet microwave radio system connecting our studio TOC to our Lansing transmitter site. This is a fairly short hop of about 3-1/2 miles. The connection had good reliability but was limited to a bandwidth of about 10 Mb per second. This seemed like it might be enough to get one stream through, but the experiment didn't work. The audio was very



choppy, and it was causing problems with audio at the studio.

Last year we upgraded the 18 GHz link by switching the microwave radios to the Cambium system, which has greater throughput using 2048 QAM. This afforded us the opportunity to have a greater ethernet bandwidth. We played with putting a Wheatnet-IP blade on the system there, but only for short stints, and we didn't put it on the air. I wanted to use a two VLAN approach across the Cambium system – one for Wheatnet-IP and the other for all other ethernet traffic.

That never really came to fruition, and I decided to not be stubborn with that approach. The other factor here is that we also had a 5.8 GHz 802.11 unlicensed ethernet radio link running in parallel to the Cambium system. We were using the Ubiquity Power Beam radios as a backup to the Cambiums. I hated the idea of losing this as a backup system, but the obvious choice was to not hassle with VLANs but instead to divide these two physical networks into two different roles. We went with using the higher capacity 18 GHz link for the Wheatnet-IP system and then put all the other traffic on the Power Beam link.

We did this in late in March, and we were quite pleased with the results. Chiefly, that is, 44.1 uncompressed stereo audio. The digital audio that runs through our Wheatnet-IP system at our studio facility shows up at our transmitter site into our audio processor and then from there, the transmitter. We can now route directly to and from the transmitter site.

We could definitely hear the difference on the air. Some of the instruments that had been missing or hardly noticeable before could be clearly heard. Besides the improvement in audio on air is that we are also able to extend other aspects of the Wheatnet-IP system to the site, like LIOs (logic).

We were worried about the system dropping audio through this link. I haven't heard a single dropped piece of audio yet, and we have experienced several heavy rainstorms.

We are very encouraged by what we have heard so far and we are making plans to switch our other local transmitter site to the Cambium system. We'll see if we can't repeat our results at the Burnham site.

Rocky Mountain Ramblings The Denver Report

by

Amanda Hopp, CBRE
Chief Engineer, CBC - Denver

Weather Report

I think every month I say something about how time flies. We are four months into the year, beginning our fifth month. I know they say time gets faster the older you get, so for all you "old folks," warp speed must be fun. Spring is ramping up here in Denver.

We had several weeks of windy days and fire weather, which is rare this time of year. They are saying this is the first April with no snow since 2002. Statistically, April tends to be one of our snowiest months. While I am glad the snow appears to be done for the time being, I also know that it is needed. I am incredibly grateful for the little bit of rain we had recently. It did not rain for long, but it did rain, and any moisture right now is a good thing.

Over a two-week period in April, nearly

every day I read about a report of a new fire in Colorado. Some of the fires were quickly extinguished, but others did rage on for several days.



One entire town in the southwest part of the state was recently decimated by a wildfire, and of course there was the Marshall Fire right here in the Denver metro area back in December that wiped out over 1,000 homes. The men and women who go out to fight these fires are amazing, and I appreciate their hard work and service to helping keep us safe. We need rain, lots of it. I pray May brings that for us.

Growth

The vegetation growth at our transmitter sites has begun. I drove out a few weeks ago and noticed a bit of green popping out of the dirt. We will be having the KLVZ daytime tower site sprayed with

herbicide that targets noxious Canada thistle. We bought the spray last year, but the person who we have do the spraying had equipment issues and I ended up mowing the site myself knocking down all the growth. The county gets after us if we let the thistle go to seed because the seed gets in the South Platte River, which borders our site on the west side. Downstream farmers take irrigation water from the river and they get cranky when noxious weeds come up with their crops.

The hope is that this year, this month, our guy will get out there and spray and we won't have to worry about it.

At the other sites, Keith Peterson has been hard at work preparing. He has already done the first spray of the season around the buildings and at the tower bases. He did some research and bought a new product to try. I don't remember what it was, but if it does work, I will be sure to write about it for anyone else who wants to try it out.

If things keep going the way they are, with little moisture, we may not have much of a growth season. I do not know what I want more... I know we need the moisture, but at the same time, mowing and then being sick for days with allergies afterward doesn't sound like fun. I'll take what I get, I guess.

