ENERGY EFFICIENCY ENGINEERING LTD.

WHITE PAPER

Fired Appliance Approvals: Worth the Cost?

Safety legislation requiring fired appliance approval for the petroleum industry has been in force for many years but until now the cost vs benefit for approval has been prohibitive. With the advent of a new approval standard, standardized designs, new parts, and ENEFEN's proprietary approval process, only now is there a practical way to fulfill this obligation. The cost vs benefit balance has finally tipped in favour of safety.

Definitions

Approved – acceptable to the authority having jurisdiction.

The Cost vs Benefit balance has finally tipped

Authority Having Jurisdiction – the governmental body responsible for the enforcement of any part of a Code, or the official or agency designated by that body to exercise such a function.

Certified – with respect to any appliance, component, accessory, or equipment: investigated and identified by a designated testing organization as conforming to recognized standards, requirements or accepted test reports.

Code - any set of standards, regulations, or laws systematically arranged and enforced by a government agency for the protection of public health and safety

Component – an essential part of an appliance or equipment.

Fired Appliance – a device to convert gas into energy and includes any component, accessory, control, wiring, piping or tubing required to be part of the device.

Regulation – an order issued by government and having the force of law

Standard – a technical specification to be used consistently as a rule, guideline, or definition; standards help to ensure better, safer and more efficient methods and products

Standardization – the development and application of standards publications that establish accepted practices, technical requirements and terminologies for products, services and systems

Applicable Codes, Standards & Regulations

Code/Standard	Purpose
SCC CAN-P-1608 Appendix C Additional Requirements for the Accreditation of Inspection Bodies 2010	This version of the standard requires commercial and industrial gas-fired appliance inspectors to be competent Professional Engineers, with appropriate technical skills for different types of inspections
Alberta Safety Codes Act Chapter S-1 2007	Specifies the responsibilities of owners, designers, manufacturers, contractors and vendors Specifies the penalties for non-conformance
Alberta Regulation 111/2010 Gas Code Regulation 2010	States that gas equipment must be inspected and accepted by an inspection body accredited by the SCC
AMA VAR-GAS-05-05 [rev 2] Gas Safety Variance June 20, 2008	Designs and entire site specific installations authorized by a Professional Engineer may be accepted by a safety codes officer for one-of-a-kind systems
BC Regulation 134/2009 Gas Safety Regulation April 1, 2009	Ensure gas installations are safe and gas is used in a safe manner Regulates natural gas and propane installations
Saskatchewan Regulation 46/2008 Gas Inspection Regulation 2008	
CAN/CSA B149.1-10 Natural Gas and Propane Installation Code 2010	Establishes essential requirements and minimum standards for the installation of fired appliances Other safety devices may be necessary for specific applications Has been adopted by the Alberta Safety Codes Act
CAN/CSA B149.3-10 Code for the Field Approval of Fuel Related Components on Appliances and Equipment 2010	Guideline for good design practice Allows the on-site approval of one-of-a-kind fired appliances
CSA STD C22.1-06 Canadian Electric Code Part I 2006	Electrical safety for the installation and maintenance of electrical equipment Objective based criteria
CSA STD C22.2 No. 0-M91 General Requirements – Canadian Electric Code, Part II	Requirements for burner ignition systems and components

It is important to realize that the B149 codes are not laws or regulations. They are simply ***guidelines and best practices***. They are intended to convey good design practices and not to allow for all circumstances. Good engineering judgment must

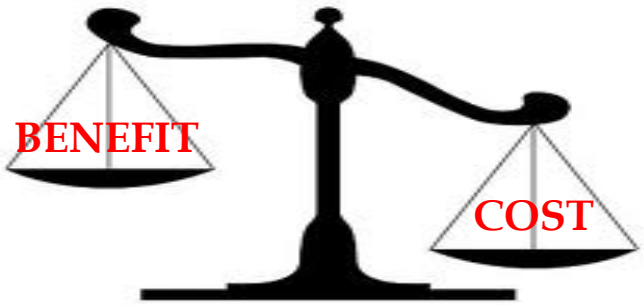
still be used when designing fired appliances, using the codes as a minimum requirement.

