



SOFTWARE
COPYWRITING
PROFESSIONAL COPY FOR PROFESSIONAL SOFTWARE

Information Packet

+1-575-347-1599

contact@softwarecopywriting.com

SoftwareCopywriting.com

www.linkedin.com/in/judtaylor

Table of Contents

Greetings!.....	2
Copywriting Project Procedures.....	5
Services and Estimated Investment.....	8
Getting to Know Jud.....	10
What Others Say About Me.....	11
Experience.....	13
B2B Writing Samples.....	15
Sample White Paper – Mjolnir Power Systems.....	16
Sample Case Study – Dabo Vatis.....	25
Sample Case Study – Blue Aardvark.....	29

Greetings!

I'm delighted by your interest, and I sincerely thank you for taking some time to read this letter and the accompanying information packet.

You likely requested or were sent this because you need a B2B copywriter who specializes in software and related services. No doubt you are looking for someone with proven experience writing case studies, white papers, or expository web content, and someone who understands the requirements of startup entrepreneurs or young businesses in software or related markets.

Whatever your reason for contacting me, you probably want to know more about me before you hire me to write for you. If we were having a face-to-face conversation, in your office or at some professional gathering, you'd ask me questions. I'll try to answer a few of those questions immediately.

What are your qualifications as a copywriter?

- I studied expository writing in college. I have written, in professional or volunteer capacities: combat orders during Operation Desert Storm,
- training materials for desert survival for Marines training at Twentynine Palms,
- software usage instructions for enterprise software,
- marketing (and other) reports for Coca-Cola Japan and Coca-Cola China,
- white papers and case studies for my startup software company,
- various legal agreements for that company, and
- introductory training materials for Lisp and Arduino.
- I have studied a number of courses produced and run by American Writers and Artists, Inc., the best source of training (and contacts) in copywriting.

Do you have experience in startups, software, or internet services?

My startup software company produced web content management software, and an application development platform, that could be used via PC's and mobile phones, and intelligently manage content in multiple languages. I also have managed custom development and integration for enterprise software for global companies.

What kinds of assignments do you handle?

I am currently concentrating on writing white papers and case studies to evangelize new technologies and successful instances of use.

Do you offer consulting services?

Yes. I can

- provide individual or serial articles,
- plan a series of case studies and white papers around your development efforts, sales, and implementations,
- review existing websites and make suggestions,
- produce training materials based on instructional design methods,
- deliver training to your company or customers, and
- discuss other requirements you might have.

What do your services cost?

My standard rates are listed on a separate Services and Estimated Investments sheet that should accompany this letter. The actual fee will be dependent upon the specific project but you will always know the investment up front.

Who are your clients, and what do they say about your services?

I have written, and successfully used, white papers and case studies for my own software startup.

My ability to distill and communicate complex technologies and their use is routinely highly praised by students of training sessions I provide. These sessions include introduction to advanced programming languages; introduction to, and use of microcontroller-based development hardware; and strategies for efficiently studying Japanese kanji.

I look forward to adding your kind words in updates to this letter.

How long will it take you to write my copy?

This varies, and depends on the specific type and scope of the project, your urgency, and the amount of other work that requires my professional attention.

After our initial consultation, I will be able to give you an estimate, and will be happy to keep you posted on the status of a project as it progresses.

If I am booked out for a while, I will let you know immediately in case your project is urgent and you need to find someone else. I may well be able to point you to another provider.

My goal is to be up-front and professional in every communication.

What happens if revisions are needed?

Revisions are normal and not a problem. We'll work together to understand your technology, product, or service; your customers; and your expectations. This will help me create effective copy for you. If you are not completely satisfied with the project, I will revise content to meet your specifications.

Up to two rounds of revisions are complimentary if requested within 30 days of my delivery to you of the "first final". If a project requires more than two rounds of revisions, or revisions are requested after 30 days, there may be an extra charge.

My goals are to provide work worthy of praise (I'd love to revise my Information Packet to include words from you), and to clearly explain benefits of innovative technologies, software, and services.

Who will own the copy and other content?

I will own the copy and other content for a project until that project is paid in full, after which, the copy and content will belong to you. I reserve the right to use the copy as a work sample, unless you specify, in writing for clarity, that I may not.

How do we get started?

Let's get in touch!

Once I hear from you, we'll set up a free 15- to 20-minute free consultation, so I can begin to understand your needs, and the scope of any project. The "Copywriting Project Procedures" section of the Information Packet that should accompany this letter explains how I normally work.

Please contact me so that we can discuss your needs and goals, and how I can best help you meet them!

George P. "Jud" Taylor IX

+1-575-347-1599

taylor@softwarecopywriting.com

Copywriting Project Procedures

This section describes how we can expect to work together to achieve your goals.

Initial Contact

Please contact me to let me know you are interested in discussing a project (or projects).

George P. "Jud" Taylor IX
+1-575-347-1599
taylor@softwarecopywriting.com

Discovery Questionnaire

Once I learn of interest in work, I will send, via email, an appropriate **Discovery Questionnaire**, to collect information that we will need to share in order to make sure a project is a success.

Answers to questions on that questionnaire will help us define the scope of your project, and to help me know more about you and your company. This will set us on the right track to achieving your business goals.

Please **answer the questions and return it to me as quickly** as possible.

It shouldn't take too long to complete; most clients return the form within one to three business days.

Launch Consultation

Once I receive the answered questionnaire, I will review it and build a short **Project Plan**, to help clarify requirements to all involved.

We will schedule a no-cost, 15 to 20 minute **Launch Consultation** 3 to 10 days after I have received the questionnaire. The agenda of the Launch Consultation will be the questionnaire and the project plan, and I will particularly listen to additional direction and insight you have about the project.

Investment and Start of Work

After the call, I will draft and send you a **Services Agreement**.

