Insulation, the Forgotten Technology for Energy Conservation and Emission Reduction

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ABSTRACT

This is the story of how mechanical insulation can improve your business and benefit the economy and the environment. You may think you have heard this story before, but now you can get the "rest of the story." Insulation is the "Rodney Dangerfield" of energy conservation and emission reduction initiatives. Did you know that insulation is applied but rarely engineered? Did you know that it is estimated that between 10% and 30% of all installed mechanical insulation is damaged or missing? This paper, and corresponding presentation at ACEEE's 2009 Summer Study on Energy Efficiency, provides evidence as to the "Power of Insulation" in the new construction, expansion and maintenance arenas when designed, installed and maintained properly, including an overview of the most comprehensive mechanical insulation resource that has been developed in decades.

Insulation can reduce energy consumption and greenhouse gas emissions; increase your available carbon credits, be an important part of sustainable design initiatives, be part of your safety program, increase manufacturing productivity; eliminate or at minimum reduce corrosion under insulation, control condensation and mold growth and provide an unrivaled return on your investment. So why is it a "Forgotten Technology"? Usually what sounds too good to be true, isn't. That is not true in this case. You need to get the "rest of the story. Insulation may be the best example of *"Moving Investment Decisions to Energy-Efficient Solutions"*.

Introduction

Mechanical insulation from an energy savings investment perspective in industrial and commercial applications although important to facility operations and manufacturing processes is often overlooked and undervalued. For a variety of reasons the knowledge base of mechanical insulation has eroded over the last ten – fifteen years. Combine that with insulation being taken for granted as to providing a simple one time pay back and you have identified the problem. This paper will explore this subject and provide evidence; processes and resources for de-mystifying this proven but often forgotten energy savings and emission reduction technology, simply known as insulation. With today's and tomorrow's cost of energy, our dependency on foreign energy sources, our renewed focus on the environment, and the importance of job preservation and creation in our economy there has never been a more important time to think about insulation differently.

Defining Mechanical Insulation

The scope of this paper focuses upon "Mechanical Insulation Systems" that are utilized for piping, equipment, vessels, ducts, boilers and other similar mechanical equipment and piping

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applications in industrial and building – commercial applications. Or said another way, "Mechanical Insulation Systems" shall be defined to encompass all thermal, acoustical and personnel safety requirements in:

a) Mechanical piping and equipment, hot and cold, applications
b) Heating, Venting & Air Conditioning (HVAC) applications
c) Refrigeration and other low temperature piping and equipment applications

Where Is the Knowledge Base?

The knowledge base of mechanical insulation systems at the engineering, architectural, and facility owner level has, in most cases, decreased over the last ten - fifteen years. The root cause can be summarized by a combination of attrition, right sizing and multi-tasking. In addition, insulation is not a field that is attracting specialization in the engineering, architectural or maintenance arenas. Mechanical insulation does not have the bells and whistles, computer chips etc. of many other technologies. This reduced knowledge base has led to the improper and under utilization of mechanical insulation in many applications.

Mechanical insulation although important to facility operations and manufacturing processes is often overlooked and undervalued. National standards, universal energy policies or generally accepted recommendations as to what should be insulated, what insulation systems are acceptable for a specific use and application best practices do not currently exist.

Development of mechanical insulation specifications or the selection of an insulation system is normally influenced by past practices or by the most knowledgeable person(s) in the decision chain or industry segment included in the design – selection process.

Past practices and knowledge? – Those topics produce several fundamental questions.

- Were past practices correct – did the insulation system perform to expectations; were conditions like the cost of energy different five, ten or twenty years ago verses today, or tomorrow, and are there new technologies or approaches that should be considered and
- Where can someone obtain unbiased information on what should be considered in designing, selecting, specifying, installing and maintaining an insulation system?

Many, maybe most, engineering and architectural courses contain maybe one hour, if that, on thermal - mechanical insulation; the knowledge base in many engineering, architectural and facility owner firms has eroded and the insulation manufacturers who for years were the educators of the industry have for a multitude of reasons dramatically reduced their in person communication and education efforts, they have "less feet on the street".

