Preliminary examination of a failed motorbike fuel tank.

A. Loukopoulos¹, D.G. Papageorgiou¹,², J. Sideris¹,², C. Medrea¹*

cmedrea@teipir.gr

² Technological Educational Institute of Piraeus, Department of Mechanical Engineering, 250 Thivon & Petrou Ralli Ave., 12244, Aegaleo, Athens, Greece

¹ Stassinopoulos-Uddeholm, Steels S. A., 20 Athinon Str., 18540 Piraeus, Greece

Abstract

Failure analysis investigates the causes of a product’s destruction. Its final objective is to suggest measures that can be taken in order to prevent or minimize the chance of failure in the most economical way. This paper refers to the failure of a motorbike fuel tank (Fig. 1). Leakage of fuel was observed after ten thousand kilometers (in less than three years since the motorbike was purchased). The fuel tank was replaced by a new one of the same company and which also presented a leakage after 4 months of use. Gasoline is a flammable material and the sealing of the fuel tank is essential for the security of the passenger and the environment.

Fig. 1. The general aspects of the motorbike

The investigation of reservoir failure comprises several stages. Starting with the preliminary examination, data concerning the piece production and manufacture were collected. Cracks and fracture paths were evaluated by macroscopic analysis. Chemical analysis was carried out for the material identification. Hardness testing was conducted to check the working process. The paper presents conclusions on the on the crack initiation and suggests the first probable causes leading to die failure.

Keywords: Preliminary examination, motorbike, fuel tank, welding.
Preliminary examination of a cutting-forming tool used in a bridge slot filterpipe machine

G. Manolas¹, D.G. Papageorgiou¹,², J. Sideris¹,², C. Medrea¹*
cmedrea@teipir.gr

² Technological Educational Institute of Piraeus, Department of Mechanical Engineering, 250 Thivon & Petrou Ralli Ave., 12244, Aegaleo, Athens, Greece

¹ Stassinopoulos-Uddeholm, Steels S. A., 20 Athinon Str., 18540 Piraeus, Greece

Abstract

A company produces bridge slot screen filter pipes used in drilling industry. Cutting tools, are located circumferentially in a cylindrical, hydraulic, forming die. They perform a consecutive, repeating motion, perpendicular to the tube, forming the bridge slots, as the tube passes through the die. The cutting tools, are subjected to increased impact stress, since the procedure is carried out rapidly.

The cutting tools, fail repeatedly during the procedure, presenting brittle-type fracture at the surface and transversal.

The paper refers to preliminary examination of three failed pieces. Historical data and recorded background, concerning the manufacture processing and operation were collected. A complete photographic file was created including all stages of failure analysis process. Hardness measurements were carried out and optical inspection-microscopy were performed. Chemical analysis indicated that the cutting tools were made of AISI D2 tool steel. Analysis under a stereoscope revealed the surface quality of the tools. The paper presents conclusions on the crack initiation and propagation and the main causes that led to the systematic premature failure. The results of the study may prove useful for industries using similar cutting machinery.

Keywords: Failure analysis, cold work tool steel, cutting-forming die, fracture.
Preliminary examination of a failed cutting tool used in a coiled re-bars machine.

S. Varvagiannis¹, D.G. Papageorgiou¹, D. Statharas¹, C. Medrea¹*
cmedrea@teipir.gr

¹ Stassinopoulos-Uddeholm, Steels S.A., 20 Athinon Str., 18540 Piraeus, Greece
² Technological Educational Institute of Piraeus, Department of Mechanical Engineering, 250 Thivon & Petrou Ralli Ave., 12244, Aegaleo, Athens, Greece

Abstract

Straightening and twin bending system for coiled re-bars machine produce prefabricated stirrup cages. The material to be deformed goes through a compartment for initial straightening. Upon exiting from the compartment, the rod is being cut to the desired size using a special cutting tool. By consecutive bending steps, the desired product shape is obtained, using deformation rollers. All the machine parts are subjected to increased impact stresses, since the whole procedure is carried out rapidly.

The cutting tool consists of two parts: the lower fixed blade and the upper mobile punch. The punching tool fails repeatedly, during the deformation of high hardness materials (Fig. 1).

Fig. 1. General aspects of failed cutting tools.