If your company or organization has a preferred Agreement, we can use that. This agreement will contain the specifics of your project, outline exactly what I will be delivering (including project deadlines), and list your investment for the project and terms of payment. (Please

note: I require 50% of the project total prior to commencement. Most clients prefer to pay via bank transfer.)

I will begin work on your project as soon as we have both signed the Agreement and 50% payment has cleared.

Communication During Project

As we start working together, it will be important to communicate quickly and well. The best way to contact me is via email, at taylor@softwarecopywriting.com. I respond to these emails within 24 hours.

Although email is best for most purposes, I can be reached +1-575-347-1599, weekdays from 8:30 AM until 5:30 PM Eastern Time, unless I am in a meeting or if talking on a phone would be dangerous.

If I do not answer, **please do leave a voicemail with your name and phone number**. I will return your call as soon as I can.

For longer scheduled calls, we can arrange a voice or video call, through Skype or other platform.

Project Research

Project research will help me understand your product, your voice, and, as relevant, your customer's core emotional purchase drivers. I will also work to discover your customer's buying process and identify their core needs and perspectives, so that you will be positioned as the best solution to those requirements. \

Research will begin with a review of your website, material provided by you, and other materials relevant to your project.

If required (as for case studies and white papers or special reports), I will interview key members of your team, and perhaps one or more of your customers.

As needed, I will reach out to you for any additional details, and other resources.

I will treat your information with appropriate care.

Collaboration

During the project, communication will be key. I appreciate that you will likely be very busy. Some clients like to have me work on their project and wait until I have completed the first draft, with very little communication until then. Others prefer a more hands-on approach, dealing with me on a daily or bi-weekly basis. I am happy either way.

Which way of collaborating would you prefer?

Let me know

- how often you would like to communicate, and
- the best way for me to reach you.

To minimize confusion, having a single point of contact (besides you) in your organization will be very important. I will normally communicate directly with that person. They should then coordinate with other team members as needed to obtain required information and approvals.

Let me know who will be my single point of contact during the project(s).

Review of First Draft

I use word processing software with edit tracking to share drafts. This will allow us to track changes to documents, make comments, and collaborate. I do not recommend using Google Docs, because they have, in some cases, locked users out of their own documents, and because Google scans documents stored on its servers for its own purposes.

As part of the Agreement, we will decide on deadlines for first drafts. Once I send first drafts, please do review each carefully. I strongly suggest that you also ask applicable team members to review the document. When reviewing first drafts, checking the tone, message and any offer is critical.

Based on feedback on first drafts, I will be able to fine-tune work for second (and, if required) third drafts.

Revisions

Revisions are expected. We will work together to get a solid understanding of your needs, which will help me write effective copy. If you are not 100% satisfied with the project, I will revise it to your specifications.

One or two revisions will be made on a complimentary basis, provided these revisions are requested within thirty days of receipt of the project. Additional revisions, or revisions requested after thirty days, might incur additional charges.

My goal is not to minimize or maximize revisions, but rather **to** contribute work that will **earn a glowing testimonial.**

Final Approval

Once I have made all revisions, I will submit a final draft to you. I ask that you then affirm by email that work is complete. Once I receive this affirmation from you, I will send you an invoice for the balance of fees due.

The invoice will be due upon receipt.

As a professional, I will respond promptly to any requests, and I ask you to do the same with my invoice.

Review of Final Production

In many cases, you may want to send the final copy to a designer for formatting. I will be happy to check final versions after any graphical elements have been added.

Equally, I am happy to work with your design team to make any changes needed to ensure the final piece will be as effective as possible.

Following Projects

Once a project is complete, I offer a complimentary “hot wash-up” consultation. In these we spend a few minutes discussing what went well, and where improvements could be made. We also can review the Discovery Questionnaire and discuss additional ways to work toward goals.

Where appropriate, I am happy to map out new project plans to ensure my client continues to have high-quality, consistent copy to achieve goals and grow business.

Services and Estimated Investment

To best serve my clients, I concentrate on writing copy, and planning copy strategies, that explain, with enthusiasm and without hype, technologies, services, and products, and their successful use.

I will be delighted to discuss other ways I can help you.

Service Description	Estimated Investment
White Paper / Special Report	\$4,000-\$8,000
Case Study	\$1,200-\$4,000
Testimonial	\$500 - \$800
Explanatory Communications Strategy and Planning	\$150-\$200/hour
Article or Advertorial (800 to 2000 words)	\$1200 - \$2000
Newsletter	\$600-\$1,500/page
Brochure	\$750-\$1,000/page
Blog Post (depending on length)	\$250-\$800/post
Copy critique	\$100 per page or 500 words

Getting to Know Jud

Jud moved from Columbus, Ohio to Atlanta, Georgia, in 1970. He was three, and his parents insisted. Jud grew up in Buckhead, then a distant suburb – not even a McDonald's for years. Jud attended the recently bus-integrated Brandon Elementary, and went through the public school system, attending Sutton Middle, and Northside High. Jud's father was a psychologist, and his mother raised four siblings and volunteered at church and in community organizations. The move from the mid-west to the south, and the rich variety of students Jud grew up with, prepared him well for college in distant Cambridge (Massachusetts) and his professional work in the Marine Corps and East Asia.

Growing up in a house full of books, games, and tools let Jud view the world (and outer space) through the eyes and thoughts of others, consider wildly variant ways of organizing purposeful activity, and seek elegant, or at least simpler, solutions. One day, helping an elder apply jute rope to a steel support post to make a basement bedroom more attractive, Jud watched the elder lay out the rope in long sections, and then pull one section at a time around the pole. After a few minutes, Jud timidly suggested that the rope could be held in hand while the elder simply walked around the pole, and get the job done faster. It worked! Jud loves looking for an unnoticed opportunity to improve things – to win!

