INFRAMATION
THE THERMOGRAPHER'S CONFERENCE

Electricity Provider Provides Infrared Inspections to Member Companies

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ABSTRACT

The municipal electric utilities who are member-owners of Missouri River Energy Services® (MRES®) asked MRES to provide them with infrared technology to reduce electrical outages, electrical spikes and problems associated with electrical service. Most of the member utilities could not justify the cost associated with purchasing a quality camera, attaining and retaining certification, adding or allocating staff to efficiently operate a program, and many flatly did not have the desire to perform the inspections. Some were required to contract with an outside consultant to perform an inspection.

After performing a survey of the MRES membership, and developing a business plan, MRES management moved ahead with a program that offers infrared services priced by the hour, or by discounted half-day and full-day rates, using a predictive maintenance approach. MRES provides its members with the thermographic electrical inspection services needed to detect potential equipment failures, reduce downtime, and meet safety requirements of insurance carriers. In addition, the program has been expanded to include physical plant troubleshooting and predictive maintenance; including mechanical applications, electrical applications, roofing applications, and building envelope (heat loss) applications.

The MRES program has been a success and continues to grow at an astounding rate due to customer satisfaction. Key to that satisfaction is the willingness of MRES to go beyond the normal scope of the infrared inspection and subsequent reporting that is being offered by competitors, the customer relationship both before and after the sale, and the commitment of its staff to promote the program.

INTRODUCTION

Missouri River Energy Services is a not-for-profit, joint action agency serving member municipal utilities in Iowa, Minnesota, North Dakota and South Dakota with wholesale electricity and energy services. While providing electricity remains the primary focus for MRES, infrared services and predictive maintenance services have become an integral part of the energy service offering to both MRES member electric utilities and hundreds of commercial/industrial customers of those members.

During this presentation I hope to convey the importance of listening to what the customer wants and needs, and of providing services to meet those needs with information that is concise and correct. I will also talk about how MRES developed an infrared inspection service program that can be utilized by member electric utilities on their electrical distribution and motor systems, end-use customers in a wide variety of electrical, mechanical and process applications, and insurance carriers for assessment of risk. I will show you how to grow an infrared program that can be very profitable both in dollars and customer loyalty.

WHY DID MRES DEVELOP AN IR PROGRAM?

The MRES Infrared Inspection Program originally sprung up from a customer inquiry about infrared technology and interest in putting that technology to work in their plant. MRES began to investigate the uses for infrared technology, the economics of providing service to members and customers, and the interest in such a service from our customer base. During customer meetings, maintenance personnel were asked about the use of, or interest in, infrared technology at their company. Responses were mixed

from “What is infrared?” to “We already have an outside consultant provide the service on a regular basis”, to “We would consider it, but only if the service is cost effective”.

Several MRES member utilities were already using infrared technology to troubleshoot problems on their electrical distribution systems. However, the equipment they were using was either black and white video technology that did not provide precise temperature readings, or heat probe “gun” technology that looked at a very limited area, or a combination of the two. The members were not getting the accuracy or full scope of information that they wanted and needed.

Based on the results of customer responses, meetings with member municipal utilities, and a study of potential uses of infrared among this group, a marketing plan was written to implement a program that would provide infrared services to the member utilities and to any business or resident in the membership geographical territory. The listing below shows the three groups that MRES focused its efforts on, as identified in the marketing plan, and examples of expected applications for infrared services.

