by developing automatic control of synchronous compensators and designing compensator with two excitation windings.

Alternative to the synchronous compensator is static thyristor compensators (STC). Creation of them is result of development of semiconductor technology. Advances in power electronics led to the possibility of creating a new type compensator called STATCOM.

The STATCOM uses algorithms relating to vector control of voltage converter. In general vector control involves measurement of the instantaneous values of voltage and current three-phase system, converting them into orthogonal components of selected system axes d and q, the computation of control actions required in this coordinate system and then transforming them into three-phase system to be implemented in the form of control signals applied to the control object.

Reactive power control system of STATCOM is performed by generating an ideal voltage by the converter. The current in the inductive reactance lags in phase by an angle $\pi/2$ from the voltage across the defined difference of network voltage Uc and converter Un. If these voltages are in phase Uc > Un current will be inductive and STATCOM system consumes reactive power from the network. When Uc < Un there is the capacitive current that contributes to the generation of reactive power. Thus, the STATCOM controls reactive power by varying the voltage at the output of the converter Un.

Similarly, for the active power control by the STATCOM it is necessary to change the phase of the voltage Un relative to the network voltage Uc.

The paper presents only basic voltage control devices. In general voltage and reactive power regulation is an intensive process demanding the use of innovation technologies and profound knowledge of electrical engineering.

References:

1. Дьяков А.Ф., Овчаренко Н.И. Микропроцессорная автоматика и релейная защита электроэнергетических систем: учеб. пособие для вузов. 2-е изд., стер. М.: Издательский дом МЭИ, 2010. 336 с.: ил.
2. Овчаренко Н.И. Автоматика электрических станций и электроэнергетических систем. Учебник для вузов. Под редакцией Л.Ф.Дьякова. Москва: Издательство НЦ ЭНАС, 2000.

Askarov, A.B., Shishkovskaya, Yu.V.

Energetics: energy modernization and clean energy

National Research Tomsk Polytechnic University.

Introduction

Energetics Incorporated, a wholly owned subsidiary of VSE Corporation, is a full-service technical and management consulting company serving public- and private-sector clients. Also it is a firm helping clients solve today's complex global challenges: energy modernization, energy efficiency, clean energy and climate changes. Energetics is headquartered in Columbia, Maryland, USA with offices in Washington, DC and Arlington, Virginia.

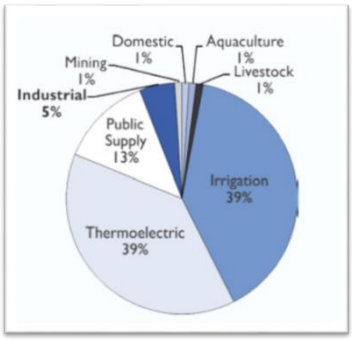
The history of the company.

Energetics was founded in 1979 by a small group of engineers in Columbia, Maryland. They named the company "energetics", because it is a branch of mechanics that deals with energy and its transformations. In 1995, Energetics was acquired by VSE Corporation,

which provided the company with a new opportunity for growth. For the past 30 years, Energetics has enjoyed steady growth. What began with a few employees in a small office has grown into a successful company with over 160 employees located among six main offices across all the USA.

Company activities

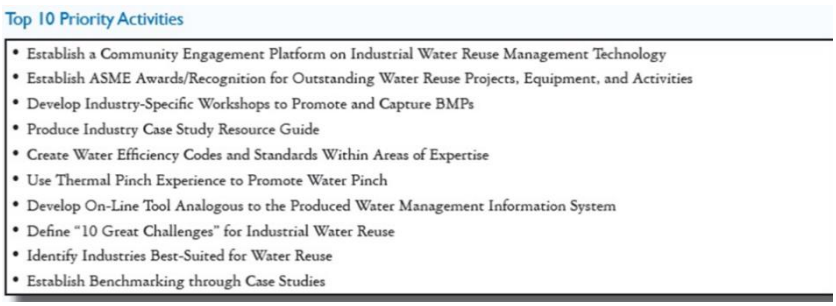
For 30 years, Energetics Incorporated has helped their clients develop and manage effective research and information programs in the fields of energy, manufacturing, climate and environment. Their success lies in their ability to align program capabilities with critical national objectives and to effectively communicate complex issues to enable informed decisions. Major clients of Energetics – the U.S. Department of Energy and the New York State Energy Research – respect their obsession with quality products and successful client outcomes.



