

Problems:

- Production capacity of metal workshops in Mongolia is limited
- Exploitation and burning of caolin has not yet been taken over by private enterprises
- Quality of stove production not yet institutionalized

Impacts:

- Reduction of the CO emission by 97.5% below the legal limits (legal limit CO/CO₂ = 2%, GTZ 7 stove CO/CO₂<0.05%)
- Decrease of PM 2.5 emissions by complete burning process by up to 90 %
- High efficiency constantly well above 80% without cooling the flue gas below 200C to ensure no condensation and a constant draft
- Significant reduction of coal consumption due to high efficiency, complete combustion and heat control
- Strong reduction of the air transport out of the room by the stove due to optimized air supply resulting in less cooling effects due to draft of cold air
- High recognition and demand for the GTZ 7 developed stoves by Millennium Challenge Account (MCA) Mongolia, ADB, Xacbank, World Vision and users.
- Good collaboration between World Bank, ADB, MCC/MCA and Xacbank



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GTZ 7 Stove

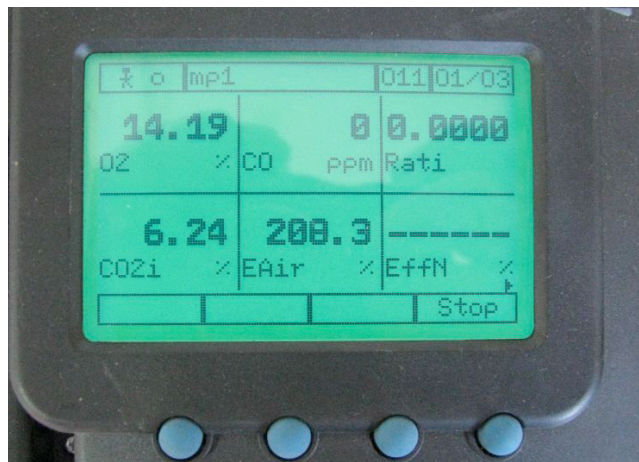
Sustainable approach for energy
saving and clean air

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gtz



Background:

PROBLEMS TO BE FACED:

- Ulaanbaatar (UB) belongs to the cities with the highest air pollution in Asia in particular with regard to PM1, PM 2.5 and PM 10
- In UB, 60% of a population of 1,2 million live in the Ger Districts
- The stoves in the Ger Districts used for heating and cooking contribute between 50-70% to the PM air pollution.



- The traditional Ger Stoves have:
 - incomplete combustion resulting in dangerous CO-concentration and high PM 2.5
 - long ignition phase, which is the main source of pollution, due to the fact that first the whole amount of coal is pyrolyzed releasing burnable volatiles which escape => high CO-concentration during ignition phase
 - high air leakage leading to a decreased thermal efficiency resulting in air exchange on a high range

Aims:

GER DISTRICT INHABITANTS USE ENVIRONMENTALLY FRIENDLY STOVES FOR HEATING AND COOKING.

- Reduction of PM 2.5 and CO emissions through complete combustion
- Increase of thermal efficiency of the stove and burning all combustible parts of the fuel

- Optimal air use
- Steady and continuous burning process by avoiding batch process
- Simultaneous char and volatile burning
- Satisfying requirements of different user groups
- Long-life and reliable product
- Adapting stove to the available fuels used
- Enabling a long self-contained burning process without intervention



METHODOLOGY TO REACH THE AIMS:

- Changing burning process from bottom lit up draft to bottom lit down/cross draft
- Simultaneously burn of char and volatiles by using always only a small amount of coal while in parallel pyrolyzing a thin coal layer
- Steady and continuous burning by gravity driven feeding with fresh coal from air sealed hopper for a long burn without intervention (up to 6 hours or more)
- Using advantages of all burnable products, like the low ignition temperature of H₂ and the high temperature of the char to ignite the CO

=> high combustion temperature (> 1000 C) resulting in complete combustion, significantly lower CO (up to factor of 50-100 below the legal limits) and less PM 2.5

- Optimized primary and secondary air to reduce air exchange rate in the ger and increase combustion temperature.
- Using charlotte in the combustion chamber in order to protect the steel and increase the durability of the stove
- Every part can be replaced fast and easy



- Modular construction design to satisfy the requirements of users, including habitants of gers, small and medium size detached houses:
 - One size of burner (3-6 kW)
 - Cooking module
 - Heat exchanger module
 - In future:
 - Low pressure boiler module
 - Link to heating wall
- Easy handling by only one control for the power
- Reduction of costs through fast and easy assembly