Years later, during Desert Storm, Jud devised a way to approach and breach a minefield that was faster, and required less equipment, than the alternative. After discussing his ideas with his platoon sergeant and squad leaders, the changes seemed best, so Jud's platoon trained using the new approach. During a rehearsal training, Jud's platoon shaved minutes off of the time required to breach a (simulated) minefield. His Marines were pleased, because, in such situations, each second counts. Being able to break complex activities down, and clearly explain them to Marines, or others, has continued to serve Jud well.

Even later, as a software entrepreneur, one of Jud's main jobs was to explain ever-evolving content management technologies to customers who were somewhat bewildered at the pace of change, and appropriately skeptical of a start-up company claiming orders-of-magnitude improvement. Jud successfully got through to his customers, and loves to continue to get through to others.

To discuss how Jud can help get through to your customers, Jud can be reached directly at **404-575-347-1599** or **taylor@softwarecopywriting.com**.

What Others Say About Me

Prior to starting Software Copywriting, I have had experience in a variety of professional roles requiring skill in written communication. In volunteer activities, I give classes in computer languages, use of microcontrollers, and how to study Japanese kanji.

From professional and non-volunteer life:

"In a potentially dangerous situation, you are dependable...you capable of structured thought and drawing logically defensible conclusions...you have a keen sense of right & wrong, good & bad, and fairness with the courage to act to ensure outcomes are right, good and or fair."

– *Jason H., USMC*

"You have courage...loyalty...you are a good teacher. You bring a unique perspective to looking at a problem, then solving the problem. You have pride, which when channeled correctly means your dedicated to doing quality work."

– *Andy L., USMC*

"...sense of humor, calm under pressure, good at explaining complex concepts, good with kids, excellent memory"

– *Aaron E., UBS Bank*

From volunteering (teaching classes):

"This was a great intro to Arduino and gave me a running start. Jud is so knowledgeable about the subject that he could set a doctoral program. If you go, be sure to ask about thorium."

– *Don S.*

"Wonderful." – *Edward B.*

"I really enjoyed the class and definitely learned a few useful things. Looking forward to more!"

– *Carter S.*

"I had a great time learning about Arduino and practicing some basics. Jud is a great teacher! He made this novice understand and not feel overwhelmed by all the information. Very informative and fun class!"

– *Jenn T.*

"Awesome class. Well informative and Jud was a great instructor. This may sound crazy but three hours is not enough time. I'm very much interested in other Arduino classes that are offered to add to my repertoire."

– *Dwayne*

"This was an excellent class!" – *Hans C.*

"A really wonderful place to start for a beginner. The class covers a lot!"
– *Ashlan W.*

"Jud's class is a great jump-start to the world of Arduino, with a good mix of presentation and hands-on work."
– *Derek B.*

"Great! Really good introduction." – *kebernet*

"Jud was great! Really helped us get from zero to coding and building our project. Highly recommend this to any one who is legitimately interested!"
– *Auri A.*

"Have you ever wondered how LED lights can be programmed to work at your command? This awesome class will show you how to do that while learning how to use Arduino and even how electricity works in the process. There is a plethora of activities that can be accomplished with an Arduino, and this class gives you the keys to open the door."
– *Ricardo Z.*

"Fantastic introductory class! It definitely helped me get a good understanding of the Arduino."
— *Charlie S.*

"This was a good class! Moved along at an easy pace and gave solid background info, too!"
– *KnowWhere*

"Very helpful introduction to the world of Arduino! Great choice of kit to go with the class. Thank you, Jud!"
– *Matthew R.*

"Great way to dip your toes into the Arduino world and practice the basics of its many application potentials."
– *Streetcat*

"Great event. Thanks to Jud and Irm for teaching/organizing. Nice meeting everyone. Looking forward to the next one."
– *Joe*

"Great!... It was a very informative session. I plan to use this as a spring board to other projects. A bit much to absorb with my ancient brain cells but by listening closely and help from my neighbors at the table, my led string actually does what it was designed to do. Now I need to play with it to learn the impact of changes to the script."
– *CD M.*

Experience

Fusion Systems Japan, Tokyo

Fusion Systems is IT solutions company and business consultancy.

Role: senior project manager.

Writing: drafting and editing sales and services agreements, project planning documents, and instruction manuals for software.

Green Penguin K.K., Tokyo

Green Penguin developed and sold multi-lingual, multi-platform content management and application development software.

Roles: co-founder, director, sales and marketing manager, and project manager.

Writing: ran the gamut, including all documents needed to form, run, and promote a software startup; creation of user manuals; and creation of white papers, case studies, and other marketing collateral.

EigoTown, Tokyo

Eigotown was a portal website providing to Japanese consumers information, services, and products related to the English-speaking world.

Roles: member of the Board of Directors, and Vice President of sales.

Writing: creation (and execution) of explanatory presentations, similar to white papers, as well as all marketing collateral.

CTR Ventures, Tokyo

CTR Ventures was a venture capital firm that focused on internet-related startups in Japan.

Roles: were member of the Board of Director, Representative Director, and Partner.

Writing: creation and review of business agreements, and creation and editing of documents related to pursuit of funding into a fund, and promotion of companies CTR invested in.

The Coca-Cola Company, Japan & China

Roles: software implementation team manager, marketing data manager (Coffee Business Team), and Executive Assistant to the Deputy President of Coca-Cola China.

Writing: creation of project proposals, project plans, progress review documents, and operating manuals (such as for the Sales and Distribution module of SAP); and creation and editing of quarterly reports for the Deputy President of Coca-Cola China to the Chairman of Coca-Cola.

United States Marine Corps (Japan, Mid-East, California)

Roles: platoon leader of combat engineers in Operations Desert Shield and Desert Storm; Assistant Logistics Officer, 3rd Combat Engineer Battalion; and Range Maintenance Officer, and Search and Rescue Officer, for Marine Corps Air-Ground Combat Center.

Writing: creation of combat orders, planning documents for regimental training exercises, creation and review of administrative reports, and creation and documentation of search and rescue procedures

Harvard University (Cambridge, Massachusetts)

A.B., Government

Writing: Expository Writing (freshman class), various academic writings.