Combine all of these and you find mechanical insulation is applied but rarely "engineered". With the best intentions, but not necessarily with thorough knowledge, many specifications have evolved over the years primarily based upon modification of old documents. This practice combined with the lack of mechanical insulation educational and awareness programs as to the value in having a properly engineered, installed and maintained mechanical insulation system has led to the underutilization of mechanical insulation.

There are several mechanical insulation resources (ASHRAE; Midwest Insulation Contractors Association; Process Industry Practices, etc) and excellent "guide specifications," "handbooks," "standards," "practices" etc that are and have been available for years. However,

the effective use of those resources is based upon the premise that the user is aware of them, has access to them and has some level of knowledge of mechanical insulation systems. That assumption may not always be correct.

The National Institute of Building Sciences (NIBS), in June 2005 formed the National Mechanical Insulation Committee (NMIC) for Building and Industrial Applications to bring together major governmental agencies, private industry and organizations that are concerned with the design, installation and maintenance of mechanical insulation systems. NIBS and NMIC offer the opportunity for a constructive public and private partnership in the examination of topics related to mechanical insulation and providing education as to their findings and the merits and value of properly engineering, applying and maintaining mechanical insulation systems.

NIBS was authorized by the U.S. Congress in the Housing and Community Development Act of 1974. NIBS is an non-profit, non-government organization bringing together representatives of government, the professions, industry, labor and consumer interest to focus on the identification and resolution of problems and potential problems that hamper the safe, affordable structures for housing, commerce and industry throughout the United States. NIBS brings together expertise from the public and private sectors to identify and resolve issues affecting the building process and to assure that no single interest area will dominate or hold undue influence over NIBS and its work and assures the maintenance and free exchange of information.

Recognizing the problems related to the lack of knowledge with mechanical insulation the Committee's first initiative was the development and continual updating of an internet based Mechanical Insulation Design Guide (MIDG), available through the NIBS Whole Building Design Guide, www.wbdg.org/midg on a no cost basis to all users.

MIDG is not another general "Guide Specification." It is a comprehensive "decision tree" one-stop knowledge resource to assist the novice or the experienced or knowledgeable user in the design, selection, specification, installation and maintenance of mechanical insulation systems. It also includes a series of "on-line calculators" related to energy conservation, emission reduction and other engineering requirements. MIDG was launched in January 2008 and is the most comprehensive resource that has been developed for mechanical insulation in decades.

Energy Conservation Investment

The most widely recognized and proven benefit of mechanical insulation is energy conservation yet it is often the "forgotten technology". This paper will examine why mechanical insulation as an energy investment should be a priority, especially if you are interested in moving investment decisions to energy-efficient solutions and often obtaining an unparalleled return on your investment.

Insulation is the "Rodney Dangerfield" of the construction industry – it gets very little respect and is taken for granted. When designed, applied and maintained properly, insulation is a powerful technology — one that provides long lasting benefits. However, insulation is often overlooked or relegated to the bottom of the list and ignored. One reason may be that insulation systems have no moving parts, no bells and whistles, no computer chips, or fancy gauges — and certainly is not sexy. This technology is not some mysterious myth. The principles of insulation are simple and not necessarily revolutionary – possibly another reason why it is often overlooked. However, the bottom line is that insulation can provide in many cases an annual return on investment of greater than 100%. With energy efficiency and conservation and the

reduction of greenhouse gas emissions, and job creation/preservation being priorities in today's world, maybe it's time to begin thinking about this underutilized, under-valued and under-appreciated technology differently.

Energy is often one of the most costly components of operating any building or manufacturing facility and its processes. A reduction in energy consumption reduces cost. Without exception, this is a continual objective of most companies. It may not be at the top of the list, but certainly within the top ten of corporate initiatives, along with safety, quality, shareholder value, and the environment. While insulation can be one of the easiest, fastest and least costly "technologies" to reduce energy cost, it is often the last option considered.

