TAFONIUS

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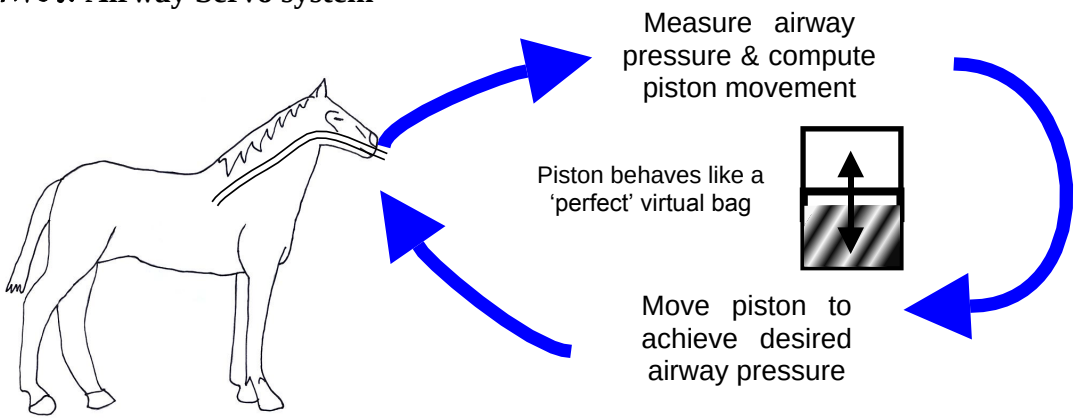
What makes TAFONIUS different from any other ventilator?

Ventilator Design

TAFONIUS does not use any pressurised gas to drive the ventilator. Instead a precision motor system controls piston movement. This results in silent operation, reduced running costs and precise control.
The advanced motor system and motor control means that the piston can behave like a virtual bag during spontaneous ventilation and during the expiratory phase of controlled ventilation. It also means that any part of the respiratory cycle can be executed as a series of phases of varying lengths. Any phase can have a resolution of less than 1/100th second. During normal IPPV for example, only one phase is used during inspiration and this lasts the full length of inspiration. During expiration multiple phases are used each one lasting 5ms (200 times per second). In each of these phases the airway pressure is measured and the piston moved accordingly. Not only does this system provide very smooth control of breathing but allows the implementation of an Airway Servo System to control patient airway pressure:

TAFONIUS: Airway Servo system



If the Servo Airway pressure is set to 0 cm H_2O then the patient experiences no resistance to breathing out, significantly reducing the work of breathing. To the patient it feels like exhaling to ambient with no machine attached. If the Servo Airway pressure is set to 5cm H_2O then the patient experiences 5cm of CPAP or PEEP.
With the combination of multiple phases and an Airway Servo System, any pattern of breathing can be designed and implemented. In time, researchers will develop a library of ventilating modes, patterns, sequences and manoeuvres that can be used to ventilate your patient. No longer will you need to buy a machine to obtain new features.

The concept of the 'Virtual Bag'

TAFONIUS doesn't have a rebreathing bag in the circle so how does the patient breath out against the piston? The answer is that TAFONIUS has a piston that can behave like a piston or behave just like a bag - the Virtual Bag

The Piston as a "Virtual bag"
When the ventilator is idle and a patient is connected, the system behaves like a 'perfect' bag. By this we mean that when the patient breathes out there is no expiratory resistance and when the patient breathes in there is no inspiratory resistance. This action is possible due to the Airway Servo System just described. If the patient breathes out then the piston withdraws, effectively filling. If the patient inspires then the piston moves down, effectively emptying. Because the piston is driven by a motor it is the motor that overcomes the resistance of any piping, valve or soda lime. The patient 'appears' to be breathing into room air with no resistance.

Dictating the size of the "Virtual Bag"
With varying sizes of patients it is beneficial to keep the size of any reservoir bag in the system to a minimum. This then allows rapid responses to changes in anaesthetic or oxygen concentrations. The size of the "Virtual Bag" in TAFONIUS is controlled by the setting of the Tidal Volume control plus a buffer volume. Whenever the piston volume exceeds the upper volume limit, gas is dumped from the system. If the piston volume falls below the lower volume limit then gas is added to the system. At all times the user can still change the fresh gas flow through the vaporiser. The virtual bag minimizes the system volume and allows the circle to act as a closed system unless or until excess gas needs to be removed. With such a system the supplied oxygen gas flow can approach metabolic demand. Typically maintenance rates of just 4ml/kg are used when in this state.

Other features

It is difficult to describe all of the innovative features of TAFONIUS in a small handout such as this.
There is a comprehensive range of monitoring signals displayed on the 15" touchscreen monitor: ECG, IBP, CO2, O2, N2O, AGENT, TEMP. All of these have associated traces, trends and alarm capabilities with visual as well as audible indicators. Patient details and records can be entered at the beginning of an op and are displayed on the screen . The screen organisation is customisable so that traces can be placed where required or removed if not in use. At any time a trend graph of the measured parameters can be viewed so that a trend of Blood Pressure for example can be viewed during a procedure. This data is available when an op has finished in a spreadsheet format.
TAFONIUS uses the concept of Presets for screen organisation and initialisation features. When you are happy with a range of initialisation values and the layout of your screen, save it as your own preset so that you can come back to it at any time. You can save as many setups as you like; one for foals, another for colics and so on.

TAFONIUS is looking to the future

TAFONIUS is capable of controlling many Servo systems at once. We have already seen the precise control offered by the Patient Airway Servo System. This level of control can be extended to other systems such as Oxygen percentage control. Built into TAFONIUS are valve and regulatory controls that allow the production of any FiO2 setting from 0.21 to 1.00 By measuring the inspired oxygen concentration the relative amounts of air and pure oxygen needed for a required FiO2 can be computed and the appropriate amounts added. With measurement of inspired anaesthetic agent concentration, the same process can be used to automatically control the addition of agent to the circuit.

The control tools for these new Servo systems are already built into TAFONIUS and the provision of these raw tools means that new control systems designed in the future can be immediately utilised simply by a change of software. TAFONIUS is an investment in the future, not just a new ventilator!

For more information on the facilities and abilities of TAFONIUS please feel free to ask for a demonstration or put any questions you have to the booth personnel.