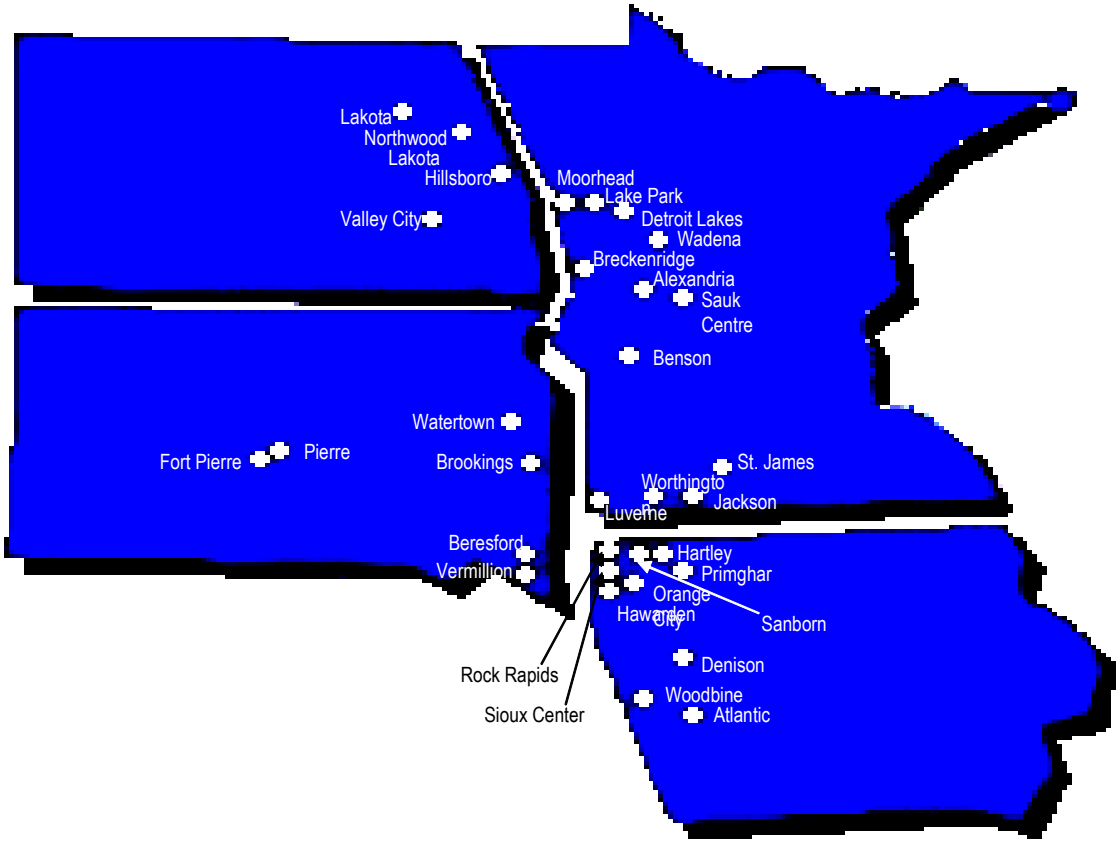

Figure 1. *MRES Customers*

MUNICIPAL UTILITY-BASED IR SERVICES

- Electric Distribution Systems
- Substations
- Transformers (both utility-owned and customer owned)
- Water Delivery Systems
- Well Head Motors and Electric Station Controls

- Wastewater Lift Stations
- Wastewater Pumps and Controls
- Digester Systems and Controls

COMMERCIAL/INDUSTRIAL IR SERVICES

- Electric Distribution Systems
- Internal Transformers
- Process Machinery (chicken nuggets to aluminum extrusion)
- Low Voltage Computerized Control Cabinets
- Roof Analysis (leakage)
- Heat Loss (due to poor insulation/construction)

GENERAL PUBLIC IR SERVICES

- Residential Infrared Inspections (focusing on heat loss)
- Limited Electrical and Contractor Performance Audits

MARKETING APPROACHES USED

- Direct customer meetings (one-on-one)
- Infrared informational mini-seminars
- Business association groups
- Customer recommendations
- Trade shows
- Community events
- Direct mailings
- Direct contact with local electricians

MRES REPORTS AND REPORTING PRACTICES

When surveying customers, MRES staff discovered that many infrared competitors offered very limited reporting after the inspection. Usually customers received a few report pages showing a visual digital picture (sometimes pasted on the report page) along with a corresponding infrared image, for only those pieces of equipment where a serious problem was indicated. In developing the MRES program, a key decision was made to turn our service into a predictive maintenance tool by offering the customer a detailed printed report showing every piece of equipment scanned, a CD-ROM disk copy of the report for reprints and enlargement, and a follow-up visit to insure that any corrective actions taken did actually reduce or eliminate the suspect problem.