Energy Conservation Seldom a Design Criteria

It is interesting to review the process for determining the design criteria for insulation on new construction or expansion projects verses the maintenance process and how priorities are established. In new construction, the primary driver in determining the insulation system is the process. Very seldom is the insulation system or thicknesses examined from a current energy conservation perspective and considering projected future energy cost over the next 10-20 years is basically not considered. Once a facility or plant is operating and the energy consumed is a reality, as opposed to a theory, it seems that complacency or acceptance of the results outweighs examining actual results in comparison to original expectations. Properly and timely maintaining an insulation system seems to be mostly reactionary verses proactive. That is not the correct formula for obtaining the best operating performance, providing a safe working environment, maximizing your return on investment etc.

The cost of energy has dramatically increased over the last ten years, yet there is very little serious discussion being given to upgrading insulation thicknesses that were designed and installed when oil was $25 barrel. When the cost of a barrel of oil was $147 in mid-2008 and gas at the pump cost was approaching, and in some places exceeding, $4.00 a gallon, all you heard was the need to explore alternative energy sources, expanding drilling operations and the need to conserve energy. Now with a barrel of oil at $50 and gas in many places below $2.25 the loud voices seem to be a distant memory. We have been here before. Reducing the focus and commitment to explore and implement all forms of increased energy production, efficiency and conservation is a mistake. While everyone is enjoying the current benefits of the low cost of oil history has proven that similar events have reduced the focus on the bigger problem. Many are forecasting the cost of a barrel of oil will return, for a variety of reasons, to $90-$100 a barrel, or potentially higher. This same scenario has played out before.

It is always been puzzling as to why the need for energy conservation and efficiency, especially within the industrial and commercial market segments, has not lead off the news cast in lieu of being delegated to sidebar comments. Energy conservation-efficiency is not the sole solution to our current or future energy demands. But, if energy conservation-efficiency is not a high priority with new construction designs and within existing buildings and manufacturing – plant facilities and processes will that not foster similar behavior in the future? And, isn't conservation and efficiency the faster means to deliver results now thus providing time for the technologies of the future to develop?

There are literally hundreds of energy conservation initiatives being offered across all market segments. Some are very beneficial while some appear to contain a little bit of smoke and mirror calculations. Where does mechanical insulation fit? The value of insulation for energy

conservation and efficiency has been proven for decades yet it is more often than not overlooked for the fancy initiatives containing bells and whistle, shiny moving parts, etc with a longer pay back period.

In addition it has been estimated that between 10 – 30% of all installed mechanical insulation is either damaged or missing. That is a big number – even if you discount it by 50%. The question that must be asked is, why are companies not upgrading insulation thicknesses to reflect today's and tomorrow's cost of energy and allowing missing or damaged insulation to exist when both situations can be corrected and provide a significant return on the capital employed or maintenance dollars expended?

Return on Investment (ROI)

The return on investment with an insulation initiative often exceeds expectations. Many times the return is less than a year. It can provide a faster return than many of the fancier and more visible energy efficiency investments. In today's competitive and shareholder-driven bottom line world, insulation can make a difference. But, it is not normally a Board Room discussion. Maybe it should be? Was your insulation system designed for 1959, 1979 or 2009? And with the most recent trends, are you planning for the cost of energy in 2019? – You may be missing a significant investment – return on investment (ROI) opportunity.

Examples of energy inefficiency can be found within the Department of Energy (DOE) – Industrial Technologies, "Save Energy Now" (SEN) Program. (www.eere.energy.gov. industry/saveenergynow. The program is part of a national campaign by the DOE to help manufacturing – industrial facilities reduce energy and operating costs and operate more efficiently and profitably. Independent specialists who have been trained in the utilization of sophisticated software assessment tools and have passed a rigorous qualifying exam, visit a plant and work with personnel to identify immediate and long-term opportunities for improving energy efficiency and bottom-line results. Mechanical insulation is one of the many opportunities that are examined.