B2B Writing Samples

The following writing samples are:

- a white paper is about a real technology, but a fictitious company.
- two case studies about real project I was directly involved in, but in which companies and other details have been changed.

Sample White Paper – Mjolnir Power Systems

This white paper is about a real technology, but a fictitious company.

Thorium - Providing Power for The Now and Our Next Thousand Years

The security of human civilization depends on safe, economic generation of much more electrical power, without damaging the health of humans or our ecosystem.

Although humanity has made great progress in generating and using power, and increased use of power is directly related to increase in world GDP, a large fraction of the world suffers poverty. Also, current methods of generating power severely degrade human health and the environment.

- Use of fossil fuels powers much of our civilization, but pollutes air and water, and degrades our environment.
- Hydroelectric power is limited to places with rivers, disrupts ecosystems, and, in one case, led to flooding killing hundreds of thousands.
- Solar and wind power are inexhaustible, but are available only inconsistently; kill terrible numbers of birds and bats; and require vast areas of land and monumental amounts of construction.

Nuclear power is clean, very safe, and reliable, but, as currently used, needs expensive refinement of fuels and expensive disposal of wastes, and can be made even safer.

So how can we increase the power (especially electrical) available? By using thorium as fuel in molten-salt reactors to generate electrical power and process heat. Thorium is as common as lead, requires no refinement to become useful (unlike uranium), and can be used in molten salt reactors to dramatically simplify waste disposal and increase safety.

All at a cost per kilowatt-hour as low as coal, using well-tested technology.

The Challenge

This paper discusses how leading companies are designing molten salt reactors (MSR's), using thorium, to optimize and accelerate construction of modular power generation and production of valuable fission products.

The results? Inexpensive electrical power, process heat, desalination of water, and byproducts that can combat cancer and power deep-space satellites.

In the following pages, we take a closer look at how humanity has historically met its power needs; the downsides associated with pre-nuclear and current nuclear solutions; the usefulness of thorium as an effectively inexhaustible source of power; the benefits of using thorium as a fuel in liquid form in a molten salt reactor; and a comparison of capital and operating costs with other ways of generating power.

As explained by T. J. Garrett (Department of Atmospheric Sciences, University of Utah), world GDP (wealth) depends directly on the rate of use of power. Net human wealth depends on the amount of power used. According to the United Nations, in mid-2017, the population of Earth is about 7.5 billion, and 836 million people live in extreme poverty. Also according to the U.N., the population is expected to reach 11.2 billion by 2100.

<Graphic: graph showing linear relationship between energy consumption per person and GDP>

More power for more people is desperately needed.

Current Practices

Pre-nuclear Sources of Energy

Before the industrial revolution, our source of power was primarily food, with some use of simple chemical sources such as wood, coal, dung, and whale oil, and local use of water or wind power.

The steam engine was revolutionary, and made possible massive use of coal and petroleum.

Invention of internal-combustion engines and electrical generators amplified usefulness of fossil fuels, and enabled large-scale use of hydro power.

Shortcomings

However, pre-nuclear sources and uses of power come with costs.

Using coal requires environmentally damaging mining, and use of both coal and petroleum pollute air and water. The U.N. estimates that over one million people die each year due to particulate pollution from coal, just one of its health risks.

Hydroelectric power is limited to areas with rivers, interferes with wildlife ecosystems, and has led, in China, to over 200,000 deaths from flooding.

Solar and wind power are inexhaustible, but are only abundant in certain places, are only intermittent, need enormous areas of land, kill huge numbers of birds and bats, and require monumental amounts of manufacturing and construction.

Our Current Nuclear Source of Energy

Nuclear power

- delivers over one million times as much power per kilogram of fuel as oil or coal,
- is extremely reliable,
- requires minimal space, and
- does not pollute our air or water.

However, current practice of using uranium in solid fuel pellets in water-cooled reactors has many drawbacks of its own.

Uranium found in nature is a mixture of isotopes: U-238 (99.3%) and U-235 (0.7%). U-235 is the isotope needed for power generation, but separating useful amounts of U-235 requires expensive refinement, and produces large amounts of depleted uranium, which needs careful disposal.

Current nuclear power plants use uranium in solid form, as ceramic pellets encased in metal fuel rods. Gaseous byproducts, such as xenon, form cavities in fuel pellets, eventually making the fuel useless. Some solid byproducts are extremely radioactive. These byproducts could be removed by reprocessing the fuel pellets, but this is expensive and complicated. Currently, in the United States (according to the Nuclear Regulatory Commission), waste is stored without being reprocessed at over 68 locations.

Further, current nuclear power plants use piped water to carry heat from the heat-generating fuel to a turbine that generates electricity. Water normally boils at 100 degrees centigrade, but is pressurized (at up to 150 atmospheres) to keep it from boiling at a working temperature of 325 degrees centigrade. Leaks at such pressure are mechanical explosions, destroy equipment, and released radioactive steam immediately expands thousands of times, requiring containment and cleanup.

A Better Solution

Thorium, used in molten salt reactors, is the answer. What are the advantages of using thorium as fuel in a molten salt reactor?

- Thorium is practically inexhaustible.
- Thorium is safe.
- Thorium is perfectly suited for use in molten-salt reactors (MSR's).
- MSR's are a tested technology.
- MSR's are inherently safer than solid-fuel water-cooled reactors.
- MSR's produce far less waste than solid-fuel, water-cooled reactors.
- Thorium, used in molten salt reactors, can provide energy at lower cost than coal.

Thorium is Abundant.

Thorium is about 7.2 parts per million of the Earth's crust, only slightly rarer than lead, and about three times as common as uranium. All natural thorium is the useful isotope Th-232, while only 0.7 percent of natural uranium is the isotope useful as fuel, U-235. So, useful thorium is more than four hundred times as common as useful uranium. Uranium requires enrichment to raise concentration of U-235, by removing U-238. Removed uranium must be handled as waste. Thorium requires no isotopic refinement, so no waste is produced.