KLZ Tower Parameters

The tower 2 ratio at KLZ has been dis-cooperative. I cannot tell you how many trips I have made to the site to bring the parameter back into tolerance. I cannot find a reason for it going out. The transmitter stays happy, and we don't see it anywhere else, even in the phase. I am still learning so I really do not know what to look at.

I recently made a trip to the site with my dad, and we went to both ATUs and the phasor and made sure things were tight and that there was nothing obvious going on. For me, this is always the first step. When the issue returned, we took the OIB out and began measuring the self-impedances of the towers to get a baseline. Then, when the issue came back, we went out to measure again to see if there had been a shift. We did not see a shift, which pretty much eliminated everything downstream of the ATUs, so we moved our efforts into the phasing and coupling system.

While I was dealing with some other things at the site, my dad removed two capacitors that would produce the kind of shift we have been seeing if their values were changing and measured their values. Those values were on the money. We

checked the security of all the connections in the phasor while we were in there, tightening all the hardware and coil clips. I readjusted the T2 ratio for licensed value and we left.

Of course, in true fashion, a few hours after we left, the ratio started dancing around again. It will jump out for a short amount of time, then get back close to where it needs to be. It is making tracking down the issue very difficult. I am enjoying learning, though, what to do to troubleshoot an issue like this. I will be better prepared in the future to deal with a similar situation.

KLDC Move

The KLDC project is moving forward. I won't say much about it as I am just the engineer. My dad is the one designing and planning this move. I am just here for the ride and do what I'm told. I look forward to it, though. Ruby Hill is not a site I have ever enjoyed. It is creepy. I never feel safe there, despite having a fence with two locked gates surrounding it. The new site will be much better. It is easier to get to, it is in a location where I shouldn't have to worry about security. During business hours, there is a ton of activity from the drywall warehouse that shares the site. After hours, the site is secured with a motorized drive gate that will close and prevent unauthorized access. It is an easier drive. There are tons of places to eat nearby.

It will be a tough move, a stressful move, but when we are done, it will be a breath of fresh air.

Coming Up

I have plenty of cleaning and maintenance to do at the transmitter sites. I need to clean ATUs and replace the weatherstripping on many. I need to do some long-awaited transmitter maintenance as well. I have not done a good job at keeping up with this. I will remove various power modules/cubes (depending on the transmitter), use a vacuum and maybe some compressed air, to clean out any dust from the transmitter and then the modules and cubes. The cleaner things stay, the less likely there will be an issue in the future. I have printed off Nautel's recommended maintenance for the NX5 and 50. I know what to do with the older transmitters and will take care of them. I look forward to being out of the office for some time while I deal with all these things.

That about covers it for this month. I pray you all stay safe and well.

The Local Oscillator
May 2022

KBRT • Costa Mesa - Los Angeles, CA
740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1

KNSN • San Diego, CA
1240 kHz/103.3 MHz, 550W-U

KCBC • Manteca - San Francisco, CA
770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2

KLZ • Denver, CO
560 kHz/100.3 MHz, 5 kW-U, DA-1

KLDC • Brighton - Denver, CO
1220 kHz, 660 W-D/11 W-N, ND

KLTT • Commerce City - Denver, CO
670 kHz/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2

KLVZ • Denver, CO
810 kHz/94.3 MHz/95.3 MHz, 2.2 kW-D/430 W-N, DA-2

WDCX • Rochester, NY
990 kHz/107.1 MHz, 5 kW-D/2.5 kW-N, DA-2

WDCX-FM • Buffalo, NY
99.5 MHz, 110 kW/195m AAT

WDCZ • Buffalo, NY
950 kHz/94.1 MHz, 5 kW-U, DA-1

WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT

WCHB • Royal Oak - Detroit, MI
1340 kHz/96.7 MHz, 1 kW-U, DA-D

WRDT • Monroe - Detroit, MI
560 kHz/107.1 MHz, 500 W-D/14 W-N, DA-D

WMUZ-FM • Detroit, MI
103.5 MHz, 50 kW/150m AAT

WMUZ • Taylor - Detroit, MI
1200 kHz, 50 kW-D/15 kW-N, DA-2

WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT

WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT

WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT

WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT

WYDE • Birmingham, AL
1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND

WYDE-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

WXJC • Birmingham, AL
850 kHz/96.9 MHz, 50 kW-D/1 kW-N, DA-2

WXJC-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT



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