Of the SEN assessment studies, published and reviewed to date, over 50% have identified replacing, repairing and upgrading the mechanical insulation as an opportunity of which 80% have estimated a simple return on investment in less than a year. Annual dollar savings in some studies were approaching $1,000,000 and many exhibited returns in less than 4 months. These third party – impartial assessments confirm the 10-30% missing/damage estimates and the return on investment opportunity. Following are a few of SEN findings:

GOODYEAR Union City, TN
***A** significant number of process units are partially insulation* Potential savings = $402,000 per year. Estimated cost to insulateranges between $80 - $200,000 = payback in 2 – 5 months.

MITTAL STEEL, Weirton, WV
Hot water washing tanks are located throughout the facility, 50,000 SF of surface area. The surface temperature of these tanks is 140° F. Assuming ½ the heat loss can be saved with an inexpensive – simple insulation system, the annual savings would be $371,000 + per year

Examples like these can be found across all industries, large, medium and small, from power generation to manufacturing to food processing and in below and above ambient applications. You need only to examine your own facilities and begin to think about insulation differently to find an opportunity to increase profitability year after year while decreasing our dependency on foreign energy sources, improving our environment by the reduction of greenhouse gases, creating or preserving jobs and helping our economy recover. Sounds like a pretty good formula

Extrapolation of the SEN Data

The National Insulation Association (NIA), a long time partner with the ITP, asked to work with them and the Oak Ridge National Laboratory (ORNL) team to mine the findings related to mechanical insulation and to extrapolate that data across the universe of plants included within the focus of the ITP assessments.

The objective was to determine the total potential of energy savings, greenhouse gas emissions and job creation within the plant universe focused upon by the ITP – SEN.

Analysis Approach:

- The plants were segregated into three size categories:
  - Large Plants – using > 500 BBtu/yr upon which the assessments were conducted by the independent assessors approved within the SEN program. The Power – Utility industry segment was not included with the scope of the assessments.
  - Medium Plants – using 26 – 500 BBtu/yr upon which the assessments were conducted by the ITP's Industrial Assessment Centers (IAC)
  - Small Plants – using < 26 BBtu/yr were not included within the scope of the ITP assessments
- The numbers of plants by the size categories were determined from the 2002 Energy Information Administration – Manufacturing Energy Consumption Survey (EIA-MECS). Those respective plants were then subdivided into two areas, the plant categories or type that included within the focus of the ITP assessments and those that were not. (Apparel, Leather and Allied Products, Printing, and Furniture) Following is a summary of those findings:

Plant Size	Number Plants included within Assessment Scope	Remaining Number of Plants	Total Plants
Large >500 BBtu/yr	2,765	1,249	4,014
Medium 26-500 BBtu/yr	77,413	34,985	112,398
Small <26 BBtu/yr	n/a	84,298	84,298
Total	80,178	120,532	200,710

- The assessment results were than simply extrapolated to the total number of plants within the large and medium size categories

Additional Calculation Information:

- Utilizing the estimated payback period (months) in comparison to the energy saving dollars an "Estimated Insulation Contract Value" was determined. Utilizing the "Estimated Insulation Contract Value" and the estimated annual man year) contract value that on average can be generated by a field insulation mechanic the estimated number of jobs that potentially could be created was developed including downstream distribution related jobs

Plant Size Large > 500 BBtu/yr Medium 26-500 BBtu/yr Small < 26 Bbtu/yr	Energy Savings Billions ($) /year	CO_2 Reduction Billion Lbs/yr	Payback (Months) ROI (*) (20 yrs)	Jobs (*) Created Preserved
Large/Medium	**> $ 1.9**	**> 45.6**	**12.0/ 103%**	**12,069**
Small (*)	**> $ 0.6**	**> 15.9**	**9.6 / 135%**	**2,930**
Total	**> $ 2.5**	**> 61.5**	**11.3 / 109%**	**14,999**
Distribution (*)				**1,533**
Total	**> $ 2.5**	**> 61.5**	**11.3 / 109%**	**16,532**