KEY DECISIONS MADE IN OFFERING THE MRES INFRARED INSPECTION SERVICE:

1. MRES personnel will not open or close fixtures, cabinets, panels, or covers. This decision was based on two very important factors. The first and most important factor was a safety and/or liability concern, but secondly, MRES wanted the company to provide either maintenance personnel or an electrician to accompany us during the inspection. The thermographer can then show the electrician or staff person immediate results of the infrared inspection and provide education on why the service has been requested and the value of the results. Most electricians see that MRES is not in competition with them and, in fact, creating work for them and selling their services back to the customer. This has led to many referrals and additional work for both MRES and the electrician.

2. MRES will provide complete reports with full analysis and maintenance recommendations on EVERY item inspected. This originally became a nightmare time-wise! However, when priced correctly, it is also a great source of revenue and MRES found that our customers really do use all of the information. They use the report to trend motors, add electrical equipment to particular circuits, and troubleshoot electrical problems, even when there was no problem or only a minor problem indicated at the time of the report.
3. The comprehensive reporting was an issue that created huge timing concerns and ultimately forced us to review and adjust our rates. But, through the comprehensive reports, we also found a huge niche market – insurance underwriters. The fire insurance carrier of one of our customers asked the customer for a complete electrical audit. When they pulled out the MRES infrared audit, performed about two months prior to the request, showing detailed findings on each electrical panel and piece of equipment, along with the corrective actions taken, the insurance carrier reduced their premiums by twenty percent (20%)! Needless to say this customer was willing to tell the world what he did, how they used the MRES infrared report, and how the company reduced maintenance and overhead costs. The company has become a great promoter of the MRES infrared program to other businesses in the community as well as others in the industry!
4. MRES researched the use of the Minnesota Conservation Improvement Program (MN CIP) for our member utilities in Minnesota. The MN CIP is a utility funded, but state mandated, program designed to promote energy conservation. Minnesota mandates that each electric utility must spend one and one-half percent of gross revenues on approved energy conservation programs. MRES discovered that the infrared inspection service was considered an approved "indirect" program because it can pinpoint inefficiencies in electrical equipment and heat loss in building envelopes. Therefore, utilities could use up to twenty-five percent (25%) of their total spending requirement to cost-share the expenses of infrared inspection services with their customers. What MRES also discovered was that the "funded dollars" could be applied to all customer classes. These dollars allowed MRES to reduce the customer's cost of infrared inspections to all customer classes, and allowed MRES to penetrate the residential market by providing home infrared audits (mainly showing heat loss). When the customer had a gas furnace, rather than electric heat, MRES was sometimes able to provide the infrared inspection to the natural gas supplier and bill them for the inspection since gas suppliers are also required to comply with the MN CIP rules.

MRES INFRARED PRICING AND CUSTOMER SERVICE PROGRAM

After researching the competition and developing our own internal cost of service projections, MRES developed the following pricing scenarios:

- Hourly rate-based infrared service: Billed at $135.00 per hour (on-site time only).
- Half day rate: Billed at $500.00 (four hours on site).
- Full day rate: Billed at $900.00 (eight hours on site).
- Report charge: Basic charge @ $40 per report. Video enhanced @ $75 per report.
- Daily and one-half day thermographer expenses.
- Mileage charge at federal rate.
- Travel time billed in the event of excessive travel required.
- MRES offers pricing plans competitive with the market.