The paper refers to preliminary examination of two failed pieces. Data concerning the manufacture, processing and operation of the piece were collected and a complete photographic file was created. Hardness measurements were carried out and optical inspection were performed. The material used to make the tools was identified by chemical analysis. The paper presents conclusions on the crack initiation and propagation and the main causes that led to the systematic failure.

Keywords: Failure analysis, cold work tool steel, cutting-forming die, fracture.
Preliminary examination of a mould-printing die prematurely failed.

J.Sideris$^{1,2}$, S.Leptidis$^2$, C. Medrea$^2^*$

cmedrea@teipir.gr

$^1$ Stassinopoulos-Uddeholm, Steels S. A., 20 Athinon Str., 18540 Piraeus, Greece

$^2$ Technological Educational Institute of Piraeus, Department of Mechanical Engineering, 250 Thivon & Petrou Ralli Ave., 12244, Aegaleo, Athens, Greece

Abstract

A company produces truck wheel covers as spare parts for the local market. A progressive die, mounted in a hydraulic press station, performs consecutive forming and selective cutting stages. During the last stage, the die marks by mould-printing the assembly configuration of the wheel cover onto the wheel rim. The forming punch failed prematurely. Almost half of the sixteen projections of the tool, situated at the circumference of the working surface, fractured (Fig.1).

Fig. 1. General aspects of the die

The paper refers to preliminary examination of the failed die as the first step in failure analysis. Historical data and the recorded background were collected. Non-destructive testings were performed, including hardness measurements and optical inspection. A complete photographic file was created. Chemical analysis was carried out using the optical transmission spectroscopy method and the material used to make the die was identified. Chemical analysis indicated that the punch was made of Vanadis 4 Superclean tool steel, in accordance with the designer’s selection. Analysis under a stereoscope revealed the surface quality of the tool. The paper presents the first conclusions on the crack initiation and propagation and the causes that led to the premature failure. The machining process should be redesigned as it is considered the main
cause of the failure. The results of the study may prove useful for industries using similar cutting machinery.

Keywords: failure analysis, cold work tool steel, forming die, fatigue.
An approach for structuring and operating curriculum of engineering faculties based on international standards.

D. Sapikas¹, E. Bocaj², K. Ntoutsos-Oikonomou³, D. Pantelis⁴, C. Patrikakis⁵

¹Dpt. of Electronic Computer Systems Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.6982800472, Email: dsapikas@gmail.com

²Dpt. of Automation Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.6976410277, Email: eda.bocaj@gmail.com

³Dpt. of Electronic Computer Systems Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.6970076460, Email: kntoutsos@gmail.com

⁴Dpt. of Automation Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.6978341122, Email: d.pantelis2@gmail.com

⁵Dpt. of Electronic Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.2105381534, Email: bpatr@teipir.gr

Abstract

It's a known fact that some Higher Educational Institutions (HEIs) from all over the world approach the structure of their faculty's curriculum on a different basis. In latest years student mobility has been increased. Thus, the need for a common language between universities created prototypes for the recognition of the courses. In several countries, as part of the nation's culture, university courses aren't offered in foreign language and most importantly in English. In such way, many benefits regarding students discretion in mobility, professors teaching abilities and university's
international partnerships are compromised. A new approach should be taken into consideration changing the previous faulting situation based on international standards. Association for Computer Machinery (ACM) and Institute of Electronics and Electrical Engineering (IEEE) two well known international research organizations focused on computer science and engineering in general suggested modern curriculum for engineers based on the market needs and latest research edge. HEIs should take in consideration the suggested changes to modernize their engineering faculties curriculum. Additionally, e-learning techniques have been radically improved over the latest years, offering numerous advantages for distance learning, cost reduction and program flexibility. A joint approach of standards and new technologies may leverage up HEIs and consequently professors and students.

Keywords : curriculum, IEEE, international, engineering
Adapting macroeconomic principles for engineering reality.

