TAE is "True Analog Emulation" - Arturia's exclusive technology which accurately reproduces, tone, waveshape, tuning and other detailed characteristics of an analog synthesizer.

What are the main characteristics and advantages of the TAE technology ?

Better reproduction of analog oscillators
TAE recreates the characteristics of analog oscillators in amazing detail. The transparency and clarity of our analog synthesizer emulations give the musician a freedom to be inspired by classic sounds or explore new textures with the expectation that previous limitations of digital oscillators will not interrupt the creative flow.

Better reproduction of analog filters
Filters are a major element in substractive sound synthesis. It is important to reproduce the exact characteristics of analog filters in the digital domain, as well as the individual characteristics of classics instruments that give them each their characteristic sound.

Implementation of soft clipping
Soft clipping can give the sound more punch and deeper basses, together with limiting the amplitude of the sound. It is another important point that gives analog synthesis its sound and "attitude".

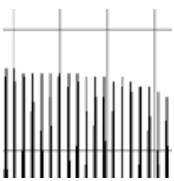
Better reproduction of analog oscillators

TAE oscillators are very similar to their analog counterparts for several important reasons.

One of the main reasons is that they are "free", i.e. they are not sampled or wavetable based - or generated from a 0-point when a note is played. Each waveform generated dynamically, allowing the waveform to be in constant adaptation regarding sampling "cutting" and quantization, avoiding one of the major "tell-tale" signs of digital waveform generation and provides a certain level of "liveness" found in the classic analog synthesizers of the past.

Standard digital synthesizers produce aliasing in high frequencies, and also when using Pulse Width Modulation or Frequency Modulation. TAE allows the production of oscillators that are totally aliasing-free in all contexts (PWM, FM,...), at no extra CPU cost.

Frequency spectrum of a typical software synthesizer



Frequency spectrum of a TAE oscillator

Also, all of our oscillators are highly optimized for the particular working frequency. That means that you can play with an instrument exactly as if you played a real analog synthesizer. Again, the waveforms are not presampled and or regenerated with digital perfection, allowing each note to have a life of its own.

In addition, original analog oscillators were unstable. Actually, their wave shape was always slightly different from one period to another. It is also true that due to analog hardware sensitivity, new period trigger times varied with the temperature and other environmental conditions.

TAE allows the simulation of the oscillator's instability, helping to create warmer and fatter sound.

Original analog oscillators used condensers' unloading to produce common wave shapes (saw tooth, triangle, square). This means that wave forms were slightly curved or distorted in other ways that are considered highly desirable in a musical context. TAE allows the reproduction of condenser's unload in order to give you the original analog sound.

Because TAE oscillators are "free" and "alive", when you play a simple chords with raw oscillators, you don't have a digital impression of "fog" or a "blocked" sound, but you have a pleasant feeling of transparency and clarity.

PWM

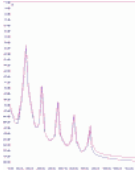
With TAE, you can even produce complex PWM sounds with unprecedented quality and, of course, free of any aliasing. It is true for all the our TAE waveforms (square, triangle, saw...). This produces sounds which are unique on the market, because PWM is very difficult to achieve on certain waveforms like triangle or saw/ramp. We bring you new levels of reality in a virtual analog synthesizer, so that you can achieve new levels of creativity in your music.

Better Reproduction of Analog with Direct Filter Circuit Modeling

TAE® produces the characteristics of the analog filters in the digital domain.

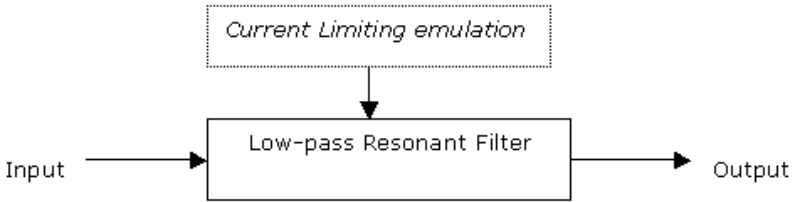
Let's take the Prophet V for example. Due to advances in computer processing power, the Prophet V can now employ direct filter modeling techniques to achieve unprecedented accuracy in the emulation of the original's analog 4 pole low pass filter. By modeling the operation of the individual hardware components of the filter circuit, the warm nuances synonymous with the original's analog sounds are recreated. This graph is a frequency domain plot as just a single example of direct circuit modeling in action; it shows the generation of harmonics at multiples of the resonant frequency when the filter is in self oscillation mode, for both the virtual (blue) and original (red). These harmonics are characteristic of the Prophet 5's filter and are due to the non-linear behavior inherent in its analog circuitry. The harmonics generated add to the richness and warmth of the sound produced by the filter. As a result of the direct recreation of the analog circuitry in the Prophet V, the same characteristics of the sound are present, thus giving the user a truly analog sound.

Harmonics generated by the filter circuit when in self oscillation
prophet 5 original: blue, prophet virtual: red



Implementation of soft clipping

In analog synthesizers, the resonant filter uses a current limiting function, preventing the signal from being too loud (soft clipping).



TAE allows the reproduction of this current limiting function, making the sound more natural. It also allows filters to enter self-oscillation like original hardware synthesizers do.

Also, soft clipping can be a kind of saturation effect, but with a very particular shape. Common shapes can't give good results compared to analog soft clipping which is very particular to output amplification stages of analog synthetisers, and is a critical component to "the analog sound".