CUSTOMER SERVICES

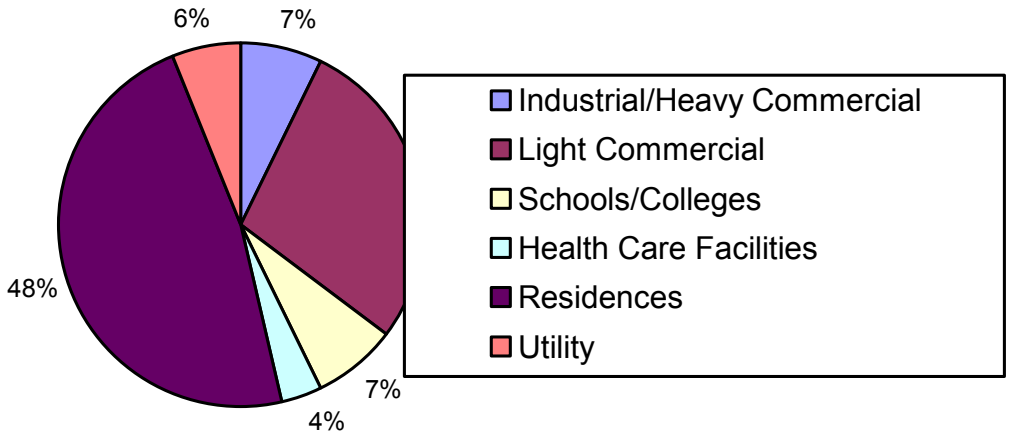

Figure 2. *MRES 2002 customer mix.*

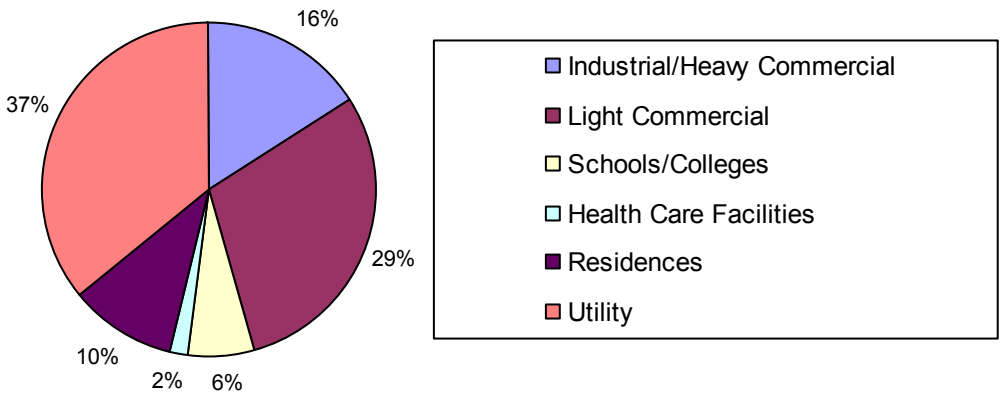

Figure 3. *MRES 2002 dollars billed.*

Customers are offered the following services:

1. MRES or a utility representative will perform a walk-through and offer a non-binding dollar estimate for service. On the day of the infrared shoot, the MRES thermographer will meet with the customer's maintenance staff or designated electrician to determine the route to be taken, to detail what safety measures are required (especially for manufacturing plants or food processing plants who require protective clothing, sanitation or eye/ear wear), to cover the item list for imaging, to discuss what pre-imaging work needs to be completed, and to cover follow-up/clean-up area (extremely critical when working in public buildings, i.e. hospital, schools, nursing homes). Since MRES bills only for on-site time, the customer is well aware of what their bill will be based on, which protects them from hidden costs.
2. During the shoot, the maintenance staff, management staff, or the electrical contactor is shown areas of serious or critical concern and a special directory is saved with images of problems that could require immediate attention. MRES saves these images in a separate directory because, upon completion of the daily activity, a quick report is processed detailing areas that may need immediate maintenance attention before the full report is completed and delivered.
3. When the full analysis and report are completed, an MRES or utility representative will deliver the printed report and CD-ROM report to the customer and/or electrical contractor. They will review in detail the process used in determining problems, cover all of the report findings, and answer questions.
4. For any problem found that is graded as being serious or critical, MRES has committed to a NO COST revisit and re-shoot of the item in question, after maintenance or repair has been completed. This last step is very important for both safety and insurance underwriting.

CUSTOMER ACCEPTANCE AND USE OF THE PROGRAM

Most of the end-use customers of MRES members are trying to develop an active predictive maintenance (PM) program. The first step that many customers have taken in developing a PM program has been to utilize the MRES Infrared Inspection Program. Insurance carriers have required some customers to conduct an audit, while others decide to use infrared services because they can easily see the cost benefit of the program. After the infrared report has been presented and problems pinpointed, many customers have commented that the IR findings have helped them diagnose a recurring problem and after that initial audit, subsequent annual audits are common place. MRES' repeat business rate is growing to the point that we may have to add additional staff to keep up with the demand of the program.

