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## APPLICATION OF APPARATUS – NOISENESS ANALYSER ON LABORATORY CONDITIONS

**Summary.** Noise and vibration are concomitant work processes, all machinery possibly different production machines or vehicles. Vibration and noise of the working environment can not be completely eliminated, but they can be reduced to an acceptable value. Our goal is to reduce vibration and noise just using pneumatic flexible shaft couplings. To measure use hand-held analyzer type 2250. The article describes a device for measuring noise which is located at our workplace. It's a sound analyzer fourth generation. This device allows different operating modes and can be extended to other work moduls.

**Keywords:** flexible pneumatic coupling, hand-held analyser, noise, dynamic measurements, mechanical system, experimental measurements.

## ZASTOSOWANIE URZĄDZENIA DO BADANIA NATĘŻENIA HAŁASU W WARUNKACH LABORATORYJNYCH

**Streszczenie.** Hałas i wibracje są zjawiskami towarzyszącymi procesom pracy we wszystkich urządzeniach oraz maszynach produkcyjnych, czy też środkach transportu. Nie da się całkowicie wyeliminować wibracji i hałasu, ale możemy je zredukować do dopuszczalnej wartości. Naszym celem jest zmniejszenie wibracji oraz hałasu właśnie przez zastosowanie elastycznych sprzęgieł pneumatycznych łączących wały. Do pomiarów użyjemy ręcznego analizatora dźwięku typu 2250. Artykuł przedstawia urządzenie do pomiaru hałasu, które znajduje się w naszej pracowni. Jest to analizator dźwięku czwartej generacji. Urządzenie to ma różne tryby pracy i można je rozbudować, dodając kolejne moduły robocze.

**Słowa kluczowe:** elastyczne sprzęgła pneumatyczne, analizator, pomiary dynamiczne, hałas, układ mechaniczny.

### 1. INTRODUCTION

At the Department of Machine Design, Transport and Logistic at the Faculty of Mechanical Engineering, there is long term research related to the development of the flexible pneumatic couplings and capturing dangerous torsion vibrations in the mechanical systems by

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an application of those couplings. According to the many authors [1,2,3,4], the most appropriate solution of dangerous torsion vibration capturing is appliance of adequate flexible pneumatic coupling. Mastering this dangerous torsional vibrations can greatly reduce respectively eliminate negative impacts on the environment (vibration, noise) and at the same time protect the individual parts of machinery from mechanical damage.

Measurement of noise and vibration of mechanical systems as technological units is an essential part of the analysis acoustic effects. Evaluation of such systems can be carried in several ways and requirements. Monitoring of mechanical systems is also being made in terms of the dynamic action of the forces. Vibrations of mechanical systems can induce resonance in other parts and components, and to become a strong source of mechanical vibration and noise. Mechanical system works with the application of various flexible couplings and changes its characteristics [5,6].

Vibration and noise are accompanying phenomena workflow all machinery, production machinery vehicles, various household appliances, etc. It can not, therefore, vibrations and noise from the work environment and completely remove, but reduced to an acceptable value.

Noise is called any unwanted annoying and disturbing sound. Noise as unwanted sound spreads in quite a long distance. This is reflected especially in enclosed areas where they are mostly located in various mechanical systems. As a result of this phenomenon active noise and vibration to anyone within range of acoustic and mechanical energy [8,11].

## 2. THE MEASURING APPARATUS

Type 2250 is the innovative, 4th generation, hand-held analyzer from Brüel&Kjser (fig. 1). The design philosophy is based on extensive research which concluded that the instrument should be easy and safe to use, while at the same time incorporating clever features. Type 2250 has been awarded several prizes for its combination of excellent ergonomics and attractive design. Type 2250 can host a number of software modules, including frequency analysis, logging (profiling) and recording of the measured signal. These are available separately at any time - or you can order a fully preconfigured instrument from the factory.

The combination of software modules and innovative hardware makes the instrument into a dedicated solution for performing high-precision measurement tasks, in environmental, occupational and industrial application areas. As a result, you get the functionality you need now, plus the option of opening up for more functionality later - and your investment is securely protected.

