

# Pios methanol cycle

By Jörg Weigl

**E-bike with direct methanol fuel cell,  
made between lunch and Sunday tea time!**

The Pios methanol cycle was seen beside the European FUEL CELL FORUM 2009, International Fuel Cell Conference Kultur- und Kongresszentrum Luzern, Lucerne, Switzerland 29<sup>th</sup> June to 2<sup>nd</sup> July 2009. It was created to participate in the Eco- Tour de Ruhr, 18<sup>th</sup> international solar, electric vehicle, pedelec, scooter Rally in Dortmund Germany from 3<sup>rd</sup> to 5<sup>th</sup> July 2009.

Pios is a brand name used for many fuel cell powered prototype vehicles created by Jörg Weigl.

For this purpose the mechanic engineer Jörg Weigl and the electronic engineer Ernst Dilger meet at Schwaikheim near Stuttgart, Germany on a Sunday afternoon to create the Pios Fuel cell cycle. Ernst gave his self designed electric bike and Jörg brought his direct methanol fuel cell system.

Six screws and a few aluminum profiles fix the EFOY direct Methanol fuel cell system from Smart Fuel Cell together with a 5liter Methanol fuel canister to the rack of the bike. The output voltage of the 60watt 24 Volt fuel cell system was adjusted by soft ware setting to fit the charging curve of a seven cell lithium polymer battery with 5Ampere hours.

The motor take the electric energy from the battery, the fuel cell system automatically recharges the battery with constant 60watt power.



Picture: Winner of the Eco tour de Ruhr, fuel cell category; Jörg Weigl

At the Eco tor de Ruhr 2009 the vehicle was the first and one in the category fuel cell, and shows a quite interesting concept for long distances on electric assisted bikes so called "Pedelec". The Pios methanol bike is only a working prototype as a drivable lab to test technology in every day conditions with fun; but the technology could be implemented in a nice looking and fine working top class Pedelec with and daily autonomy of up to 300kilomeeter.



Photo: Jörg Weigl and Ernst Dilger with Pios Methanol Cycle

### Technical specifications:

- Bike: touring bike, standard diamante frame, 28inch wheels
- Motor: LRK Motor (24pol), 3phase AC permanent magnet Motor outrunner. Self made by Ernst Dilger designed for pedelec.
- Motor Power: 24V 18A 432Watt electric input, nominal cruising power power adjustable and limited for longer battery life.
- Motor controller: Inverter DC to AC Schulze Electronic 24.40 motor controller for model sport. Nominal operation voltage 24Volt limited at 18 Ampere.
- Transmission: tooth belt 1:20 to back wheel with one way ball bearing in pulley
- Human interface: finger operated throttle on handlebar and pedelec sensor.
- Battery: 7 cell Lithium polymer cell 5Ah nominal 25,9 Volt charge cut of Voltage 29,4 Volt. Manufacturer Thunder Power.
- Fuel cell battery charger: Direct Methanol fuel cell Model EFOY 1600 from Smart fuel cells Germany

Possible daily range (24h): 160km at 40km/h 300km at 25km/h

Methanol consumption: 0,6liter per 100km at 25km/h

Weight:

Bike: 15kg

Drive train: 0.8kg

Battery: 0.6kg

Fuel Cell system: 6.8kg

Methanol tank (full): 5kg

Total: 28.2kg

Costs:

Basic Bike: ca 300Euro

Motor controller: 150 Euro

Motor self designed by Ernst Dilger, parts 150 Euro

Direct Methanol fuel cell: ca 2900Euro

Total: 3500Euro