One industry that has focused on infrared as PM tool and fully utilizes the comprehensive reported provided by MRES is the ethanol production industry. In some cases, MRES has been called to audit an ethanol plant's construction in the initial stages of start-up. Since ethanol plants are very intensive electrical and motor users that need very clean, reliable power, any electrical fault from the transformer to the motor could completely shut down production. Many of these plants have contracted complete IR audit services for as many as four times per year.

Figures 4 through 11 give some examples of what we have found with our IR thermography program. Figures 4 and 5 give examples of electric utility finds showing a "direct" knuckle joint and an "indirect" load break elbow problem. Figures 6 and 7 are industrial customer examples showing an overloaded neutral wire on a very old fuse panel and a hot outboard bearing on a boiler blower motor. Figures 8 and 9 give building envelope examples. The first is just a shot of a downtown roof area. The second shows some real problems in a home with insulation defects in both the sill and attic areas. Figure 10 shows the cold pattern on an air conditioning return air duct. Figure 11 is an example of industrial processes showing the temperature of chicken nuggets exiting the oven.

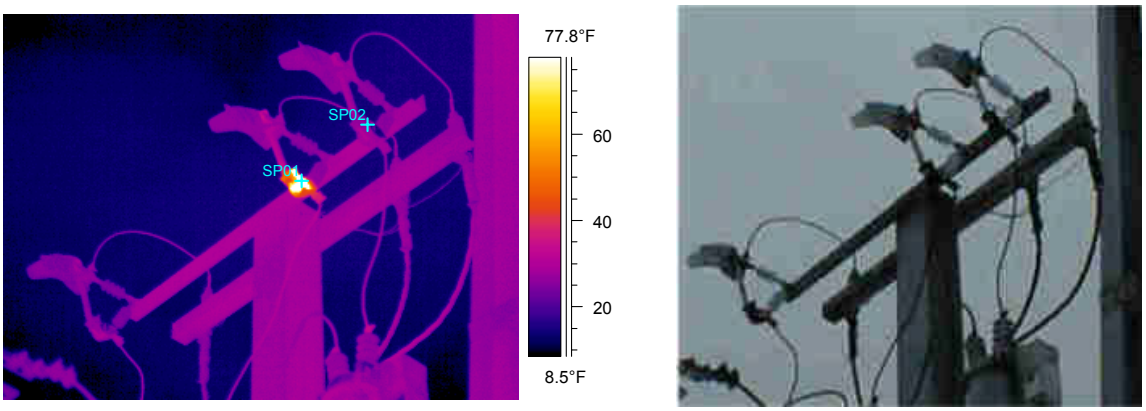

Figure 4. *Fused cutout on a riser pole hot lower swivel knuckle.*

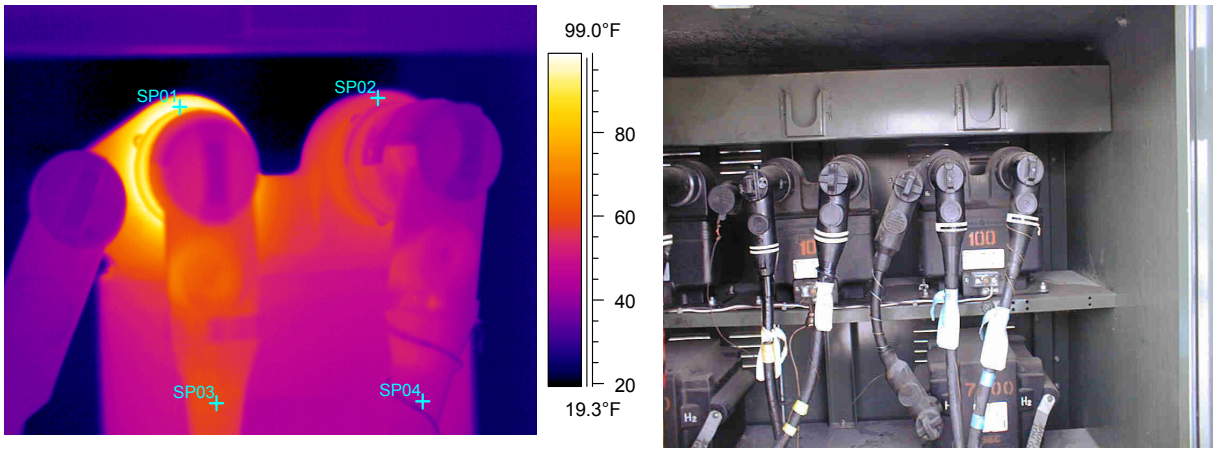

Figure 5. *Metering chamber on a transformer showing a hot lobe on load break elbow connector.*

