Modern Tendencies Of Recording And Acoustic And Technical Solutions Of The Modern Concert Hall

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The Vth international festival of symphonic music, which recently took place, showed the active cooperation of the participating countries in musical culture. A Memorandum of cooperation was signed between more than ten countries. The festival was interesting and fruitful. Many events were held, one of which was the international scientific and practical conference "Traditional music: problems of history and theory", which was attended by guests from different countries, many of whom later held master classes for teachers and students of the State Conservatory of Uzbekistan. Master classes were held by: composer Balnura Kydyrbek (Kazakhstan); composer, people's artist Rashid Kalimullin (Russia); musicologist Khurshed Nizomov (Tajikistan); composer Aydin Samimi Mofaham (Iran); Andrian Petuta (Australia) and others. The master classes were aimed at studying and exchanging experience in the field of composing and musicological art of the participating countries, exchanging opinions and culture, strengthening ties, and studying new works.

The central event was the performance of original works by composers from foreign countries and Uzbekistan. The works of Do Hong Kuan (Vietnam), Rashid Kalimulin (Russia), Abdurakhmon Toshmatov (Tajikistan), Jan Meisl (Czech Republic), Balnur Kydyrbek (Kazakhstan), Felix and Dmitry Yanov-Yanovsky, Rustam Abdullayev, Mustafa Bafoev, Avaz Mansurov, Khurshida Hasanova, Oydin Abdullayeva, Viktor Khandamyan and others were performed in this way. At the end of the festival participants and guests were filled with impressions and inspired to new creative tasks.

Various concert halls were provided for concerts, the main ones being the concert halls of the State Conservatory of Uzbekistan. Both the international festival and the halls, where academic music is performed, must meet the new standards and acoustic characteristics for such events. Today I would like to share my practical experience of modern sound equipment systems and acoustic capabilities of halls according to European sound quality standards. This comparison and recommendations will be aimed at improving the functioning of sound recording in
the halls of the Conservatory. The experience will be reviewed based on the recently constructed building of the Music Academy of Zagreb (MUZA), Croatia.

The Academy of music building has two recording studios with analog and digital signal conversion. Each Studio can simultaneously record the signal from the large and small halls. These studios can record two concerts at once with different recording systems in analog and digital signal. A common mixing console that allows you to mix, process and record audio material on modern audio media unites analog and digital studios. In this regard, I would like to recommend combining all the halls into one center to create a modern sound recording at the State Conservatory of Uzbekistan. This center would allow recording in various formats and types of signals. Another goal would be to save all sound recordings and concerts in one database and send them to the music library department for listening in the form of practical (handout) material. Also, this center would allow to save all newly recorded works of composers of Uzbekistan and students of the art of composing in a database that serves both for a resume (portfolio) and for copyright protection (it would improve this field of activity). For example, in the academies of the city of Zagreb, a database has been created in cooperation with Google to store all creative works submitted for exams held at the end of semesters for three years of bachelor's and two years of master's degree. The same system is provided for the faculty staff.

One of the main tasks of forming a modern sound is the transition to new standards of sound quality. Today, modern sound recording functions not only in the Dolby Digital format, but also in the Dolby Surround format. Even today the State Conservatory of Uzbekistan shall switch to sound recording and conducting concerts (playback) in Dolby Surround format. This system enables to listen to and record audio material in a wide format. It will allow upgrading the sound quality to a new level. This system has long been used in European countries not only for professional sound recording, but also to improve the professional qualities of sound engineers. The creation of the Dolby Surround format will allow listeners to feel the full range of musical compositions and groups, and as a result, will open up a new field of
research in Uzbekistan. Such research has been carried out for decades together with the Music Academy and the University of Zagreb.

The Grand hall of the Music Academy is equipped with modern playback technology, which creates a high-quality surround sound. In addition to balanced acoustics, the Surround 7.1 system has been created, which provides artificial acoustics or design aurolization (modeling various types of acoustics using computer music technologies and identifying acoustic problems before building an architecture).[1] The "Quadro" system and Dolby Surround function in hardware studios of the Academy of Music (MUZA), the Croatian national theatre (HNK Zagreb), the studios of the University of Zagreb (SZ), Academy of dramatic arts (ADU), Academy of fine arts (ALU), as well as in all teaching studios of the abovementioned educational and cultural institutions.

The creation of the Dolby Surround system in the halls of the Conservatory will allow hearing the sound stage in a new way, expanding the opportunities for making new creative works in the field of sound engineering and sounding music academic stage. The Dolby Surround system also needs to be integrated in all educational and professional recording studios of the Conservatory. This will enable to learn the sound format after a while and create (record) high-quality music of various styles, genres and directions.

New laboratories shall be established to study sound and formats. For example, the "Acoustics" laboratory was built at the University of Zagreb (SZ). This laboratory is headed by the faculty of “Electrical and computer engineering”, Department of Electroacoustics. To study sound in our country, it is necessary to make a "Sound and acoustics" laboratory based on the European experience to learn sound vibrations, sound characteristics, the origin, propagation and perception of sound, sound formats, natural and synthesized signals. Studying the signal parameters would allow learning more about sound, improving the quality of sound recording, expanding the range of formats, and creating a modern practical school of sound engineering. The establishment of the laboratory would promote the
development of such areas as musical acoustics, electroacoustics, and psychoacoustics.