<Graphic: How much thorium, vs. how much uranium, with uranium broken down between U-235 and U-238>

Thorium is a common byproduct of current mining of rare earths such as neodymium (heavily used to make ultra-strong magnets for manufacture of consumer and military electronics) and other useful minerals. In fact, large amounts of thorium are currently disposed of as waste from mining, and the current price of thorium is about fifty dollars per kilogram. Since this “waste” contains so much extractable energy, the cost of thorium is only a microscopic fraction of the cost of delivering power.

In fact, right now, the United States has enough thorium (buried as “waste” in Nevada) to generate more electrical power than is used in the U.S. in three years. Kirk Sorensen of Flibe Energy estimates that generating electricity for the current population of Earth, each using as much electricity as an average resident of the U.S., would require 1500 metric tons of thorium. The International Atomic Energy Agency estimates world readily available reserves of 1.725 million tons, which, at 1500 metric tons per year, would last 1150 years. Further exploration, and improvements in technology, will increase readily available reserves.

Thorium is safe.

Naturally-occurring thorium has a half-life of 14.05 billion years. Contrary to common misunderstanding, longer half-lives are safer: less radiation is released per unit of time. For comparison, U-235 has a half-life of 70.4 million years (20 times as radioactive as thorium) U-238 has a half-life of 4.47 billion years (over three times as radioactive), and even naturally occurring potassium-40 (a small fraction of that naturally occurring, even in bananas!) is eight times as radioactive as thorium.

Thorium can be used in molten-salt reactors.

Uranium can be used in MSR's. In fact, the Molten Salt Reactor Experiment, conducted at Oak Ridge National Laboratory in Tennessee, used uranium as fuel.

Crucially, however, thorium and uranium can be easily separated when dissolved as fluorine salts. This is important so that uranium can be concentrated for generation of heat and neutrons, and thorium can be concentrated for absorption of neutrons to transmute into new uranium.

<Graphic: 60's era photo of staff at MSRE>

Molten-salt reactors are proven.

Molten salt reactors were thoroughly tested at Oak Ridge National Laboratory during the Aircraft Reactor Experiment (1954), and the Molten Salt Reactor Experiment (1965-69).

Molten-salt reactors are safer than solid-fuel water-cooled reactors.

Using molten salt, instead of water, to absorb heat from nuclear fuel and carry that heat toward a power-generating turbine is safer. Water needs to be highly pressurized to be kept liquid at useful temperatures, but molten salts need no such pressure. So, a leak would not result in a steam explosion, and no radioactive steam would be released. A leak would result only in a drip, rather than an explosion, and the salt would simply re-freeze.

<Graphic: frozen salt plug>

Molten salts can be used to carry the fuel as well as the heat. This is very advantageous. Gaseous fission byproducts, such as xenon, can simply bubble out rather than causing cavities in solid fuel pellets. Other fission byproducts, which are extremely valuable if they can be retrieved, cannot readily be extracted from solid fuel pellets, and so are treated as waste. These precious materials (some can fight cancer; another can fuel deep-space satellites) can be extracted from liquid fuels in a straightforward manner.

<Graphic: comparison (not to scale) of sizes of piping, walls, and containment required>

Molten-salt reactors produce far less waste than solid-fueled reactors.

Nuclear reactions produce some gaseous byproducts, and these deform solid fuel pellets and metal fuel rods. Also, radiation degrades some uranium oxide into uranium metal and oxygen, and this oxygen can degrade fuel rods. Because of these problems, fuel rods are removed from service after twelve to eighteen months, with only a fraction of the uranium in the fuel rods having been consumed.

Fuel pellets can be reprocessed (an expensive and complicated process) but (in the U.S.) are not. So large amounts of waste containing highly radioactive byproducts (some of which would be extremely valuable if they were extracted) must be stored for very long times.

Liquid fuels allow simple off-gassing and separation of xenon and krypton, preventing the damage that requires removal of fuel rods that still have otherwise-useful fuel. Valuable byproducts can be retrieved, extracted chemically and mechanically. Unwanted highly radioactive byproducts can be "left in the soup", and "burned", providing even more power.

<Graphic: comparison of sizes of waste streams, calling out useful isotopes recoverable from molten salt>

Unlike solid fuel reactors, which use less than one percent of mined uranium, thorium, used in a molten salt reactor, can be completely consumed.

Thorium, used in molten salt reactors, can provide energy at lower cost than coal.

According to Energy from Thorium (www.energyfromthorium.com/2010/07/11/ending-energy-poverty) the median cost (of five studies) of construction of a molten salt reactor, per Watt, is \$1.92, well lower than \$2.30 for coal.

Since nuclear fuel is astronomically more energy-dense than fossil fuels, the cost of fuel per kilowatt-hour would be around four thousandths of a cent (nearly one thousand times lower than coal), and total costs of delivered power would be about three cents per kilowatt-hour (Update of the MIT 2003 Future of Nuclear Power, 2009).

Expected Results

Shifting to nuclear power generated using thorium as fuel in molten salt reactors will have many benefits:

- Huge amounts of new power can be brought online rapidly.
- Replacing coal-fueled generation with nuclear generation will clean our air and water, and eliminate the need to alter our landscape.
- Opting for thorium as a fuel source, rather than uranium, will dramatically reduce complexity and cost of refinement of ores into fuel, completely eliminating radioactive waste from this step.
- The choice of thorium will also reduce the production of plutonium and other transuranics, radically simplifying storage of fission byproducts.
- Cancer-killing bismuth-213 will be produced as a by-product.
- Reactors and buildings will have much lower construction costs and be fundamentally safer.
- Fission products will be able to be economically extracted, rather than being treated as expensive-to-handle waste.