The problem with applying the B149.3 code in the petroleum industry is that it was originally developed for natural gas and propane fired boilers and simply does not (and can not) cover many of the special cases encountered with petroleum industry type appliances. So the only way to apply it to these special appliances and process requirements is to use ***engineering judgment, experience and common sense***. This requires trained and experienced professionals who understand the intent of the code, the inner workings of a specific appliance, and the process itself.

Those not qualified to work with the code could incorrectly choose not to apply it because, "this code is not applicable to what I am doing…" and therefore compromise the safety of an appliance.

The Old Approval System

The benefits did not justify the cost



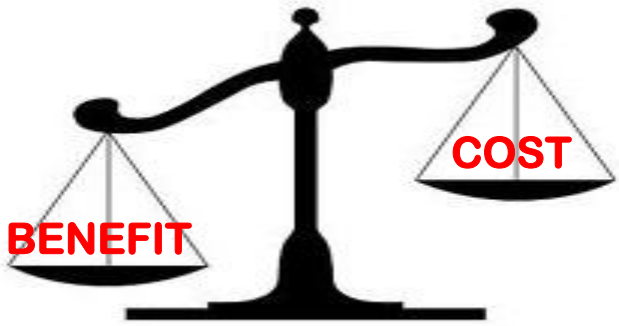
In the past an appliance operator would need to acquire approval via a ***custom*** (read expensive) process that did not necessarily include professionals with oil and gas experience. The system, process and components could be foreign to the inspector and therefore require extensive review to approve and ensure safety. Certification bodies did not necessarily have the required technical expertise, industry experience, process knowledge, testing equipment and infrastructure to perform the prescribed investigations. And then the results could be limited to the standards conformance of components rather than their inherent safety and suitability for the application.

The existing infrastructure of the certification bodies for one-of-a-kind fired appliance approvals is still almost non-existent and not set up to handle field approvals of uncertified appliances as stipulated by the codes. The cost and timing of such approvals is not acceptable to the petroleum industry.

The typical result of this expensive process would be a field approval that ensured safety of components but not necessarily of the whole system.

The New Approval System

Safety can now be on the proper side of the balance



A number of changes and advancements have happened in the past few years that allow ENEFEN to provide evaluations and field approvals of fired appliances with not just low cost, but potential benefits that could mean savings well in excess of approval cost. When the fuel reduction, operation, maintenance, and reliability benefits of our services are factored in clients typically start realizing savings immediately. Results vary but a poorly performing appliance can provide a quick payback.

Perhaps the most significant change is that the Standards Council of Canada (SCC) recently revised the Inspection Body (IB) inspector requirement for commercial and industrial gas-fired appliances. It is now mandatory for inspectors to be "registered professional engineers who are competent in the design, operation and safety inspection of commercial and industrial gas-fired appliances and equipment, as determined by the governing engineering regulatory association". It goes on to say that, "The IB shall ensure that its inspectors demonstrate ability to apply knowledge and skills of inspection principles, procedures and techniques, to enable the inspector to apply those appropriate to different inspections and ensure that all inspections are conducted in a consistent and systematic manner." ENEFEN inspectors meet these criteria and are as comfortable with the standards as they are with actually operating and tuning your equipment. ENEFEN is currently in the process of becoming a Canada-wide accredited IB.

The Alberta Gas Safety Code requires that, "No person shall manufacture, install, sell or offer for sale any equipment related to gas systems for us in Alberta unless the equipment has been… inspected and accepted by a certification body accredited by the SCC…" ENEFEN expects to be accredited soon, however in the meantime we have "accreditation" from AMA in the form of a letter of acceptance stating that our methods and process for field approvals are acceptable. We have been authorized to inspect and accept in Alberta for over five years now.

Standardized = streamlined = lower cost

For new systems or upgrades ENEFEN now offers a ***standardized*** option to reduce cost. Using one of our ***design codes*** for specific applications the entire evaluation and field approval process is streamlined. Each design code is fully

compliant with all relevant codes and standards so no engineering and design time is required. They include up-to-date certified parts, the best proven parts for the application, and many safety and cost considerations from years of experience working with the B149 codes.