«Water Management Technology»

As the example of the company activity, we can consider one of many Energetics programs such as Water Management Technology. Everybody knows that population growth, aging water infrastructure and inefficient water usage make the current growth in water demand unstable (Fig. 1: see left) [3, p.3]. An increase in energy production, which requires water for cooling and emissions control, also contributes to that demand. For these reasons, water and wastewater industries require new approaches to optimize water use, reuse, recycling, and provide security and stability of the water infrastructure.

To reach this goal Energetics and American Society of Mechanical Engineers (ASME) together synthesized the workshop results to develop the new way. It identifies ten high-priority actions that ASME can pursue (Fig. 2) [3, p. 17]. Nowadays there is a number of technologies and tools available for water efficiency and water reuse, but Energetics workgroup clearly see the importance of better communication in needs and benefit, for a wider adaption of water efficiency and water reuse techniques. There is a need for a more thorough understanding of water use within specific industries to determine the best place for further assessment and action. Consequently, the workgroup identified a number of potential ASME roles that can help improve usage of water power across all the USA [3, p. 18].


Top 10 Priority Activities

- Establish a Community Engagement Platform on Industrial Water Reuse Management Technology
- Establish ASME Awards/Recognition for Outstanding Water Reuse Projects, Equipment, and Activities
- Develop Industry-Specific Workshops to Promote and Capture BMPs
- Produce Industry Case Study Resource Guide
- Create Water Efficiency Codes and Standards Within Areas of Expertise
- Use Thermal Pinch Experience to Promote Water Pinch
- Develop On-Line Tool Analogous to the Produced Water Management Information System
- Define "10 Great Challenges" for Industrial Water Reuse
- Identify Industries Best-Suited for Water Reuse
- Establish Benchmarking through Case Studies

Fig.2. Ten high-priority actions for ASME.

Conclusion

So, in conclusion, I think it is necessary to say that Energetics is the successful growing company which committed itself to develop their staff and improve our world. It is a great company with a wide range of products for employees to work on and gives them a lot of flexibility and independence. If you had some problems with optimization of your production, you could freely access to Energetics. There are many engineering companies in the world and Energetics is one of the best.

References:
1. Energetics // Linkedin [сайт]. URL: http://www.linkedin.com/company/energetics (дата обращения: 04.04.2014).
2. Energetics Incorporated // Energetics [сайт]. URL: http://www.energetics.com/Pages/default.aspx (дата обращения: 04.04.2014).
3. Gerry Hamilton, Keith Carns, Kelly Parmenter, Ray Erhard. ASME Water Management Technology Best Management Practices and Innovations for the Process Industries. Washington, D.C.: ASME, 2010. 55 p.
4. Value Engineering Company // VSE Corporation [сайт]. URL: http://www.vsecorp.com/ (дата обращения: 04.04.2014).

Beck, P.A.

Underground cables

National Research Tomsk Polytechnic University.

Underground cables are part of the electric transmission system designed for underground installation. Their main purpose is the transmission of electrical energy. Undergrounding refers to the replacement of overhead cables providing electrical power or telecommunications, with underground cables. This is typically performed for aesthetic purposes. In figure 1 below one can see how cables can improve the visual impact to people and surroundings.

Figure 1 (left) – Before and after laying underground cables.

One of the commonly used types of underground cables is an extruded dielectric cable which consists of the following components:

- Conductor – Typically aluminum or copper. It carries current and voltage.
- Strand Shield – It is applied over the conductor to form a smooth, concentric shape preventing insulation from flowing into the strands.
- Insulation – Typically rubber (EPR) or plastic (XLPE or TR XLPE.) It insulates the medium voltage conductor from ground.
- Insulation Shield – It controls the stress within the insulation and is part of the dead-front configuration.
- Metallic Shield – Typically copper or aluminum, but may also be lead. The shape can be concentric neutrals, copper tape, longitudinally corrugated copper tape, drain wires, flat strap, or lead sheath.
- Outer Jacket – It provides protection to the metallic shield that helps prevent moisture from attacking the shield or migrating into the insulation where it can cause trees and potential cable breakdown.[1].