Press Release
Jan 16, 2006 | ID: 5099

Volvo Audio - Volvo Cars Develops Premium Sound
For A High Quality Audio Experience

- Volvo Cars develops its own audio system
- Audio systems and cars are created together for optimal function and listening experience
- Collaboration with world-leading brands and manufacturers, such as Dolby and Dynaudio

The first audio unit that bore Volvo's name was presented back in 1969. Since then, Volvo Cars, together with leading manufacturers, has developed its own audio systems and introduced a number of world-firsts. Among other things, the world's first RDS radio was in a Volvo, as was the first system with Dolby Pro Logic Surround. And the second generation, Dolby Pro Logic II Surround, was developed in conjunction with the Volvo XC90.

“A high-class sound system is essential to the total premium experience in Volvo cars,” says Lex Kerssemakers, Senior Vice President Brand, Business & Product Strategy. “We know from interviews with our customers that audio is high on the list of priorities when a car is purchased.”

Independent research shows the same results. A high-class audio system ranks among the five most important functions in the car. And 79 percent of automobile customers feel that sound quality is “very important” when they choose an audio system (J.D. Powers 2002 and 2003). This puts great demands on the manufacturers of cars and sound systems.

Volvo a world leader
Volvo Cars, which develops its own sound systems and components, has an ambition to be at the absolute forefront with respect to sound quality. Volvo’s top-of-the-line system, Premium Sound, was developed with very high demands on sound quality and with the use of advanced technology. The latest generation of Premium Sound has a high-class digital class D amplifier, Dolby® Pro Logic II Surround, and loudspeakers from the Danish company Dynaudio®.

The foundation for the Premium Sound system of today was laid in the mid-1990s when the previous generation of the Volvo C70 was developed. It was an explicit objective for the car to have the world’s best factory-fitted audio system.

Loudspeakers from Danish Dynaudio
The first step was to find the best possible loudspeakers. The members of Volvo’s audio group had actual experience from building loudspeakers and had determined that the Danish company Dynaudio produced drivers that were as close as one could come to being ideal.

Dynaudio is one of the world’s absolutely foremost developers and producers of loudspeaker systems, for both home use and in professional studios. England’s BBC is among the companies that now exclusively use Dynaudio as reference loudspeakers. According to Dynaudio themselves, the key to their success is producing their own drivers, with the aid of advanced technology and an uncompromising choice of materials.

“At Dynaudio, we have never felt that there has been room for compromises,” says Wilfried Ehrenholz, Dynaudio’s founder and owner. “And our customers are evidently prepared to pay for high-class technology.

“When we set out to build the audio system for the first C70 model, it was natural for us to contact Dynaudio,” says Hans Lahti, a technical specialist in the Audio department at Volvo Cars. “But since Dynaudio was an untested supplier to the automotive industry at the time, we compared them with other loudspeaker manufacturers. It soon became evident that the Danish speakers were by far the best.”
Built the car around the loudspeakers
Thanks to Dynaudio’s superb basic design and high building quality, only small modifications were necessary for the special acoustic environment in a car. This made the prerequisites the best imaginable for the car’s designers.
“The task confronting our designers was for the first time, with slight exaggeration, to build a car around the loudspeakers instead of integrating loudspeakers into an existing car,” says Hans Lahti. “And the strategy was for our best sound system, Premium Sound, to be marketed as a system from Volvo with loudspeakers from Dynaudio.”

“Volvo was the first car manufacturer to see the potential in a genuine Premium Sound system,” says Wilfried Ehrenholz at Dynaudio. “And we soon realized that our companies shared the passions for quality and perfection. This also formed the basis for more long-term collaboration, which for Dynaudio has contributed to deeper knowledge of sound in a car and also to rapid growth. This, in turn, has resulted in the advantages of economies of scale and increased possibilities for investing in continued development and focusing on quality.”

After the introduction in the first-generation C70, an accessory system was developed for the then existing S70 and V70 models, based on Dynaudio loudspeakers. As of 2003, they were also available in the Volvo S80.