*Estimated by National Insulation Association

Assessments Use 3E Plus® Software

The "Save Energy Now" program assessment specialists use the 3E Plus® software program to analyze mechanical insulation. 3E Plus® is specifically designed to help the user understand and quantify the effects and benefits of insulation vs. bare surfaces. The "3E" part of the 3E Plus® name is an acronym for Energy, Environment and Economics, the three major features of the program that was developed by the North American Insulation Manufacturers Association (NAIMA). The 3E Plus® Software Program can be downloaded free of charge at www.pipeinsulation.org. Or visit the Mechanical Insulation Design Guide, www.wbdg.org/midg and use the "on-line" energy – emission calculator, entitled Rate of Return on Investment & Emission Reduction contained with the Design Objective – Energy Conservation Section

"Simple Payback" Is Not the Only Return Consideration

In today's business environment "simple" payback calculations are not the only measure for determining the return on investment. The time value of money and the increase in positive cash flow are also important items to be considered. "Simple" return on investment calculations should be expanded to include the financial impact of: secondary benefits, life cycle costing, and return on investment, net present value and asset appreciation.

Analyzing and communicating the benefit of energy conservation initiatives, like an insulation energy management program, requires multiple levels of communication. Facility managers and engineers need to understand and endorse the initiatives and equally important so

does the CFO and CEO. Technical jargon, reams of specifications and engineering calculations may be of great interest to plant operations but will probably be boring to a CFO in minutes. CFOs are interested in the investment aspects the initiative and assume plant management and engineering have addressed the technical and practical application components.

Slight improvement in plant productivity and product quality may be as or more important than pure energy cost reduction. The conservative value of improved productivity, improve product quality, reduction is product losses or returns and reduction in production downtime should be considered. You need to perform the cost-benefit analysis of any proposed capital investment. The key word is of course "investment" since a properly designed and installed insulation system is an investment and not an expense. This concept is the same regardless whether you place the investment within an Operating Budget or Capital Budget

"Simple Payback" is a simple measure of the time it takes to recover capital spent on an investment. For example, if $150,000 in insulation upgrades reduces production or operating – energy costs by $25,000 a month, the payback period is six months. As a basic measure of investment attractiveness, the payback period tends to be most compelling when the period is relatively short. Simple payback periods do not reflect the value of the cost savings over time. Some people fail to consider that the savings from an insulation project represents permanent savings over an effective life time of X years.

A variation of a simple payback period which provides the annual return from the investment is referred to as the return on investment percentage or ROI. The ROI on the "Simple Payback" example previously discussed is 200%. Sign me up – where do I invest? However, the ROI is greater because determining the ROI simply from the payback period ignores the time value of money.

Net Present Value (NPV) is a method of evaluating the profitability of an investment over the long-term. By recognizing the time value of money and equating dollars from different years, net present value makes it possible to evaluate the value of long-term investments. Mechanical insulation, as are many if not all energy efficiency initiatives, is a long-term investment.

If a company believes it can get 15% ROI, often referred to as the hurdle rate, for its money then the energy savings initiative must beat that ROI to be seriously considered. Cash investments generally occur at the beginning of the project and the savings occur in future periods. Therefore the NPV calculation discounts the future cash flow since the company does not have it today. If the NPV from your insulation initiative beats the hurdle rate, than it should be considered. While the length of the analysis may vary from company to company the NPV basics do not change. There are several components to this calculation therefore it is helpful to determine your company's NPV discount rate, method of calculation and hurdle rate before presenting the financial analysis on any energy conservation initiative. If the simple payback calculation is any indication, an investment in mechanical insulation may easily exceed even the highest hurdle rates.