D. Sapikas\textsuperscript{1}, D. Papadopoulou\textsuperscript{2}, A. Fotopoulos\textsuperscript{3}, C. Patrikakis\textsuperscript{4}

\textsuperscript{1}Dpt. of Electronic Computer Systems Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.6982800472, Email: dsapikas@gmail.com

\textsuperscript{2}Dpt. of Economic Science, Aristotle University of Thessaloniki, Thessaloniki, Greece Tel : +30.6982021652, Email: diamipap1994@gmail.com

\textsuperscript{3}Information Technologies in Medicine and Biology, Dpt. of Informatics and Telecommunications, National and Kapodistrian University of Athens, Athens, Greece Tel : +30.6976808535, Email: anax.fotopoulos@gmail.com

\textsuperscript{4}Dpt. of Electronic Engineering, Technological Educational Institute of Piraeus, Piraeus, Greece Tel : +30.2105381534, Email: bpatr@teipir.gr Addr: Petrou Rally & Thivon 250

Abstract

It is fact that the base of the macroeconomic assumptions that are part of the nowadays theories about economics and are being considered for taking decisions for a company or an organization are based on old fashionated principles that used to seem logical by the view of well educated researchers by the years. Those assumptions have actual affect until now on the most of their applies, but once you study those a little bit more abstract and try to apply them on modern engineering based ecosystems you will fairly easy notice conflicts with engineering principles and theories that are also at least the same important. Some examples may be in the wide from the Turing machine to crypto currencies and quantum computing. Conflicts commonly occurre in the topic of productivity where different standards have been
set in each case. We could easily notice the minimum occurrences and affects of the bottleneck phenomenon on modern well designed infrastructures where it is fact that almost every single possible occurrence can be bypassed and minimize its affect. Another parameter that should be applied is the probability and the randomness of some effects that they may affect a production environment, such as noise, system faults, downtimes and in some special cases the random character may be part of the design.

Keywords: macroeconomics, engineering, cryptocurrency, bottleneck, 6 sigma
Study of Biomedical Sensory Systems by Nonlinear Optical Spectroscopy

P. Kervalishvili¹, T. Berberashvili¹, T. Bzhalava¹, A. Tadjeddine², C. Humbert²

1) Advance Science and Technology Centre of Modern Engineering Physics in Georgian Technical University;
2) Laboratoire de Chimie Physique in University of Paris Sud

Abstract

Microorganisms are the microscopic, single cell formations. They are in the soil, in the water, in the air, on the surface of living organisms and in the internal organs. The viruses are different from other microorganisms because they are the only alive organisms, with no cellular construction. In the lifeless nature, they don’t show any features of live organisms. Unlike most living things, viruses do not have cell that divide; new viruses are assembled in the infected host cells of human, animals, or plants. Because of viral breeding the, host cell dies. There are especially viruses which are breeding in the cell of the bacteria.

Viruses spread in many different ways. Just as many viruses are very specific as to which host species or tissue they attack, each species of virus relies on a particular propagation way.

The microorganisms in the air may exist in three phases of bacterium aerosol-drop-shaped, drop-nuclear and dusty. We call bacterial aerosol as a physical system which consists of tiny solid or liquid particles in the gaseous environment. The existence of the bacteria in the air for a short time is quite enough to transmit pathogens and viruses from diseased person to the healthy one and, as a result, the propagation of the epidemic occurs. The discovering of microbes and carrying out fast methods of indication promote to uncover microorganisms as in the air, in the water and soil.

The multifunction destination of nano-sensors and their diversity is the result of the growing development of nano-technology. The application of this technology in the medicine leads us to the new direction called nano-medicine. The interface between nano-systems and bio-systems is emerging as one of the broadest and most
dynamic areas of science and technology, bringing together biology, chemistry, physics, biotechnology, medicine, and many areas of engineering.

The ability to detect rapidly, directly, and selectively individual virus particles has the potential to significantly impact healthcare, since it could enable diagnosis at the earliest stages of replication within a host’s system. Simultaneous acquisition of the vibrational and electronic fingerprints of molecular systems of biological interest, at the interface between liquid media, or at the air/solid, air/liquid interfaces in conditions similar to those encountered in nature or in model environments, requires the use of sensitive and specific spectroscopic probes. Such a characterization is difficult to achieve with conventional linear optical spectroscopies due to their rather poor sensitivity to the low number of molecules (Raman) or their maladjustment to water environment (infrared absorption).

We suggest as a solution to this problem the use of the nonlinear Two-Colour Sum Frequency Generation Spectroscopy (2C-SFG) that meets the desired spectroscopic requirements.