Volvo calibrated the sound
However, good loudspeakers do not tell the entire story behind good sound. The car itself presents a difficult challenge. The limited and irregularly shaped interior space means that the loudspeakers are actually located too close to the listeners, and are also placed at different distances. This makes it difficult to achieve a well-spread, natural stereo pattern. Furthermore, the car’s interior, with a combination of hard and soft surfaces and varying surface structures, makes sound reproduction difficult to control. In addition to this, the experience is also affected by all of the background noises from the car, the road, and the wind.

“But on the other hand, we are familiar with the space and the audio system,” says Hans Lahti. “We also know where the listener is sitting, which simplifies matters when developing and fine-tuning the system. And it is very much a question of fine-tuning. We are probably the only car manufacturer who calibrates the sound in the car ourselves.”

Using digital signal processing (DSP), the sound is adapted to the shape of the interior and the location of the loudspeakers. DSP technology is also used to fine-tune the tone curve, thereby contributing to natural sound character.

A panel of listeners with professional ears
In addition to measurements, a great deal of time is devoted to active listening.

“One must listen subjectively to attain the right sound,” says Hans Lahti. “The ear is a very sensitive instrument and we use professional ears for our sound tests. We have an exclusive panel of listeners at Volvo Cars, consisting of people with extensive experience of sound in cars, and whose hearing is checked regularly.”

Volvo also gets valuable feedback from customers in conjunction with our product clinics, and also in the form of letters and e-mail from car owners.

Volvo involved in developing surround systems for cars
First-class loudspeakers were not the only distinguishing feature of the first-generation Volvo C70. It was also the first car in the world that had a factory-fitted audio system with Dolby Pro Logic Surround. This technology, which was initially developed for home cinema systems, converted two-channel sound to a more natural four-channel listening experience (left, right, centre, and surround). The adaptation of the system to cars was the result of collaborative efforts between Volvo Cars and Dolby Laboratories.

“It began with an internal special assignment in conjunction with the project planning for the first C70 generation,” says Hans Lahti. “We wanted to determine if it was possible to improve the stereo listening experience in a car. Was it possible to circumvent the problem of always sitting close to the loudspeakers on one side of the car, which was at the outer edge of the stereo sound pattern?”

At that time, home cinema systems were a relatively unknown concept. However, there was
expertise on multi-channel sound for cinemas in Volvo's audio group, as well as experience from previous tests with four-channel stereo.

"We tested a Dolby Pro Logic decoder from a cinema system combined with a centre loudspeaker," says Hans Lahti. "And this resulted in an obviously better sound pattern, with a clearer "image" of the soloist's position on the stage."

After these tests, it was natural to contact Dolby Laboratories in San Francisco. Since their start in 1965, Dolby had worked with the development of high-quality sound systems and advanced surround technology for cinemas, home cinema systems, etc. This contact revealed that Dolby had also conducted tests in cars. Among other things, they had built a prototype system in a Volvo car.

"So collaboration had begun without any of us being aware of it," says Hans Lahti.

**Dolby Pro Logic Surround in the first-generation Volvo C70**

Through combined efforts, Dolby's decoder was adapted to the conditions in the cabin of a car. Among other things, this meant that the centre of the soundstage could be moved laterally from the centre of the car to a place directly in front of the listener, regardless of whether he/she was in the driver's seat or on the passenger's side.

Collaborative efforts between Volvo and Dolby were successful and when the first C70 model was introduced in 1997, it also marked the premier of a factory-fitted surround system in a car. The listening experience offered by the car was greatly appreciated and in 2001, Volvo's Premium Sound system was given the "Best of the Best 2001 award" by the Robb Report in the United States. The Surround system was subsequently also made available in other Volvo models.

"The joint efforts between our sound technicians and Volvo's have been very successful," says Martin Lindsay, Director of Business Development for Automotive Entertainment at Dolby Laboratories. Together, we have learned a great deal, which has led to continued collaboration and a number of innovations. One example is the solution using the unique centre loudspeaker, which in one stroke ended the war between the driver and the passengers over the Balance control."

**Volvo XC90 first with Dolby Pro Logic II Surround**

When Dolby Laboratories' and surround sound veteran, Jim Fosgate wanted to develop the second generation of surround sound, Dolby Pro Logic II, Volvo was a natural partner. This was in conjunction with the development of Volvo's first SUV, the Volvo XC90. The car was to have seven seats, divided into three rows, and it was important for the passengers sitting at the rear to also have a natural sound experience.