The US EPA / DOE EnergyStar program offers many software tools including Excel files to analyze the financial value of proposed energy related improvements. The free EPA / DOE tools include:

CALCULATOR	URL
CFO	http://www.energystar.gov/ia/business/cfo_calculator.xls
Financial Value	http://www.energystar.gov/ia/business/financial_value_calculator.xls
Cash Flow Opportunity	http://www.energystar.gov/ia/business/cfo_calculator.xls
Building UpGrade	http://www.energystar.gov/index.cfm?c=comm_real_estate.building_upgrade_value_calculator

Asset Appreciation

A large number of facility owners are interested in any project that improves the sustained long term profitability of their business. Reduced operating expenses, such as energy cost, equal better operating profit. The most interesting aspect of this bottom line improvement is that this cash flow is worth several multiples to the business. An extra $100,000 in cash flow could be worth six - ten times that amount to the value of the business. Properly designed, installed and maintained mechanical insulation can easily provide sustained increased long-term profitability. This has been proven time and time again across all industries.

The Bottom Line - Mechanical Insulation Is an Investment with Few Rivals

Energy conservation with the use of properly designed, installed and maintained mechanical insulation is simply a “low hanging fruit” opportunity that should not be overlooked. Said another way, it is an investment that may have few rivals from a return perspective.

Reduction of Greenhouse Gas Emissions

Congress and the new Administration are focused on improving energy efficiency in buildings as never before, and for good reason. Buildings are responsible for 40% of U.S. energy demand and all greenhouse gas emissions. Making efficiency gains in this area crucial if we are to markedly reduce America's energy consumption and effectively combat climate change. At the residential level, insulation is well understood for its efficiency benefits and widely used. However, the same cannot be said in the commercial and industrial segments, which together consume 2½ times more energy than homes, according to the Energy Information Administration

The reduction of direct or indirect fossil fuel energy consumption derived from the use of mechanical insulation in the commercial – building and industrial industry segments can substantially reduce the number of pounds of greenhouse gas emissions currently being released into the atmosphere. This benefit is not being considered in many applications. Why not? Many people do not relate the reduction of energy consumption to the reduction of greenhouse gas emissions. Again, while the building or commercial industry may currently being receiving a lot of press, the opportunity within the industrial sector to reduce greenhouse gas emissions and improve a company’s environment footprint is phenomenal on an individual company or cumulative basis.

Energy conservation and efficiency is a major component to protecting our environment. But, as long as greenhouse gases, carbon dioxide, can be omitted without penalty we will

probably continue with our historical harmful practices. The debate continues as to the need or value of federal regulations which would implement a formal carbon credit program (potentially "Cap and Trade") or impose a carbon tax. These methods are being explored, and in some cases implemented, by various state initiatives. History has proven that when United State businesses are incented or regulated to accomplish certain objectives, they proactively move forward. The United States can't solve the total climate change problem alone. We must work through all the appropriate international organizations to create and enforce global programs to effect change. At the same time we must be cautious not to put our products in a non-competitive position. That being said we should proceed cautiously but not delay in aggressively moving forward with emission reduction initiatives. Mechanical insulation can be a major contributor – if only we think about insulation differently.

How do you calculate this benefit into the return on investment or decision making process? The answer will vary, depending upon the facility, carbon credits if applicable, regulatory requirements etc. The 3E Plus® Program is an excellent tool for determining the impact that insulation can have on the reduction of greenhouse gas emissions. Using the same algorithms as those used for determining energy loss or gain, 3E Plus® allows the user to determine the impact that any repair or upgrade to an insulation system can have on the reduction of emissions if fossil fuels are used for the energy source. 3E Plus® calculates CO_2, NO_X and Carbon Equivalents (CE).

You read and hear many statistics as the value of new lighting systems for both energy conservation and the reduction of greenhouse gas emissions. The new lighting technologies are major contributors to energy conservation and accordingly emission reduction however, have you ever taken a simplistic view of how at one foot of pipe insulation would compare?

Insulation, is a better option than a light bulb?

Carbon Reduction Option	Energy Savings, MMBTU/yr
1 ft of insulation on 350°F pipe	14.4
1 car, 5% increase in mpg	3.7
1 compact florescent light bulb	0.9
1 ft of insulation on 180°F pipe	0.9
1 ft of insulation on 42°F pipe	0.6
1 tree	n/a

Is Insulation "Greener than Trees?"