Summary

- Thorium is so abundant that it can provide power for thousands of years.
- Thorium, unlike uranium, requires no refinement, and so has no related wastes.
- Thorium is perfectly suited for use in molten-salt reactors, which are fundamentally safer than water-cooled reactors because they can operate at normal pressure, and pose no risk of mechanical explosion or release of radioactive steam. Liquid fuels also simplify processing of fission byproducts; allow extraction of valuable byproducts; and allow the most dangerous byproducts to be burned as fuel.
- Thorium, used in molten salt reactors, can provide power at lower cost than any other source, including coal and natural gas.

How to Decide

When considering strategies for generating power for the advancement of civilization, there are important features of power sources to consider.

Is the energy source cost-effective?

Purely on a cash basis, solar and wind power are prohibitively expensive, despite their "green-ness". Thorium in MSR's can compete with, and beat, all other sources in providing low-cost power.

What non-monetary costs are there?

Solar, wind, and hydro power all interfere with our ecosystem, by cooking (solar) or shredding (wind) bats and birds, or by destroying migration routes of fish (hydro). Hydropower can also lead to catastrophic failures, leading to deaths. Coal pollutes air terribly, leading annually to over one million deaths from related diseases, and poisons degrades grounds and waterways. Further, coal mining is also very dangerous.

Thorium is easily mined, does not interfere with the ecosystem, and does not pollute.

Is the fuel readily available?

Thorium is so abundant in the Earth's crust that every country could be energy-independent at a consumption rate equal to that of the United States now. Already, each year, enough thorium is dug up, and becomes tailings of rare earths mining, to provide power for the world many times over.

Does the use of the power source create large amounts of waste?

Thorium requires no refinement (as does uranium) and so produces no related waste. Use of molten salt reactors dramatically reduces the volume, and duration of high radioactivity, of waste, and allows complete usage of fuel.

Is the power generation system safe?

Molten salt reactors cannot melt down. "Melting up" is actually a required step in the production of power. Molten salt reactors do not require pressurization as do water-cooled reactors, preventing explosions and release of radioactive steam. Electrical power failures at a power plant would lead through simple physics to the draining, cooling, and freezing of the fuel.

Thorium, used in molten salt reactors, uniquely meets all these criteria.

Next Step

If you are ready to move forward with planning and executing a program to provide enough electrical power to bring all of humanity up to a civilized standard of living, and provide that power for a millennium or more, we look forward to working with you!

We will discuss the requirements for building a proof-of-concept reactor, in order to extend the learnings from the Molten Salt Reactor Experiment; and discuss the requirements for building the first few Hammer Class production civilian reactors.

You can take a useful, extremely profitable part!

About Mjolnir Power Systems

Founded in 2017, Mjolnir Power Systems is developing the leading thorium-fueled molten salt reactors for generation of electrical power and production of high-value radio-isotopes to

ensure that Earth has enough power to run civilization on-planet and explore the rest of the solar system.

Mjolnir designs and will build modular systems for companies and governments that need safe, clean, reliable, inexpensive energy, radio-medicines, and space fuel. With world-leading technology and expertise, Mjolnir accelerates "time-to-power" for customers worldwide. Mjolnir Power Systems, which received funding from YoyoCap Partners in 2017, is headquartered in Atlanta with offices in Provo and Tokyo.

Additional information about Mjolnir Power Systems is available at www.mjolnirpowersystems.com or by calling 575-347-1599, or by contacting us by email at mjolnirpowersystems@gmail.com.

Sidebars

Sidebar 1

Bare sustenance requires about 200 Watts per person. Civilization requires much more power, most of it electrical.

At present, humanity consumes about 16,000 gigawatts, or about 2100 watts per person. The United States consumes about 10 kilowatts per person, with 4.3% of the world's population.

To bring energy availability for all humans to the level of the U.S. would require generation of a total of 75,000 gigawatts, an increase of 59,000 gigawatts.

If, as the United Nations Department of Economic and Social Affairs predicts, the world population increases to 11.2 billion by 2100, a total of 112,000 gigawatts (an increase from the present of 96,000 gigawatts) will be required to provide power for all at the rate currently provided in the United States.

Sidebar 2

The Story of the ARE, MSRE, Plutonium

Alvin Weinberg helped develop the light water during World War 2 in order to produce plutonium for bombs. He saw inherent risks in the use of solid fuel with water as the heat transport fluid, and proposed research into liquid-fueled reactors for generation of electrical power for civilian use. To get funding, Weinberg proposed development of a nuclear-powered bomber, and directed the Aircraft Reactor Experiment (ARE), using molten salt to carry dissolved fuel, at Oak Ridge in 1954.

The ARE was successful, and led to the follow-on Molten Salt Reactor Experiment (MSRE), which aimed at validating use of an MSR for use generating electrical power for civilian use.

However, the Molten Salt Reactor Experiment was shut down by the U.S. government so that all resources could be concentrated on development of fast-breeder plutonium reactors, for production of plutonium for weapons, and with a hope to use fast breeders to use a (U-238)-

(neptunium-239)-(plutonium-239) cycle similar to the (Th-232)-(protactinium-233)-(U-233) cycle.

Sidebar 3

"Our economic goal is to achieve a cost of electrical energy averaged over the life of the power station to be no more than that from burning fossil fuels at the same location. Past studies have shown a potential for the molten salt reactor to be somewhat lower in cost of electricity than both coal and LWRs. There are several reasons for substantial cost savings: low pressure operation, low operations and maintenance costs, lack of fuel fabrication, easy fuel handling, low fissile inventory..." (Ralph Moir and Edward Teller)

Sample Case Study – Dabo Vatis

This case study is about a real project I was directly involved in, but companies and other details have been changed.

In Just Two Months, Vatis Enables Dabo Expansion into Japan to Support Coffopolis

The Customer

Dabo Services, with 520 employees worldwide and headquartered in Provo, Utah, has provided order-to-accounting logistical support to high-outlet-count retailers since 1975. Dabo specializes in maintaining freshness of delicate and aromatic foodstuffs, such as coffee and rare fruits. Dabo is a key provider of logistical services to Coffopolis, the world's leading provider of the home-style coffee experience, with shops in over one hundred countries.