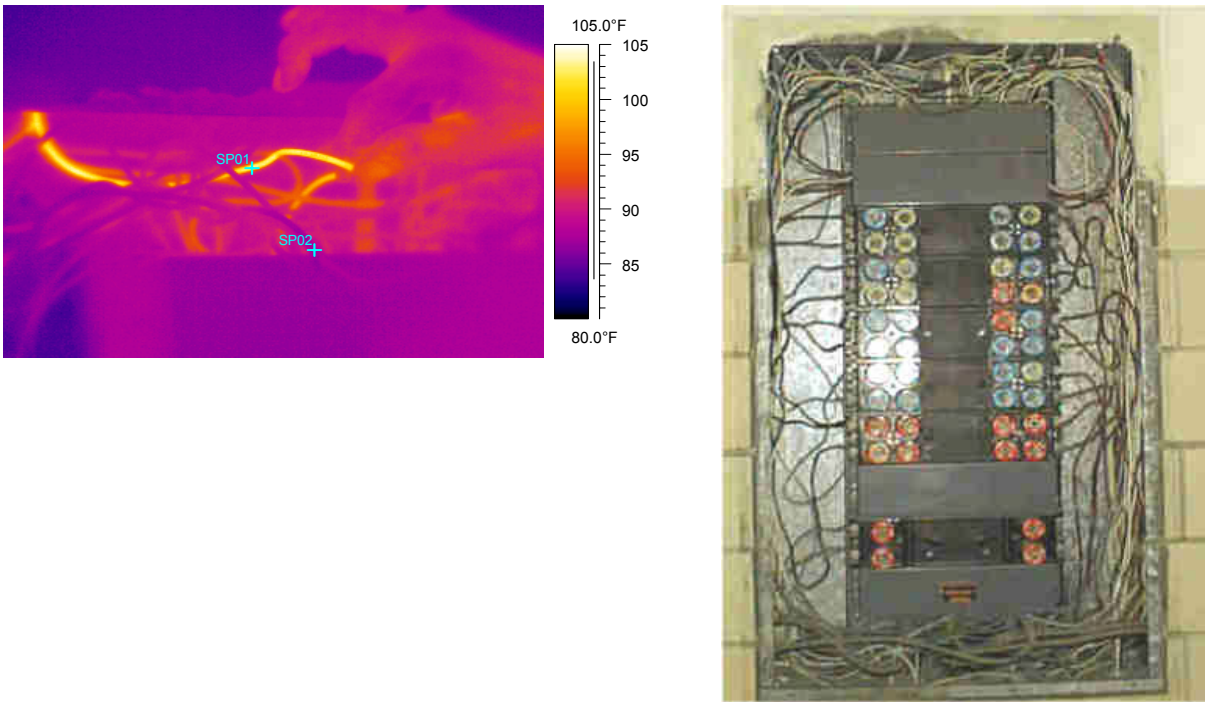

Figure 6. *Hot neutral wire in an old fuse panel due to undersizing.*

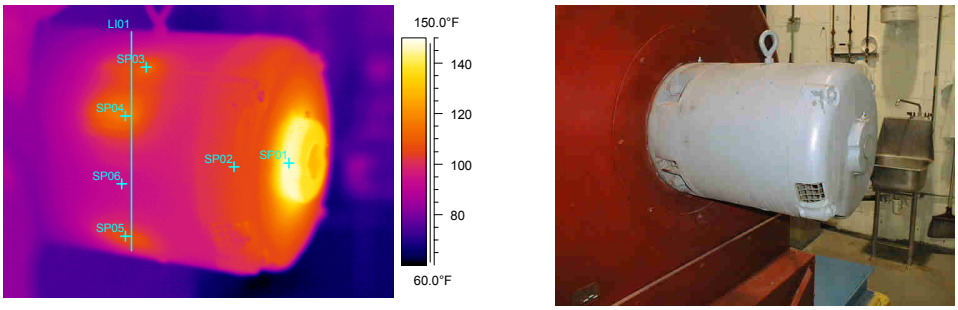

Figure 7. *Overheated outboard bearing on a 60 HP electric motor driving a boiler blower.*

