

PREVENTIVE MAINTENANCE;
LITTLE THINGS MEAN A LOT

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In a cable TV world filled with the excitement of new and developing technologies, it is sometimes easy to forget the simple, little, unglamorous things that keep systems running. A practical preventive maintenance program is filled with these little things.

They will never draw national headlines. They will never receive deafening applause. But these little things done properly, done at the right time, done as part of an overall preventive maintenance program, will keep a cable TV system running well. Subscribers like systems like that. I hope you do too.

INTRODUCTION

Imagine a newly-built cable television system in your town. The aluminum gleams as it spans from pole to pole; and where it goes underground, the pedestals stand straight and true. The amp cases hang majestically on the strand, never ceasing in their signal passing duties. Messengered droplines glide into each house and proudly carry "more choices than you ever dreamed possible."

Meanwhile back at the office, the calls are still coming in from people eager to subscribe to the service or from subscribers wishing to thank the cable TV firm for such good service. The installers (the only outside-working employees at this system) scurry from house to house hanging new wires and installing new converters.

The cable system runs flawlessly day after day, month after month, year after year. The owner and manager are left only to address such questions as: "Should we be 80% invested in the stock market and 20% in the bond market? Or should we be starting to put our excess cash into Jumbo C.D.'s and T-bills?"

And now open your mouth, insert your index fingers, and bite down hard. It is time to abandon our dream and come back to reality, to the cable system that really exists in your town. The

system that sometimes has technicians scurrying from house to house instead of installers. The system that sometimes has the owner and the manager going nuts trying to figure out where the money is going to come from to keep everything repaired and operating.

Let's face it. Real cable TV systems have real problems. Some are big problems; many are small. But the main issue I want to address is this: some systems have fewer problems or service calls per subscriber than other systems.

Is this just luck? Well, luck might have a bit to do with it. Is it because some systems are newer than others? That would certainly have some bearing on the matter. But two things more than anything else will affect this issue: PREVENTIVE MAINTENANCE and PROPER MAINTENANCE.

It is my opinion (and I hope a few others will agree) that these two things, done with care will save untold ulcers and headaches, and make life easier for all involved in cable. What follows hereafter are some thoughts and ramblings on the two P's of maintenance.

A BAD EXAMPLE

In 1973 a state-of-the-art cable television system was built in Seymour, Indiana. It was constructed in a top quality manner with P1 aluminum and spliced using non-cored fittings. The C-COR 400 series trunk and distribution amplifiers were capable of passing 24 channels and were professionally balanced and swept for peak performance.

Waterproofing compound (RTV) was applied to all aluminum fittings and splices to insure that corrosion would not develop in the passives and the amp cases. In short, as the system lived through its first few weeks of active life, it might have resembled to a certain degree the "dream" system mentioned at the start of this paper.

However, between 1973 and June 3,

1981, when I came here, something went wrong. The dream turned into a nightmare. What was once gleaming aluminum spanning from pole to pole had turned into disaster on strand held together by corrosion, tape and short pieces of mangled lashing wire.

This did not come about by total neglect of maintenance. Nor did it happen in one year. I truly believe that the different technicians working here during that time span worked very hard and thought they were keeping up. And, I doubt that they ever realized the picture quality and the cable plant as a whole were slowly getting in worse shape.

Near the end of this eight year period, certain conditions became accepted as normal. When it rained, all cable employees knew that certain feederlines would soon be blowing fuses. Other specific feederlines always shut down during lightening storms. There were "bad" parts of town where installers hated to go because the pictures were always grainy or had lines and interference.

One technician spent his whole day doing nothing but service calls for this system of then 3500 subscribers. No one was able to keep his signal leakage monitor turned on because it never would have shut off. There seemed to be more signals on the outside of the cable than on the inside.

What has been done at Seymour in the past three years? What could have been done to prevent these problems? What is currently being done at Seymour and other Cardinal Communications systems to insure optimum operating efficiency and prevent problems like these from arising?

THE SOLUTION

Trunkline Integrity

The backbone of a CATV system is its trunkline. The tower site may be situated at the ideal location for picking up off-air signals. The earth station may be more than adequate. And, the signal processing equipment may deliver crisp, clean, broadcast-quality pictures. But if all these lovely signals are dumped on to a trunkline with moisture ingress, breaks, signal leaking splices and passives, the subscribers may think the headend gear was purchased at a garage sale.