"Jim Fosgate had fitted his own 1990 Lincoln with a prototype system for 5.1 channel surround sound derived from a two-channel stereo source, based on an enhanced decoder for surround sound," says Hans Lahti. "Test listening in his car was a very positive experience. The sound was very natural and open, with a great deal of width, even in the rear seat."

The finished product was a unique surround processor that works digitally, and essentially functions equally well for different types of music. Through Volvo's participation, the processor was adapted from the outset to the conditions in the car, and the Volvo XC90 became the first car in the world with the second generation of Dolby Pro Logic – Dolby Pro Logic II Surround.

"Dolby Pro Logic II Surround reproduces music in a natural way, with a wider soundstage in the front seat and improved stereo effect and full bandwidth in the rear seat," says Hans Lahti. "Furthermore, the sound from the front and rear loudspeakers is mixed into a more natural whole. Even Jim Fosgate was positively surprised when he heard how good the XC90 audio system sounded."

"Volvo's uncompromising attitude towards high-quality audio entertainment corresponds well with our own," says Martin Lindsay of Dolby Laboratories. "Our brands complement each other beautifully and the combined technical know-how contributes to providing the car owner/listener with a more genuine sound experience."

**Efficient class D amplifier**

In order to further improve the audio systems, Volvo cars who already had an established cooperation with Alpine, introduces a digital class D amplifier. The first car with this new technology is the all new Volvo C70. The advantages with an amplifier of this type is the low current consumption combined with a high degree of efficiency. This also means that it develops less heat
than an analogue amplifier. It can also be made more compact. All of this is important when an amplifier is to be used in a car. But there are also difficulties to be overcome.

“High frequency electrical interference in the car can cause problems with a class D amplifier,” says Hans Lahti. “This is something that we solved together with Alpine and Danish Bang & Olufsen PowerHouse a/s and their innovative ICEPower® technology. And the result has been very good. The primary advantage is the amplifier’s very high damping factor, which makes it possible to enjoy pure and powerful sound all the way down to the deepest bass tones.”

**Sound quality before features**

Collaboration with a prominent supplier is an important element in the development of Volvo’s sound systems. However, Volvo is responsible for setting the requirements and for the adaptation to the cabin of a car. And the important thing is the way in which sound is perceived in the car.

“It is quite evident that we prioritise sound quality,” says Hans Laht. “Some manufacturers offer a greater number of technical features and the possibility of making more advanced settings, but we feel that anyone should be able to use the audio system and get the most out of it.”

Therefore, many functions are fully automatic in Volvo’s audio systems, such as the loudness control and regulating volume and bass in relation to the car’s speed. In the new Volvo C70, which was introduced in 2005, sound is also regulated automatically when the convertible top is up or down.

“It is a matter of making things easy and convenient for the driver,” says Lex Kerssemakers. For this reason, we have also designed our sound systems with large controls, an easy-to-read display, and a logical interface. And this is particularly important for Volvo, because ease-of-use also contributes to driving safety.”

50220/KH

Descriptions and facts in this press material relate to Volvo Cars’ international car range. Described features might be optional. Vehicle specifications may vary from one country to another and may be altered without prior notification.

---

**Media Contacts**

**Per-Åke Fröberg**
Director Volvo Cars Heritage
Volvo Car Group
Phone: +46 31 3257654
per-ake.froberg@volvocars.com

---

**Related Images**
Volvo Audio – Volvo Cars Develops Premium Sound For A High Quality Audio Experience

Volvo has now combined high-end audio components with its new generation of car models, creating a unique driving experience. The C70 serves as an example in this regard.

“High frequency electrical interference in the car can cause problems with a class D amplifier,” says Wilfried Ehrenholz of Dynaudio. “And the result has been that the development of an audio system for cars has been a major challenge. It is even more difficult than developing audio systems for music listening at home, because the car presents different requirements. However, good loudspeakers do not tell the entire story behind good sound. The car itself presents a whole new set of challenges.”