All approvals are processed quickly with our ***proprietary software*** and full, detailed reports are generated for each project, as per the SCC requirements. Reports include all site, client, appliance, installation, and stack gas analysis information, as well as project drawings and component manuals. A wealth of fired appliance knowledge has been captured in the software to offer extensive and practical analysis and results at a reasonable price. We have used this proven tool for more than five years and continue to expand its capabilities to reduce analysis and report processing time.

ENEFEN projects all include operation and functional testing. We perform stack gas analyses with quality equipment to measure and record critical data and identify problem areas. Fuel savings from tuning alone can quickly pay the approval cost.

Tangible Benefits of the ENEFEN Process

Low cost, extensive results

The outcome of our standardized approach, our practical data collection, and our knowledge and experience with fired heaters and the B149 codes, is high quality, reliable results and certified approvals for typically ***less than $2,000.00 per project***.

In addition to receiving an approval for operation, the minimum requirement by law, the cost also includes recommendations for standards conformance and basic appliance adjustments to increase performance. These adjustments will start saving fuel immediately.

Beyond adjustments ENEFEN also has an EfficiencyGram product that can be offered at a reduced cost with an approval. This is a more rigorous evaluation of appliance performance using data monitoring to gain a better understanding of the actual longer term operation over a period of hours or days. The EfficiencyGram report may include significant and costly upgrade recommendations, but the benefits can also be significant:

1. Reduced fuel usage and GHG emissions
2. Reduced operation time and more consistent performance
3. Reduced maintenance time including costly trips to remote sites
4. Increased reliability and lower long term replacement part cost

Long term, aggregate thinking will convince shareholders

Taking a longer term approach as shown on the charts below, the savings can be seen to add up quickly. Looking at aggregate numbers of multiple appliances will reveal a cumulative payback that shareholders will start to relate to.

These examples show the cumulative payback for a 0.75 MM Btu/hr oil storage heater, the most common fired appliance. Figure 1 with only a 5% efficiency gain is achievable for most appliances with the basic tuning we would include with an approval. Figure 2 with a 15% efficiency gain can happen sometimes with basic tuning but is more often the result of more significant system changes.