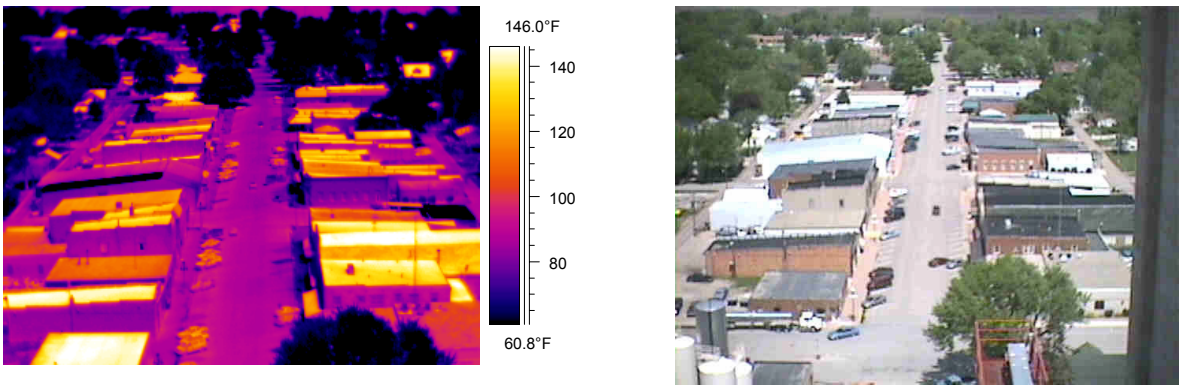

Figure 8. *Roof temperatures of downtown business district.*

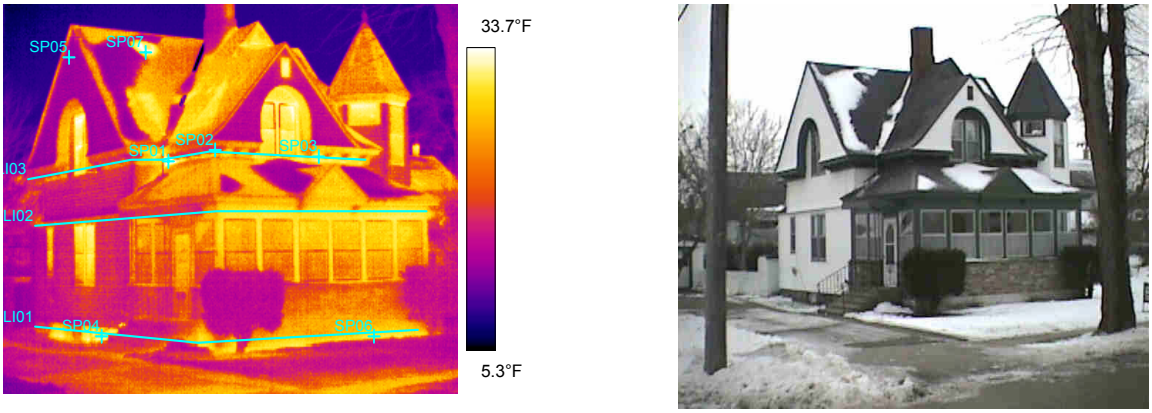

Figure 9. *Residential heat loss audit program example showing insulation problems around sill and in the roof.*