The integrity of the trunkline must be maintained to have any chance at delivering good pictures to subscribers. Thus when the battle to restore Seymour's cable TV system to better health was begun, the trunkline was attacked first. Starting at the headend, the trunkline

was inspected from amp to amp.

Particular attention was given to the number of splices in each span. One or two splices in an 1,800'---2,400' trunk cable seems very acceptable. Three or four splices could even be accepted. However, when there are five, six, or more (heavy emphasis on more), the integrity of that particular section must be questioned.

Today's splices with their radiation sleeves and high RF shielding do a very wonderful job, in my opinion. When splices are installed properly, they are almost as good as an unbroken piece of cable. And yet it seems that sage, Murphy, has warped my thinking about so many things in cable. I cannot keep myself from seeing each splice as a potential suck out, a potential short or open, or some other terrible CATV disaster.

We replaced several sections of trunkline in Seymour just to be rid of splices. We will do it again in the future as the need arises. It is good insurance. Insurance against what? Against having half your system go off on Super Bowl afternoon for two or three hours as your technicians frantically search for the offending splice.

It is insurance against problems that flare up just as a new, critically acclaimed program was about to be watched by 75% of your subscribers. Granted, these splice-induced outages may not happen often in most systems. But odds are every system's personnel could relate horror stories concerning outages of this type.

Think now about your system. Can you pinpoint any areas of above normal trouble? Could this be related to excessive numbers of splices?

Most definitely, splices are the cheapest and often the best way of repairing a trunkline. But cheapest (and easiest) is not always best and cheapest for the long haul. There can be no hard and fast rules in this area, but each system must decide for itself what the splicing limits can be.

Also, just because your system now has no heavily spliced sections in it does not mean they will never develop. They will. Electric and telephone utilities (with their pole change-outs) and drunk drivers love nothing better it seems than making sure your trunklines are 2,000 splices connected with 1,000 six inch pieces of cable.

Heavily spliced sections usually do

not grow overnight. They slowly take form over many months or years. This means that trunkline sections must periodically be inspected. Every six months seems like a good time period. However, each system's technicians should go with whatever they think will meet its needs. In any case, as the saying goes (sort of): see your trunk now, or see it later. The choice is yours.

While scanning the system for splices, do not overlook the splitters, directional couplers, and amp cases. Do the fittings seem to be in good shape? Maybe a small random sampling can give some clues about the majority of trunk fittings in your system. Check the amp cases for moisture ingress. Soggy amplifiers do funny things.

Do not be afraid to look at all these things with a critical eye. Save the trunkline!

Employees: Friends or Foes?

Before June of 1981, the cable TV system at Seymour was battling against many enemies. The natural aging process of the equipment, the weather, public utilities and drunk drivers were taking their toll. But by far the biggest enemy that the cable system faced was its own outside employees. Their work methods and "maintenance" contributed more to the system's deterioration than all other things combined.

This problem is not something that was unique to Seymour either. I think a good survey would show that many systems in any part of the country have experienced this problem. Moreover, many systems are still experiencing this problem.

Why? Lack of education! I truly believe that most times these employees are sincere in their desire to perform maintenance or do installs properly. It is just that they have never been told what really are the proper methods.

Proper Methods

Goop has got to be one of the cable system's best friends. What is it? It is the gooeey, grease-like stuff that is squirted into dropline fittings on all outside connections. It is the stuff squirted on all threads of feederline and trunkline fittings. It is squirted onto the threads of the cylinder traps or coil-type traps. Goop can be used almost anywhere.

I am using "goop" as a generic name. There are a variety of products on the market which will work as goop. Oxiban, Blackburn, No-lox are some that we have

used with great success here at Seymour and other Cardinal Communications systems.

The greatest advertisement for using goop has to be the effects of not using goop. At Seymour for instance no dropline fittings or trap fittings had it applied before 1981. Any droplines that had been hooked up a while had to be taken off almost entirely by a wrench. Putting them back on was just as bad.

It was not uncommon to have fittings that could not be removed from taps because they were corroded so badly. If someone got adventurous and worked hard to remove a stuck fitting, a broken tap port usually resulted.

In the same way, traps and dropline fittings were oftentimes "welded" together. Splice and groundblock fittings became hotspots for trouble. Even feederline and trunkline fittings were not immune to the problem. Corrosion was rampant and lack of goop was partially to blame. Signals leaked everywhere.

It is hard to believe, but many cable TV systems still use no goop and still fight a never-ending battle with corrosion. It is a battle they are doomed to lose. It is a battle where the cable TV subscribers are the victims.