The Acoustics laboratory of the University of Zagreb consists of two rooms: an acoustic room and an expert room. In the acoustic room, sixteen Yamaha speakers are arranged in a circle, vertically and horizontally (Pic. 1). There are two low-frequency speakers in the center. The room is soundproofed with acoustic foam on the entire surface of the walls and ceiling. Wiring of the speakers leads to the expert room, where sound equipment, switching panels, computer recording technologies, digital workstations (Cubase 8, Nuendo 6, Reaper) are located [5.p.109]. The laboratory has the ability to work not only with musical sounds, but also with noise for audiovisual compositions; a video monitor is located in the center of the acoustic room. When studying the laboratory, sound recordings of small musical bands and surround noise were demonstrated. Listening gave the impression of being directly involved in the performance, as well as being present in a historical or contemporary event.

The acoustics of the designed grand hall have absorbing (absorbers), reflecting and scattering materials over the entire area (Pic. 2). The hall does not have parallel walls, which eliminates standing waves and creates an even acoustic frequency response [2]. Ivica Stamać and Hrvoje Domitrović designed the acoustics in the hall; the shape of the hall is rectangular, with a large stage area and geometric shapes of structures (Pic. 3). The hall can accommodate up to 307 seats without using two platforms, where 4 rows of
seats can be placed. In this case, the spectators’ seats increase, but the stage area allows to place only small musical groups. When placing a Symphonic orchestra, two platforms are used as an additional stage area. Due to the use of platforms, the volume of the hall varies: 1 - 2330 m³, 2 – 2380 m³, 3 - 2540 m³ [3.p.120].

The main indicator of acoustics is the reverberation time. Depending on the size of the hall, the reverberation time for chamber music is 1.6 seconds; for opera performances - 1.4 seconds; for symphonic music- 1.7 seconds, and for drama performances, speech events, and film projections-1.1 seconds [4.p.1385]. This reverberation time was achieved by rotating cylindrical and semi-cylindrical structures on the ceiling, made of solid and fully reflective materials (sound absorption coefficient $\alpha_w$ 0-0.2, and the other half - with high-absorbing $\alpha_w$ 0.9-1). Each cylinder can be individually rotated and thus adjust the acoustics. Along the edges of the orchestra pit there are reflective materials to direct the first reflected signals into the auditorium, adding additional sound density to the direct signal.

When listening to the soundcheck in the hall, you can hear a clear diffusion of the field, good clarity of the texture and timbre of musical instruments and voices.

The small hall is made in the form of a rectangular structure. All surfaces are made of absorbents in the form of reflective and absorbing materials. Such blocks (traps) can change the localization, which can significantly change the acoustic properties of the room. The function of such blocks is to cover the reflecting surfaces with absorbing mobile sheets or, conversely, to create a reflection plane. In the small hall, soloists, small groups and a chamber orchestra perform well. Adjustable wall surfaces allow you to change the acoustic properties of the hall, reverberation processes, sound wave propagation, and spatial impression.
This technology can be applied in the small hall of the State Conservatory of Uzbekistan, which will facilitate the work of a sound engineer with acoustics, sound recording and sound spreading. Also, the ability to change the acoustic characteristics of the hall will allow performers to feel comfortable with their performance.

Microphone equipment in the halls is placed on ramps, which are located around the perimeter on the ceiling identical to the stage area. Microphones can record from any point of the stage both a solo instrument and a group of instruments or a band. In addition, when recording audio, video shooting and lighting options are provided. Light and color control is performed in the sound recording facility. The variety of the microphone park includes AKG, Neumann, Audio-Technica and other companies.

As already noted, there are different formats for recording, so the Studio uses speakers for Dolby Digital, Quadro, Dolby Surround formats, as well as for listening to sound recordings. For each plan, a different type of sound monitors is used (close-up, standard stereo panorama - Event, for long-distance - Genelec, for long-distance with a narrowed panorama - Avantone). The following speaker companies are used: Event, Genelec, Avantone, Yamaha, Digidesing, MAudio. Sound producing equipment of the same quality should be applied in the halls and studios of the Conservatory, which will facilitate the adjustment of the sound material according to the main criteria for quality of the phonogram.

Analog and digital studio mixing consoles help the exchange of information during recording and playback. The Studer VISTA V, Soundcraft SI IMPACT, PreSonus, Yamaha 03D, Sony and other consoles provide their capabilities and specifications in recording a high-quality signal. Tascam and Yamaha processing systems make the arrangement of the signal with more precise settings and parameters.

The recording studio is equipped with various types of audio equipment for high-quality editing, switching, processing, recording, and signal playback.
Based on the above, it is concluded that the recording, processing and reproduction of a high-quality sound requires the interaction of sound equipment, experimental processes of sound recording and acoustic properties of the room, a center for archiving and storing phonograms, the variety of acoustic arrangements depending on the band, genre and stylistic features of a composition, as well as the use of modern sound recording and playback formats.

References