Type 2250 has generous hardware and software specifications creating an extremely flexible example, from the traditional uses in assessing environmental and workplace noise to industrial quality control and development Type 2250 is a technological platform for realising measurement applications in a compact and robust hand-held instrument. The device offers a lot of options and different display modes as shown in that fig. 2.



Fig. 1. Hand-held analyser type 2250  
Rys. 1. Ręczny analizator dźwięku  
typu 2250

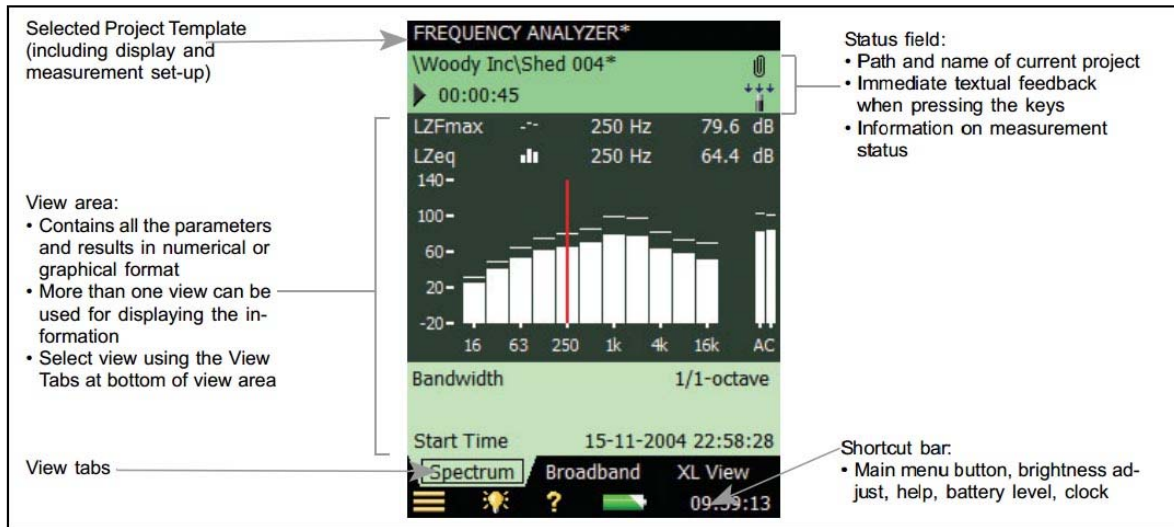


Fig. 2. Typical display when measuring

Rys. 2. Wyświetlacz analizatora dźwięku podczas pomiaru

As a user, you have several ways of tailoring the display to suit your specific needs. However, standard display elements are used to ensure commonality not only across different software modules, but also across different users, setups and preferences.

Type 2250 applies a default colour scheme for the display. This is like most examples in this data sheet. However, the instrument includes several schemes allowing you to make your own choice for outdoor use in bright sunlight (where maximum contrast is needed) and for nighttime use (where no interference with night vision is wanted).