The task confronting our designers was for the first time, with slight exaggeration, to build a car around the loudspeakers instead of integrating loudspeakers into an existing car,” says Hans Lahti. “The finished product was a unique surround processor that works digitally, and essentially as a computer. With an ordinary car, you listen to the sound from the dashboard, while with our audio system, you experience the sound as if it were coming from right in front of you. Thanks to Dynaudio's superb basic design and high building quality, only small modifications were made to its design in order to make it suitable for our purposes.”

First-class loudspeakers were not the only distinguishing feature of the first-generation Volvo C70. The car's surround sound system was an outline for Dolby's Pro Logic II, a system that was subsequently developed to create an enjoyable listening experience for passengers in motion. The car's interior, which has many hard and soft surfaces, makes it difficult to achieve a well-spread, natural stereo pattern. Furthermore, the car's interior, which is divided into a front and rear section, makes it difficult to achieve a natural stereo pattern. The result is that the sound system was designed in a way that could be controlled from the driver's seat and the rear seat could be controlled separately, so that passengers could adjust the sound to their liking.

Olufsen powerhouse a/s and their innovative ICEPower® technology. And the result has been a surround sound system that not only sounds great, but also does not suffer from the problems that arise from the car's interior. The manufacturer behind the ICEPower® technology has been known for its high-quality audio components, and the Volvo C70's surround sound system is no exception. The system is capable of providing a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality. The system is also capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality. The system is also capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality.

Dolby has worked on surround sound for the film industry for over 30 years, and the technology developed by Dolby for the car industry is no exception. The system is capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality. The system is also capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality.

The finished product was a unique surround processor that works digitally, and essentially as a computer. With an ordinary car, you listen to the sound from the dashboard, while with our audio system, you experience the sound as if it were coming from right in front of you. Thanks to Dynaudio’s superb basic design and high building quality, only small modifications were made to its design in order to make it suitable for our purposes. The downside of not having any other cars on the road, is that the sound system suffers from the problems that arise from the car’s interior. The result is that the sound system was designed in a way that could be controlled from the driver’s seat and the rear seat could be controlled separately, so that passengers could adjust the sound to their liking.

High frequency electrical interference in the car can cause problems with a class D amplifier,” says Wilfried Ehrenholz of Dynaudio. “And the result has been that the development of an audio system for cars has been a major challenge. It is even more difficult than developing audio systems for music listening at home, because the car presents different requirements. However, good loudspeakers do not tell the entire story behind good sound. The car itself presents a whole new set of challenges.”

The task confronting our designers was for the first time, with slight exaggeration, to build a car around the loudspeakers instead of integrating loudspeakers into an existing car,” says Hans Lahti. “The finished product was a unique surround processor that works digitally, and essentially as a computer. With an ordinary car, you listen to the sound from the dashboard, while with our audio system, you experience the sound as if it were coming from right in front of you. Thanks to Dynaudio’s superb basic design and high building quality, only small modifications were made to its design in order to make it suitable for our purposes.”

First-class loudspeakers were not the only distinguishing feature of the first-generation Volvo C70. The car’s surround sound system was an outline for Dolby’s Pro Logic II, a system that was subsequently developed to create an enjoyable listening experience for passengers in motion. The car’s interior, which has many hard and soft surfaces, makes it difficult to achieve a well-spread, natural stereo pattern. Furthermore, the car’s interior, which is divided into a front and rear section, makes it difficult to achieve a natural stereo pattern. The result is that the sound system was designed in a way that could be controlled from the driver’s seat and the rear seat could be controlled separately, so that passengers could adjust the sound to their liking.

Olufsen powerhouse a/s and their innovative ICEPower® technology. And the result has been a surround sound system that not only sounds great, but also does not suffer from the problems that arise from the car’s interior. The manufacturer behind the ICEPower® technology has been known for its high-quality audio components, and the Volvo C70’s surround sound system is no exception. The system is capable of providing a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality. The system is also capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality. The system is also capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality.

Dolby has worked on surround sound for the film industry for over 30 years, and the technology developed by Dolby for the car industry is no exception. The system is capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality. The system is also capable of delivering a clear and balanced stereo sound, with a natural and three-dimensional soundstage. The system is also capable of delivering a powerful bass, which adds to the overall sound quality.