Figure 1

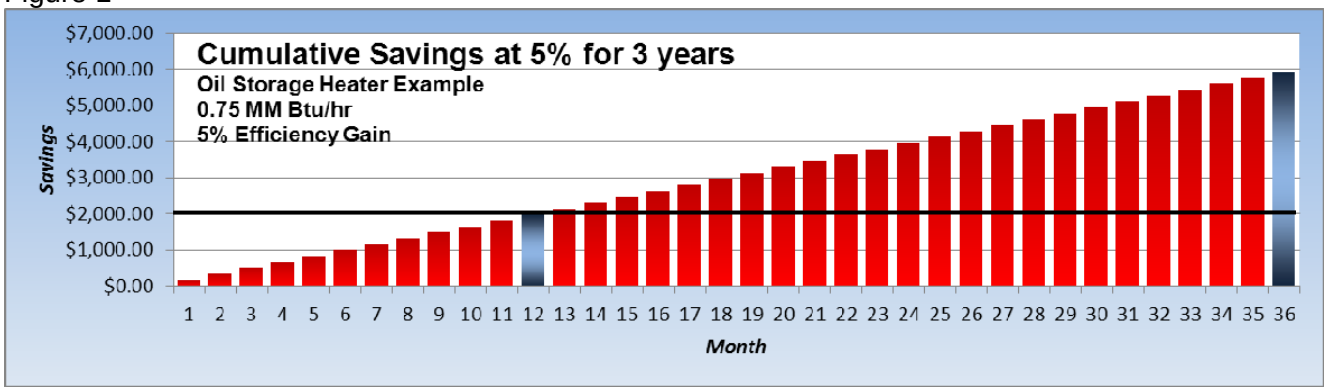
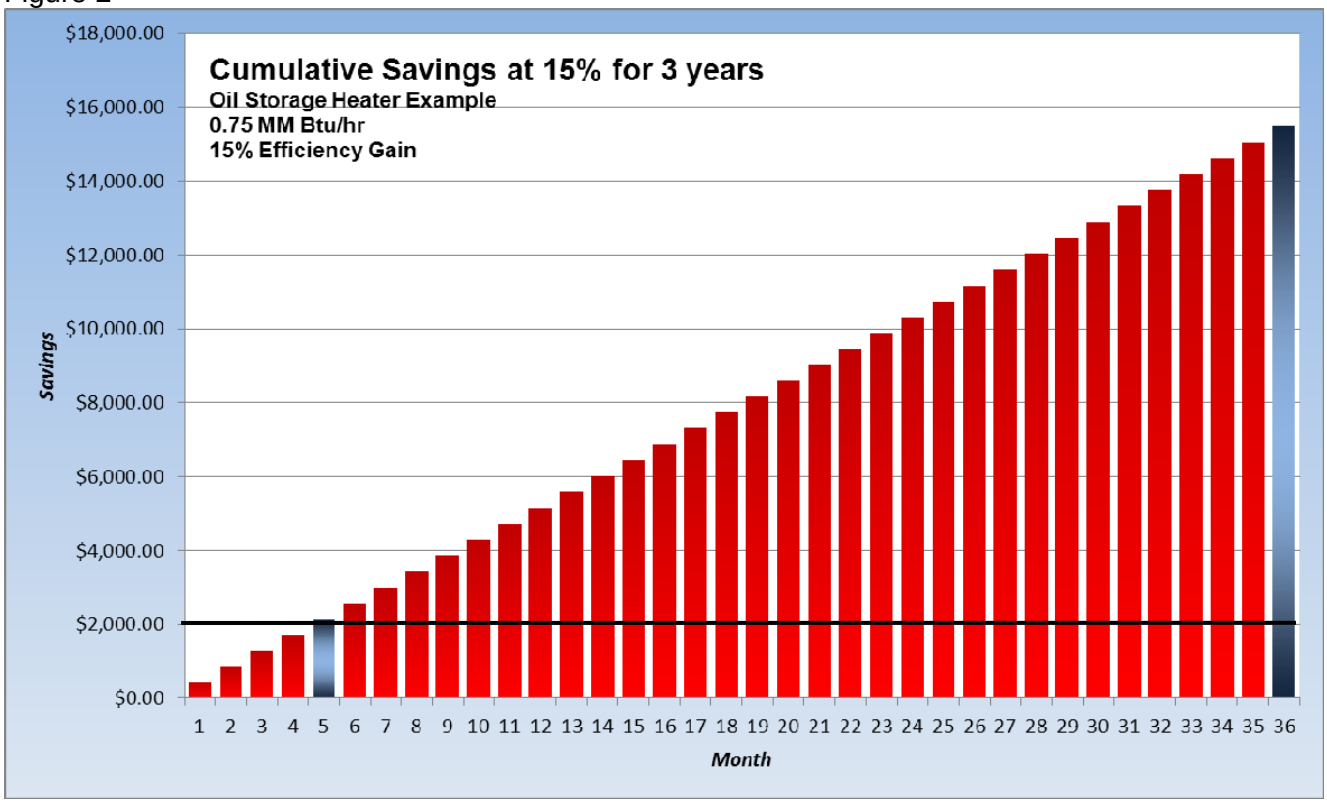


Figure 2



The Risk of Non-Compliance

There are penalties for non-compliance

All fired appliances in Canada which are not approved carry with them a risk to the owner. Receiving a fine or jail term for non-compliance is the least potential cost. The real liability is in the ***increased risk of accident due to safety issues***. Injury, death, or the perception of poor safety can have a much greater impact on a company and its shareholders. One only has to look at recent refinery and oil rig incidents to see the effects of one failed part that was not suitable for the intended service.

If standards exist and the government can show that they are enforced through inspections, fines, and other methods, then the liability is shifted from the government to the corporation. And within the corporation it is the engineers who are responsible for upholding the law and using applicable standards.

Codes, standards, and legislation are put in place for a reason. Fired appliance owners must ***focus on the benefits*** of compliance rather than the cost. There is now no reason not to comply with the law.

If you have any questions about evaluations or approvals please visit our website at www.enefen.com or call us in Edmonton, Alberta, Canada: 780-940-3464.