Carbon Reduction Option	Lbs of CO_2 per Year
1 ft of insulation on 350°F pipe	2,308
1 car, 5% increase in mpg	570
1 compact florescent light bulb	130
1 ft of insulation on 180°F pipe	109
1 ft of insulation on 42°F pipe	88
1 tree	50

The Importance of Maintaining an Insulation System

One of the problems that exist in many industries is that insulation systems are not being maintained in a timely and proper manner. This is why, 10-30% of the installed mechanical

insulation systems are noted as being damaged or missing within a few years of initial installation. Example after example has shown this to be an area where insulation energy conservation initiatives can provide a significant return on investment.

Not maintaining an insulation system in a timely and correct manner could be problematic for a number of reasons. A damaged or failed insulation system can increase annual operating cost and life cycle cost verses the purpose for which they were intended:

- Increased energy consumption, greenhouse gas emissions and cost
- Increased production cost – lower throughput
- Corrosion under the insulation is decreasing the life of the substrate thus increasing life cycle and annual maintenance cost in multiple areas
- Deceasing the life of the heating, refrigeration and other equipment due to operational demands and the effect on the surrounding work area
- Creating unnecessary risk in multiple areas including employee and community safety and regulatory concerns.

When evaluating the many energy efficiency and conservation initiatives that are available you should consider all of these benefits or consequences in your short and or long-term return on investment calculations. If history is a gauge, an investment in mechanical insulation maintenance is a decision that if avoided or delayed could cost much more than the initial investment.

Barriers to Continuous Improvement with Mechanical Insulation

Even when the overwhelming evidence as to the investment return opportunity, not to mention the other benefits, available when implementing mechanical insulation energy conservation and emission reduction initiatives, it seems that barriers are always present. Following is a general listing of those barriers and areas to be avoided or addressed to be successful in implementing insulation improvement initiatives.

- Needs a "Champion" within the company and facility
  - Good or best practices in one unit/plant are not easily and widely diffused in organizations
- Lack of detailed knowledge on mechanical insulation systems
- Management – the decision makers need motivation to allocate attention and resources
  - A longer term financial model should be considered verses only examining short term results
  - Timely and effective insulation maintenance is an investment – not an expense. The damage or cost caused by reduced focus on mechanical insulation is often not identified
  - Slow uptake on energy savings projects and implementing technical or specification recommendations
- Energy is often not a line of specific accountability and not integrated with other business objectives
- Pressure from competing and often more "glamorous" initiatives

Summary

In order to take full advantage of this forgotten technology, simply know as mechanical insulation, it is essential to begin thinking differently about insulation and the value it can provide. While mechanical insulation is neither sexy, nor an exciting topic of discussion, it is a resource that, when all the benefits are considered, should prompt the question "Why haven't we thought of this before?"

Considering the data obtained in collaboration with DOE's Save Energy Now, and the many other benefits of mechanical insulation, it certainly appears the mechanical insulation is a prime example of *"Moving Investment Decisions to Energy-Efficient Solutions"*.

In today's economy there are not too many investments that can:

a. Reduce you energy consumption – reduce your cost while helping reduce our dependency on foreign energy sources;
b. Improve your environmental footprint while helping improve the environment for generations to come;
c. Create and preserve jobs with "shovel ready" projects which is a major component in the recovery of our economy and
d. You get a return on your investment normally in fewer two years, and many times in less than a year.

In any language that is a very desirable investment outcome.

There are educational programs, software tools and resources available to help explore the many benefits of mechanical insulation. An increased knowledge of mechanical insulation can provide, in many cases, an unrivalled opportunity in both the new construction, retrofit and maintenance arenas. There has never been a more important time to think about insulation differently.

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- Insulation Outlook, May/June 2008, Closing More Sales by Learning the Foreign Language of CFO's – Richard Lubinski, President of Think Energy Management. LLC
- Insulation Outlook, January 2009, Insulation: Greener Than Trees, by Christopher Crall

The U.S. Department of Energy - Industrial Technologies Program, Save Energy Now, Partner Results