A final thought on goop: make sure your outside employees use it without failing. If they use it on 95% of their fittings, then the remaining 5% will do you in. No percentage less than 100 is acceptable. It is that important.

Here at Seymour if an installer forgets to take his goop bottle up a pole, he will not hesitate to climb down to get it, even if it is highly inconvenient. The people here know what life is like without goop. They never want to live that way again.

Heat shrink tubing and waterproof sealants such as RTV have proven invaluable at Seymour in the past few years. These fight corrosion just as the goop does. As stated earlier in this report, Seymour's cable system was RTV'd at each trunkline and feederline connection when the system was built. However as new sections were built, taps were changed out or added, or splices were cut in, little, if any, RTV'ing was done.

Just like the goopless fittings, the unsealed trunkline and feederline connections did no immediate harm. The damage came several years later as passives and amplifier cases filled with water. Corroded fittings, especially on feeder-

lines, led to signal leakage. Corroded fittings lead to dramatic irregularities in frequency responses of trunk and feederlines.

It has been a long, slow process to rid Seymour's cable TV system of this problem. Great amounts of time have been spent driving out feederlines looking for nonprotected connections. Hundreds of fittings have been changed, along with dozens of water-logged passives. None of this was cheap, and none of this should have happened.

We currently use heat shrink tubing on all trunk and feederline connections. It seems to be more effective at stopping moisture ingress. But the key again is this. Whether heat shrink tubing or other sealants are used, use them faithfully. Use them 100% of the time. Murphy says the exceptions will be a system's downfall, and he knows whereof he speaks.

Install in employees' minds the urgency of sealing connections at the time they are made. Many is the time I have heard the phrase: "I'll come back and seal the heat shrink tubing tomorrow." Only, tomorrow finds that technician working on the other side of town, and that unsealed connection is quickly forgotten. And then, two years later.....Disaster!

(That other well-known phrase: I'll come back and goop the fittings tomorrow" usually brings the same results.)

I know that the majority of systems are already doing these things. And yet I also know many that are not. Within the last two years at least two cable TV systems in this area alone were built with no goop, no RTV, or no heat shrink tubing. Undoubtedly the owners saved a bit of money up front. However, their future looks expensive.

The Eyes Have It

Because of the size of Seymour's cable TV system, I am unfortunately not able to drive out all the feederlines and trunklines each day. I feel lucky to drive my system out once every six months. But, thank goodness, I do not have to monitor the system alone. No one should have to (unless of course it is a small, one-man system).

Each system has installers and technicians who have very useful sets of eyes. If these eyes can be put to work in the preventive maintenance area, great things can be done. Or, put another way, horrible things can be prevented.

It pays for each outside employee (and even CSR's and other office personnel to a certain degree) to develop "educated eyeballs." What in the world are "educated eyeballs?"

They are eyes that see cable problems before they happen or as they are beginning to happen. They are eyes that notice little things out of place. They are eyes connected to a brain constantly in tune with seeking out trouble spots or preventing trouble spots from appearing.

Educated eyeballs are not something some cable people are born with and others are not. They are not innate. They are developed. They cannot be developed in one day, however, but must be nurtured and acquired over a period of time.

Educated eyeballs may come easier to some than others. Any skill is that way. Yet I am convinced anyone can develop them to a certain degree. Once acquired, they are an invaluable asset to any employee and to any cable TV company.

Why? They save money! They prevent trouble! They save the chief tech from exhaustion!

Most systems' installers and technicians will log many more on-job driving miles each week than the chief tech or engineer. Many of these miles will take them by or underneath the cable plant. Thus the opportunity is there for them to spot trouble, if they know what they are looking for and look for it.

What should they be looking for? The following is just a partial list: broken lashing wire, tree limbs growing heavily into the cable, low-hanging drops, expansion loops dangerously near or even rubbing J-hooks and telephone bolts, splitters hanging from taps, surprise pole change-outs, and more.

The list really is limitless. The idea is to keep the mind tuned for potential problems. When the mind is tuned in, the eyes will not be far behind.

Open Ears

In my thinking, any discussion about educated eyeballs would not be complete without some talk about ears. Of particular importance are the chief tech's ears.

Office personnel, installers, and technicians can spot all the potential trouble they want. But if the person who needs to be notified will not listen or take them seriously, the cable system is no better off. In fact, it is worse off

because employees will soon become discouraged.

Listening is of great importance in any preventive maintenance plan. Write down employees' tips and check them out. Ask them if they saw anything out of the ordinary on the cable plant. Ask them about the picture quality at some of the houses they visited. Then stand back and listen. As a wise man once said, "Installers say the darndest things."