Dabo provides complete logistical support to Coffopolis locations, from order to delivery and accounting, for all portable items, not just foodstuffs, needed by Coffopolis shops in Dabo markets.

Successful completion of a project involving Vatis Systems, Dabo added Japan to the markets in which they support Coffopolis: the Americas, Africa, and East Asia.

(Graphic: diagram showing Dabo relationships with primary vendors, Coffopolis, and retail outlets)

The Challenge

In most of the world, Coffopolis deals with its logistical partners on an open-book, fixed-percentage basis:

Coffopolis had tried, for years, to shift its relationship with Zobotani, its logistical partner in Japan, from an opaque basis to an open-book basis. Coffopolis had suggested each of the following, without success:

- a simple change of Zobotani practice
- a joint venture between Zobotani and Dabo
- a purchase of either by the other
- a sub-contracting arrangement

Coffopolis finally decided to end its business with Zobotani, and ask Dabo to provide services in Japan.

The change was unexpectedly sudden. Dabo has two regional IT teams fully capable of designing and implementing systems for Dabo in any market, but the European team, led by

Thor Schmidt, was fully engaged with major changes being implemented in Eastern Europe; and the East Asia team, led by Rupert Fung, could only immediately deliver eight of twelve functional modules - four others required extremely rapid development by a skilled team outside of Dabo.

(Graphic: Diagram showing functional modules that Rupert could and could not implement fast)

These modules were:

- management of transactions between Dabo and vendors of food items (e.g., coffee and sugar) as well as items consumed by Coffopolis shops (e.g., cleaning supplies and stationery)
- management of receiving and warehouse management
- management of picking, packing, shipping, and delivery
- specialized end-of-month accounting

Since these could not be delivered by Rupert's team within six months, an interim solution was needed, to be used until Rupert's team could deliver a final system.

Failure to implement the entire set of functionality would have prevented Dabo's expansion into Japan, and likely fatally damaged relations with Coffopolis.

Selection of Vatis

Although Dabo was aware of the ongoing negotiations between Coffopolis and Zobotani, the speed of Coffopolis' decision to terminate relations with Zobotani, and the very aggressive time-line, required immediate action by Dabo. Within minutes of Coffopolis's decision, Dabo had informally determined that outside services would be required, and this was confirmed early the next business day by Thor and Rupert.

Dabo contacted a number of potential partners, capable of rapidly implementing, and then helping operate, the functionality required to fill the holes not addressable by Rupert for four months. The candidate partners included Japan offices of two global consulting firms, and two Japan-centric firms specializing in enterprise software. Interviews with principals, managers, and (at least in the case of Vatis) previous customers were held.

Based on its decade serving Japanese and international customers in the Japan market, and documented ability to deliver business-critical software very rapidly, Vatis was chosen.

The Solution

Dabo and Vatis agreed that Vatis would provide:

- confirmation of functional requirements

- implementation and testing of software and communications and testing infrastructure
- installation and testing of required production hardware
- training to Dabo managers and staff on use of custom software
- coordination with Rupert's team to avoid building cul-de-sacs.

Implementation

Before formal selection by Dabo, Vatis began notional requirements discovery, and created software design and implementation teams. The day Dabo announced its decision, Vatis' teams began reviewing and updating their notional requirements discoveries, and began process design. Vatis executives and managers were well-known in Tokyo's high-end software milieu, and they reached out and recruited trusted programmers needed to address specific technical challenges, including proprietary document standards, Japanese banking practices, and character encoding schemes.

Given documents created during Coffopolis' negotiations with Zobotani, and based on Vatis' hard-won expertise in dealing with intricacies that arise between Japanese and global enterprises, Vatis was able to prioritize functionalities then review detailed design documents and have them approved by Dabo within two weeks.

During this process, work on infrastructure scaled for testing was completed at a new site chosen by Dabo. Over the tense remainder of two months until the deadline imposed by Coffopolis' decision, the four functional modules needed to complement Rupert's team's efforts were completed.

The major challenges faced were Zobotani's recalcitrance in providing information, and cultural sensitivities less obvious to persons who have not worked long in Japan. These were overcome with professional, earnest communications, and with advice from Vatis to Dabo regarding cultural norms.

Results and Benefits

Production use of the systems implemented by Rupert's team as augmented by Vatis went smoothly, with one non-critical two-hour delay of a delivery to ten outlets, out of 273 outlets. The software worked as required, with non-critical improvements being discovered.

In addition, data flow for sales reporting was improved by Vatis' team, with a reduction in manpower and an acceleration of time-critical end-of-month reporting. In place of eleven people working for four hours, a system implemented by Vatis completed in seven minutes with one person. Similarly, time required for creation and use of a monthly reconciliation report between Dabo and its suppliers was reduced from three days to two hours.

Key benefits to Dabo were:

- protection of Coffopolis' reputation in Japan
- continuation of Dabo's relationship with Coffopolis
- increased visibility into costs associated with supplying Coffopolis outlets

- gains in knowledge about business systems and business culture in Japan.
-

Sidebar

- Dabo's internal resources were fully capable but schedule-conflicted.
- Dabo needed to fully support Coffopolis in Japan within two months.
- Vatis delivered required custom functionality on time.
- Coffopolis' reputation in Japan was saved.
- Dabo's reputation with Coffopolis soared.

Pull-out quotes

"Vatis pulled a honey badger out of our hat, with no bite marks." Hans Geistner

"We were ecstatic at having the functionality operate on schedule. We are also delighted with the process improvements discovered and implemented along the way." Jun Ichikawa

Sample Case Study – Blue Aardvark

This case study is about a real project I was directly involved in, but companies and other details have been changed.