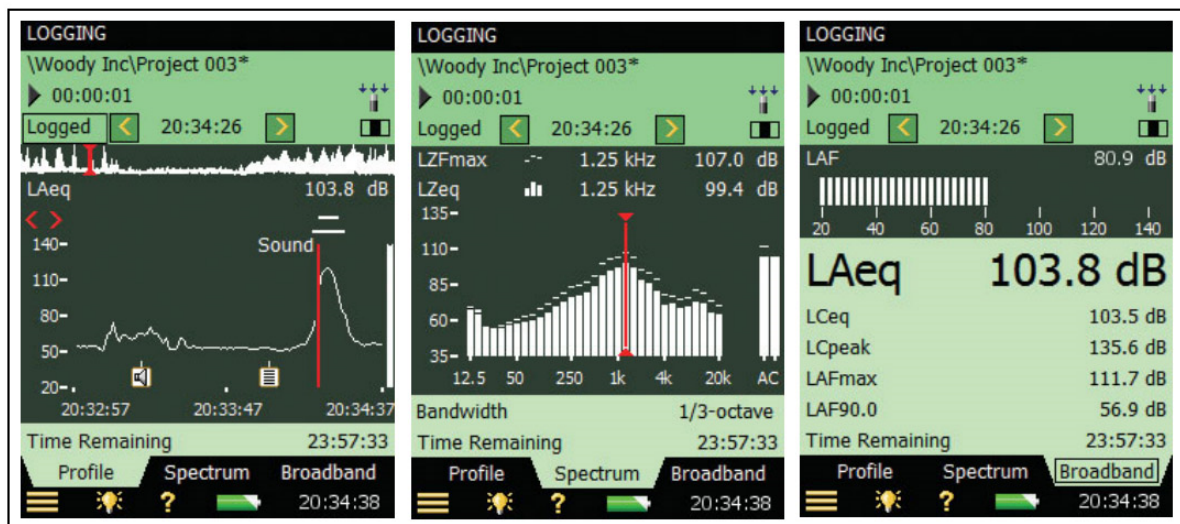


Fig. 3. Profile with on-line sound, current spectrum, and current broadband values

Rys. 3. Profil z hałasem on-line, aktualne spektra oraz aktualne wartości szerokopasmowe

You can view any quantity being measured, either during your measurement, or at any time later. This also includes data transferred to a PC.

In all configurations, Type 2250 offers a variety of views of the same measurement.

These views have no impact on the measurement, but they allow you to see exactly what you want, without interfering with any data. If, for example, you are logging broadband values as well as spectra, you can choose to observe the profile, the time history, the overall or current spectrum, or the overall or current broadband values. The choice of display has no influence on what is measured or stored.

Type 2250 makes a distinction between the measurement made and how it is displayed. Generally, Type 2250 constantly measures all the available quantities in parallel, what you see on the display (*fig. 3*) are the parameters you have selected to see. All the other quantities are measured simultaneously, irrespective of your display preferences.

Fig. 4 we can see the noise values measured mechanical system of hand-held analyser type 2250. We see that the values vary depending on the pressure in the pneumatic coupling from  $100\text{ kPa}$  to  $700\text{ kPa}$  value. Pneumatic coupling is engaged in the mechanical system. It's just an example of measurement whom we pay in our further research.

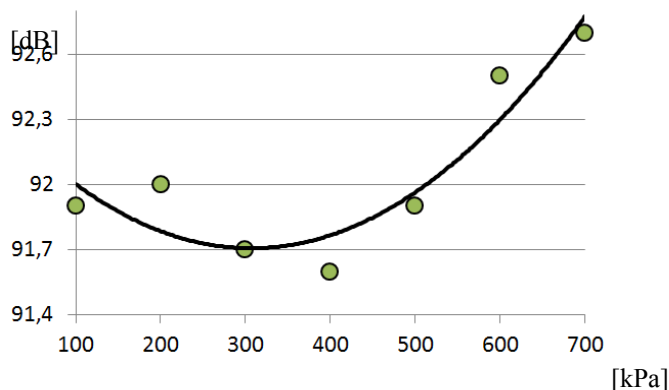
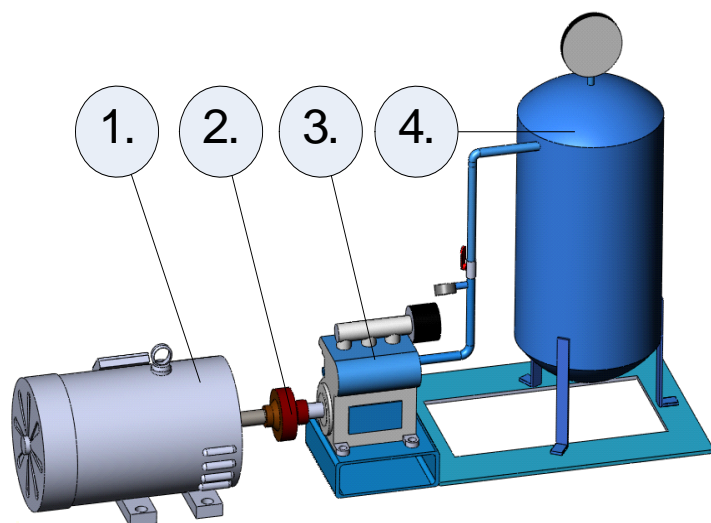