Ears can be important in another sense also. They can listen for signal leakage. Several signal leakage detection systems are currently made which make use of FM receivers mounted in company vehicles. When a vehicle is driven close to a leak of sufficient magnitude, the monitor goes off, alerting the driver to the leak. With the FAA, the amateur radio operators, and the FCC all hollering about signal leakage, it seems a good thing to be concerned about.

Once again it is advantageous to use the employees' on-job driving to help with preventive maintenance. Here at Seymour and at all other Cardinal Communications systems, each company vehicle is equipped with a signal leakage detector. It is amazing at what the installers, technicians, and sometimes even the managers find as they drive. But more amazing still are the problems prevented by good listening habits.

Signal leakage detectors for every vehicle may sound expensive; but have you noticed the increased amounts of FCC fines lately? I would rather hear about signal leakage from my fellow employees than from the FCC. It is much cheaper in the long run.

Neatness: Is It Worthwhile?

No matter where I go, I find myself spending a great deal of time looking at the cable TV lines. As I come into a city or town my eyes are instinctively drawn upwards to the aluminum spanning from pole to pole. But what my eyes really study most are the taps.

What is their overall appearance? Are the droplines coiled up neatly along with the traps? Or do great lengths of droplines and traps dangle below the taps? Do the areas around the taps look orderly to the eye, or do they look like chaos?

Although the following rule may not apply in all systems, it will apply in most. As the taps go, so goes the rest of the system.

I have found that systems with messy

or chaotic taps tend to look that way in other respects. Pole change-outs are done haphazardly. Installs may be sub par. Normal plant maintenance is done with just enough effort to get by.

All of this has something to do with system pride. If employees love their system and take pride in it, then they will do their best to make it look good, even down to the taps. But I believe low employee moral and lack of pride will soon show up at the taps and then in other places.

Also, in general, it seems that messiness breeds problems. There is something about a messy tap that invites trouble. Things just seem to go wrong more frequently. I am not sure why exactly, but I know it is true. Diligent attention to plant neatness has a direct correlation to service calls and should be an integral part of any preventive maintenance program.

Record Keeping

At first thought maybe, record keeping would seem to have very little bearing on preventive maintenance. However, it can make all the difference in the world. Good records can help spot problems or potential problems and help prevent them.

Among the best and most invaluable records of any CATV system are the system's own yearly FCC proof testings. These tests were actually not designed by the FCC to keep technicians busy doing worthless things for several weeks every year, as some cable TV operators think. They are a forced maintenance and preventive maintenance tool.

Not a year has gone by at any of our Cardinal Communications systems that we have not uncovered problems or developing problems during our FCC testing. For that reason then, we do not skimp on our testing or treat it lightly. We work hard at it, we dig deeply, and we are richly rewarded for the effort. I think our subscribers are rewarded also.

By keeping detailed records of our FCC proofs, we can see what trunklines or feederlines have caused the most problems over the years. By analysing these records, we can see what sections are candidates for a rebuild or at least some intensive work.

Other records of great importance are input, output and voltage levels from all of our amplifiers. As routine maintenance or periodic balancing is performed on the amplifiers, we can tell if these parameters have changed and how

much they have changed. We can then quickly start looking for why they have changed.

Up-to-date amplifier readings eliminate the guess-work that goes on at many systems. It is surprising how often exchanges like this really happen: "It seems like the input was a lot higher last year."----"No, I'm sure it was the same."----"O well, I think I can make it set up."

Do not neglect to keep records on stand-by power supply maintenance (battery water levels, etc.), headend equipment, tower lighting, signal leakage and more. Some records may be of more value than others in different systems, but the main thing is to decide what will be useful at your system and then record it.

CONCLUSION

So often in cable TV we are bombarded with the new technologies currently

being put into practice or that are coming soon. That is exciting and one of the reasons cable TV is a good field to be involved in.

Yet, like so many other industries, cable TV is dependent on lots of little, unexciting things. It would have been nice to present a paper full of great, new discoveries in the field of preventive maintenance, and I am sure there are some coming someday.

But for now I can only tell you about some of the little things we are doing. Putting goop in a dropline fitting does not seem glamorous. Nor does having "educated eyeballs" sound beautiful. These little things, along with others, however, CAN make a difference.

They may not win systems awards for great thoughts and ideas, but I hope they will save systems some money and help keep subscribers happy. As someone once said, "Little things mean a lot."