We propose to probe membrane models of various forms and in various environments: (i) lipid monolayers and bilayers; (ii) deposited on substrates, floating on water as Langmuir layers and at a liquid-liquid interface; (iii) alone and in interaction with molecules, including peptides and proteins; (iv) submitted to controlled stress (chemical, pH, electrochemical potential).

The promising tool is SFG. Contrary to the previous ones, this second order nonlinear process is intrinsically specific to an interface, and involves no contribution from molecules in a centrosymmetric bulk, in solution or in gas phase. It has been extensively applied to solid interfaces in vacuum, controlled atmosphere and electrochemical conditions.
Strengthening Security of Nanosensory Networks by Quantum Methods.

P.Kervalishvili$^{123}$, M.Khachidze$^2$, A. Chirakadze$^1$, L. Chakhvashvili$^1$, G. Besiashvili$^2$, M. Archuadze$^2$, P. Yannakopoulos$^3$

1)Advance Science and Technology Centre of Modern Engineering Physics in Georgian Technical University; 2)Quantum Information Science and Technology Group of Iv.Javakhishvili Tbilisi state University; 3) Technological Education Institute of Piraeus

Abstract

In the last decade quantum information theory and technology evolve and show their great potential. There are a set of problems for which it's more efficient and even not possible with classical communication to solve than with quantum equivalent. The best known example is Quantum Key Distribution (QKD), though there are quantum non-locality (entanglement), quantum teleportation, communication complexity and many more.

Quantum communication relies on some phenomenon like entanglement which gives plenty of opportunities, but at the same time it's very tricky. Present knowledge lets us define entanglement as a property of quantum system when two or more objects are linked together (their quantum states) and you can't refer to one without referring to the others, so if you measure one, others are determined as well. More than that, no matter how far they are (physical separation), measurement occurs instantly, faster than the speed of light. It's like an instant communication which would be great, so that we could reduce the dependency on distance, but unfortunately lack of knowledge does not allow us to realize its potential. Inside the quantum world, entanglement is some sort of communication because the separated states depend on each other or have a connection. The result of communication is the “immediate” transmission of one of the qubit’s state to others.

To evaluate the computational complexity of an algorithm, either classical or quantum, it is necessary to specify a set of elementary operations, the number of which used during the computation quantities the complexity.
Quantum algorithms prove that quantum approaches are more flexible than classical in complex environments like everyday life (when process goes exponentially). This kind of algorithm have suppressed any hope that encryption base on discrete logarithm (factoring large numbers) can be resistant against quantum computing, so we have to replace asymmetric encryption algorithms with novel quantum approaches. Though it was proved that symmetric algorithms perform quite well in quantum environments, similar approaches do not give effective use in quantum asymmetric world. Instead of pure asymmetric key distribution there are some thoughts about quantum asymmetric cryptography using entangled key pairs. This approach effectively uses the physical security of channel, so to estimate private key with high probability eavesdropper needs large amount of public keys. The disadvantage of this approach is the need of trusted issuer of keys, who generates private and public key pair and sends it to authenticated users securely.

On the basis of this approach the new methods of possible improvement of nano micro sensory systems security were discussed. Multiparametral and multifunctional nature of sensors and their networks was taking into account. Nano micro sensor systems integrate and interface multiple core technologies and related devices to implement a variety of functions. They can be implemented through scalable homogeneous, or heterogeneous hardware integration technologies, in order to advance the miniaturisation, functionality and reliability of the sensor, processor, actuator and communication functions. Power autonomy (consumption and supply) is a common issue. In the medium term, there is growing industrial interest to integrate nanosensors in smart (intelligent) microsystems, mainly due to an increase in sensitivity, device simplification and associated cost reduction.
An analysis based on Discrete Wavelet Transform of two dimensional gel electrophoresis images with application in proteomics

K. Karathanou\textsuperscript{a}, A. A. Fotopoulos\textsuperscript{a}, A. Papathanasiou\textsuperscript{a},
D. Nikolopoulos\textsuperscript{b}, I.P. Giannakopoulos\textsuperscript{c},

\textsuperscript{a} Information Technologies in Medicine and Biology, Department of Informatics and Telecommunications, National and Kapodistrian University of Athens, Greece
\textsuperscript{b} Technological Education Institute (TEI) of Piraeus, Petrou Ralli & Thivon 250, GR122 44, Aigaleo, Greece
\textsuperscript{c} School of Medicine, University of Crete, 71003 Voutes, Heraklion, Greece