Fig. 4. Example of the measured values of noise using hand-held analyser type 2250

Rys. 4. Przykłady wartości hałasu zarejestrowanych przy zastosowaniu urządzenia hand-held analyser type 2250

### 3. CHARACTERISTICS OF MECHANICAL SYSTEM

The system we used for the measurement is placed in the laboratory of our department.



Studied mechanical system (Fig. 5) consists of a DC motor 1, the flexible coupling 2, Compressor 3, and pressure vessel 4th To simulate the workload of the pressure tank is a flow control valve. For a detailed diagnosis of the mechanical system, we used vibration monitoring system Adash 3600 [2,3], and at the same time sound analyzer from Brüel & Kjær type the 2250th Effective component of evaluating dynamic torque measured by torque sensor type 7394 and measuring apparatus QuantumX MX840.

Fig. 5. Studied mechanical system  
Rys. 5. Badany układ mechaniczny

#### 4. FLEXIBLE COUPLING

In our mechanical systems in which we will explore the noise will be used lift shaft coupling developed in our department. Flexible couplings, except the transmission of torque, it should protect mechanical systems against torsion oscillation not only in a phase of starting and braking but also during the whole working mode. These couplings usually move radial frequency to the lower frequency such as zone of working operations. Significantly reduce the dynamic stress in the mechanical propulsion system. By its flexibility it is able to attenuate the burst of drive and thus protect particular parts against damage.

Experimental measurements are made at flexible two-bellows pneumatic coupling 4-2/70-T-C (fig. 6). This coupling has four tires two-bellows pneumatic elements equally spaced around the perimeter. Gaseous medium is supplied uniformly to all elements of the elastic through the middle [4].

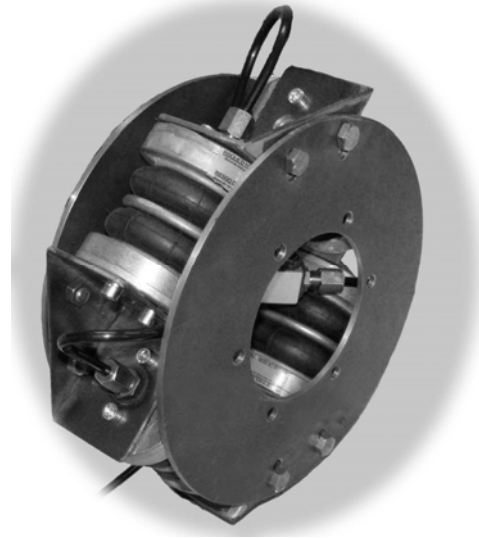


Fig. 6. Flexible two-bellows pneumatic coupling 4-2/70-T-C

Rys. 6. Sprzęgło pneumatyczne z mieszkanymi dwuwarstwowymi 4-2/70-T-C

#### 5. CONCLUSION

Type couplings, flexible material used, or gaseous medium have a significant effect on the mechanical properties of joints, and the entire mechanical system in which they are included. Type of gas has a significant impact because all gases have different physical properties.

In this article, we describe the mechanical systems on which we perform the measurement noise. Noise and vibration are concomitant work processes, all machinery possibly different production machines or vehicles. As we have written so vibrations and noise from the work environment can not be completely eliminated, but they can be reduced to an acceptable value. Our goal is to reduce vibration and noise just using pneumatic flexible shaft couplings. One such pneumatic shaft couplings I also describe in this article. To measure I use hand-held analyser type 2250. It's a sound analyzer fourth generation. This device we have in our department. Allows different operating modes, it can be extended to other work packages and I described it in detail in chapter five. My goal is to show that the use of flexible pneumatic couplings is the right solution to reduce vibration and noise in various mechanical systems.

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