Blue Aardvark's GrooveWeb cuts Developer-Months by 24X for Jameson-Thomas

Customer Background

Jameson-Thomas, founded in 1905, is the world's largest and best-loved purveyor of bubblegum, selling to all ages, with operations worldwide. Jameson-Thomas has been present in Japan since 1902, with 450 employees at headquarters in Tokyo, and over 2000 throughout Japan. Jameson-Thomas had produced one earlier mobile loyalty site and promotion, but wanted to dramatically reduce costs.

The Challenge

Jameson-Thomas faces a constant, critical challenge in maintaining brand loyalty among its end users. Studies by the Bubblegum Industry Association consistently show that, once a person takes up chewing bubble gum, that person is likely, but not certain, to stay loyal to their first brand. So, the choice of brand becomes a nearly certain stream of revenue. Brand loyalty among chewers is vital to Jameson-Thomas marketers and the company.

The advent of web-capable phones in Japan provided another channel that fast-moving consumer goods companies immediately adopted to communicate with existing and potential chewers.

An earlier Jameson-Thomas project was technologically successful, and supported some interaction with chewers, but was expensive. To provide consistent content across three mobile phone networks and two generations of interfaces required four teams (each with four website and content developers), working for six months, for a total of 96 man-months. Those developers were expensive. Justifying their cost demanded a high volume of increased or retained sales. Jameson-Thomas was seeking a partner with technology that could deliver a interactive website faster with fewer developers.

The three major Japanese carriers (Docomo, Softbank, and KDDI) had separate, partially incompatible variants of HTML for delivery of web content to phones. Also, each carrier served two generations (2.5G and 3G) of phones, with partially incompatible HTML.

Graphic: Grid showing three carriers, two generations of technology, and many screen sizes

This complexity was very costly for companies delivering content to as many phones as possible. Instead of designing one user experience and implementing once, an interface had to be implemented in up to six visually similar but technologically different versions. This was costly, and costs were magnified by need to manage changes to the target design during development.

Long development times made messaging changes over mobile sites lag efforts over other media, and development and maintenance of sites incurred dramatic new costs.

The Journey

The earlier project was a partial success, but the large time requirements, and need for multiple, large, expensive teams led Jameson-Thomas to seek alternatives for a second foray. Jameson-Thomas spoke with, and considered, in-house teams; a number of global consultancies; and, Blue Aardvark.

Blue Aardvark explained its dramatically different approach to software and hardware infrastructure for mobile sites, based on Blue Aardvark's platform, GrooveWeb. Jameson-Thomas asked Blue Aardvark to prove viability by building a test site displaying essential functionality.

Blue Aardvark implemented a GrooveWeb test site in one quarter the time suggested by Customer, with all essential functionality.

GrooveWeb was selected.

The Solution

Blue Aardvark's GrooveWeb is a platform-agnostic (use any browser), language-agnostic (output in any or many languages), integrated content management and transaction platform.

GrooveWeb is used to identify different requirements of different web browsers such as the two generations of telephony, the three different carriers, and dozens of screen sizes. These different requirements are identified and abstracted into code, to which designers need not pay attention.

This abstraction allows designers and developers to concentrate on imagery (photos and emoji), text (brand messaging or calls to action), and interaction ("Join Here!" buttons), and trust GrooveWeb to deliver the designer's vision on all devices.

Implementation

After testing GrooveWeb, Seiichi Ozawa, the senior Jameson-Thomas IT manager for web-based innovations for brand management teams, selected Blue Aardvark for software and initial consulting for a project to create a new, interactive, promotional website.

During the promotion, members of chewers.jp (owned by Jameson-Thomas) could earn "points" by buying Squiggly brand gum from Hello convenience stores on in Kyushu, then exchange these points for branded items such as key-chains or tennis rackets.

Implementation went smoothly. One team of developers (rather than four) was set up, with only two (rather than four) developers and designers. The team quickly took to GrooveWeb, and used GrooveWeb on more solutions than were initially considered.

Work was completed in one month.

<Graphic: Stick figures in groups of teams, z-dimension showing time, comparing:

- four teams of four (groups of stick figures) for three months (receding into distance)
- one team of two for one month>

One unexpected challenge faced was that the speed of making changes using GrooveWeb meant that changes that formerly took a day could be done in minutes, requiring tightening of other business processes. A second challenge was that ring-tones could be more easily downloaded, requiring hurried change to a contract between Jameson-Thomas and a copyright agency.

Results and Benefits Achieved

The website went live on time and within budget.

GrooveWeb allows design decisions and content to be captured once, managed centrally, and converted automatically. This eliminated need for manual conversions; lowered required repositories from six to one; and eliminated need for reconciliation after updates. Finally, this eliminated the need for expensive consultants to do mundane tasks.

GrooveWeb encourages abstraction of markup code into chunks, to be used to deliver content to all display platforms, so that content and code can be written once for delivery to all devices. This eliminates reconciliation of code or content, and dramatically reduces the number of content managers and coders needed, and prevents creeping differences.

<Graphic: Diagram showing difference between

- - maintaining content in three repositories (show a spelling error), and
- - maintaining content in one repository and then transforming it as appropriate to different phones>

Successes

The project was a resounding success.

Developer/designer teams were reduced from four to one; no separate teams were required to develop versions of the site for different carriers.

Team members were reduced from four to two; GrooveWeb abstracted differences between 2.5G and 3G cell-phone technology.

Since no coordination and reconciliation between teams was required (only one team), and work processes based on GrooveWeb features were faster, the project was completed in two months: one third the time of the previous project.

Points for Sidebar

- Project completed on time
- Project within budget
- GrooveWeb enabled:
 - Eightfold reduction in headcount and version management
 - Threefold acceleration of project completion and "time-to-message"
 - Successful support of promotion driving over JPY 5 billion in incremental revenue

Pull-out quotes

"GrooveWeb was exactly what I wanted, and, unexpectedly, in one piece!"

"Blue Aardvark pushed GrooveWeb to the limit, and it paid off in spades."