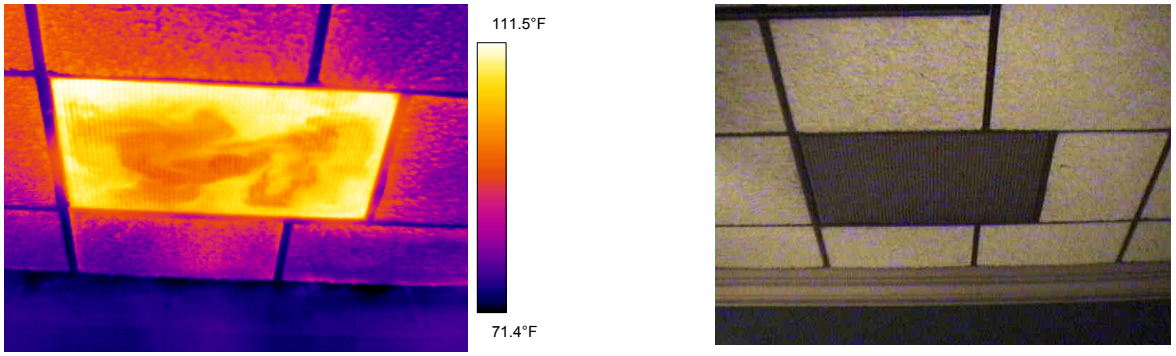

Figure 10. *Cold air return in meeting room.*

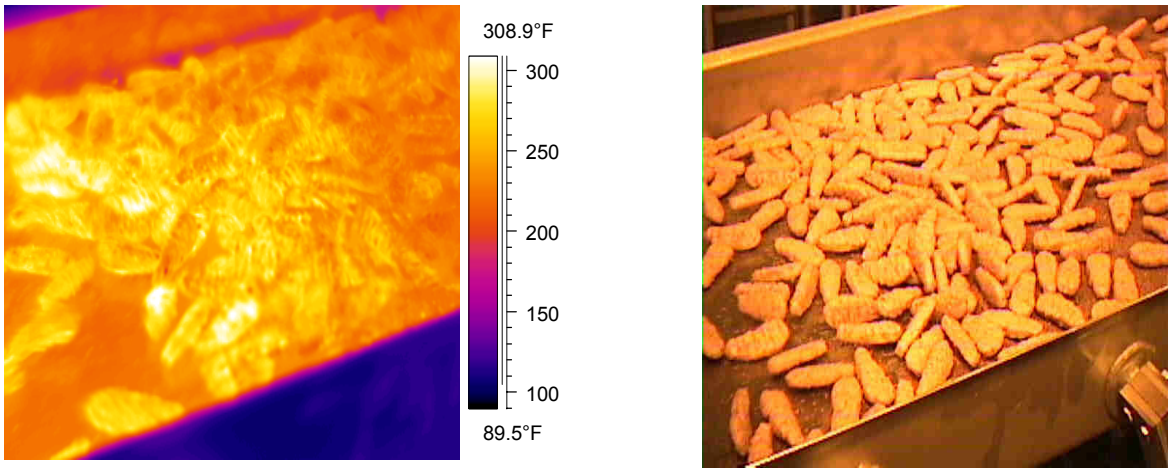

Figure 11. *Chicken nuggets exiting oven.*

WHAT WE HAVE LEARNED

Since MRES has a close relationship with members and customers, we have learned that there is a growing need for predictive maintenance even within the smaller businesses of the commercial/industrial group. MRES has found that in multiple cases, our customers have had in the past, or currently have, an infrared camera which is not being used due to lack of training, lack of personnel time, or lack of management willingness to allocate in-house time for predictive maintenance. They would simply rather pay an outside consultant for the time and expertise.

MRES has also found that virtually none of our customers have an active predictive maintenance program. The old school of thought that says “Why fix it if it’s not broke” needs to go by the wayside with new economic trends, but most customers have to be literally shut down before they will take action. They often see the need for a PM program, but they don’t have the time or resources to devote to it.

MRES has also learned that the more technologically advanced the business is, the more detailed our report needs to be. Robotics and computerized operations are becoming more common place in customer operations. MRES is slowly making changes in our reporting format to offer more specialized information and more detailed findings.

MRES has learned that we need to thermally show the operation of the equipment and let the customer’s technical staff read the findings. MRES has also taken the stance that we are not the electrical expert for the customer’s operation – the customer is! We don’t expect to know as much about the specialized piece of machinery as the customer, or even how it uses electricity, but we can accurately detail the heating patterns by using the FLIR PM695. By staying adequately trained, we can offer the customer a very valuable competitive service.

REFERENCES

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4. Minnesota Department of Commerce, 2001 Energy Planning Report.