Abstract

Two-dimensional (2-D) electrophoresis of proteins has preceded and accompanied the birth of proteomics. 2-D electrophoresis is a powerful and widely used method for the analysis of complex protein mixtures extracted from cells, tissues and other biological samples. Image analysis tools have matured into a number of established commercial packages and freely available programs that underpin research in expression proteomics. In this work, we present an analysis of Discrete Wavelet Transform (DWT) of two-dimensional gel electrophoresis images. DWT as a mechanism of linear transformation for the separation of the data into different frequency components, is used for the joint observation of results with other widely accepted methods.

Keywords: 2D gel electrophoresis, image analysis, discrete wavelet transform, proteomics
Background Emr Measurements in Zante and Lesvos Islands, Greece

D.N.Nikolopoulos¹, S.Kottou², D.Koulougliotis³, E.Vogiannis⁴, E.Petraki¹, I.P.Giannakopoulos⁵, N. Gorgolis¹, G.Kefalas, S. Potozi, R.S.Lorillia, N.Temenos¹, D.I.Tseles¹

¹Technological Education Institute (TEI) of Piraeus, Petrou Ralli & Thivon 250, GR-12244, Aigaleo, Greece
²Medical School-University of Athens, Mikras Asias 75, GR-11527, Goudi, Athens, Greece
³Technological Educational Institute (TEI) of Ionian Islands, Neo Ktirio, Panagoula 29100, Zakynthos, Greece
⁴Evangeliki Model School of Smyrna, Lesvou 4, GR-17123- N. Smyrni, Greece
⁵School of Medicine, University of Crete, 71003 Voutes, Heraklion, Greece

Contact person: dniko@teipir.gr

Abstract

This study's main purpose was to investigate extremely low-frequency magnetic fields and radiofrequency electromagnetic fields as possibly carcinogenic to humans based on the suggestion of the International Agency for Research on Cancer (IARC).

Measurements were taken in a variety of environmental locations, mostly houses and workplaces in urban, suburban and rural areas, outdoor and indoor, in the islands of Zante and Lesvos.

Emphasis of the electromagnetic field measurements was placed on mobile frequency (RF) sources, wireless technologies and DECT telephony. In different location points a total number of 208 measurements were taken in Zante island and 355 measurements in Lesvos. In Zante, measurements were performed using Antenessa and Aaronia spectrum analyzers (HF & NF) which show the exact frequency and the signal strength of the sources including RF and EMF. All possible sources of background EMR were investigated, namely in the frequency area between 9 KHz – 1.5 GHz. In Lesvos, measurements were taken with NARDA EMR-
300 RF survey meter. In Lesvos, a map of the measurement points was created and analyzed by GIS software.

On the electrical field the maximum values were below 5V/m, however increased values of up to 3 kV/m were addressed near high voltage power transmission lines. On rural areas measurements of the electric field values were approximately 3–5 times lower than those existed in urban areas. In most cases the magnetic field values were lower than 2μT. In some occasions some of the measurement values up to 6μT were occasionally observed.

In conclusion the results of the study showed that Wi-Fi modems, mobile phone and DECT facilities when in use, expose people to high electromagnetic radiation although the intensity greatly depends on the distance and the functionality of the devices.
Specification of the industry’s necessities in nowadays – the role of Tempus activities to the connection of the industry with the education

G. Priniotakis, D. Tseles, P. Yannakopoulos, E. Gialinou, M. Sigala

Abstract

In the frame of the UNITE Tempus project, the main intention is to connect the necessities of the industry with the higher educational system in Belarus. Aiming to achieve this, is taking in mind the existing systems in the European countries taking part at the project, like Greece, Belgium, Spain, Portugal. Until now, there have been implemented some activities of the project, which contribute to the formation of the first view of the textile industry’s necessities. It is about the following reports: “Identification and analysis of good practices of cooperation between HEI and industry”, “Good practices for Liaison offices”, “Needs analysis for liaison services in Belarus”. In the present paper are analyzed all the data derived from the before-mentioned reports in order to be channeled to the activities of the project which follow.

Keywords: textile industry, European projects, education, liaison offices