



CSLF

TECHNICAL GROUP MEETING

(19 – 21st Jan. 2004)

PRESENTATION BY

INDIA



PRESENTATION SYNOPSIS

1. Indian Power Scenario

2. R&D works being undertaken in India

3. Areas of knowledge sharing

4. Areas/Projects for association

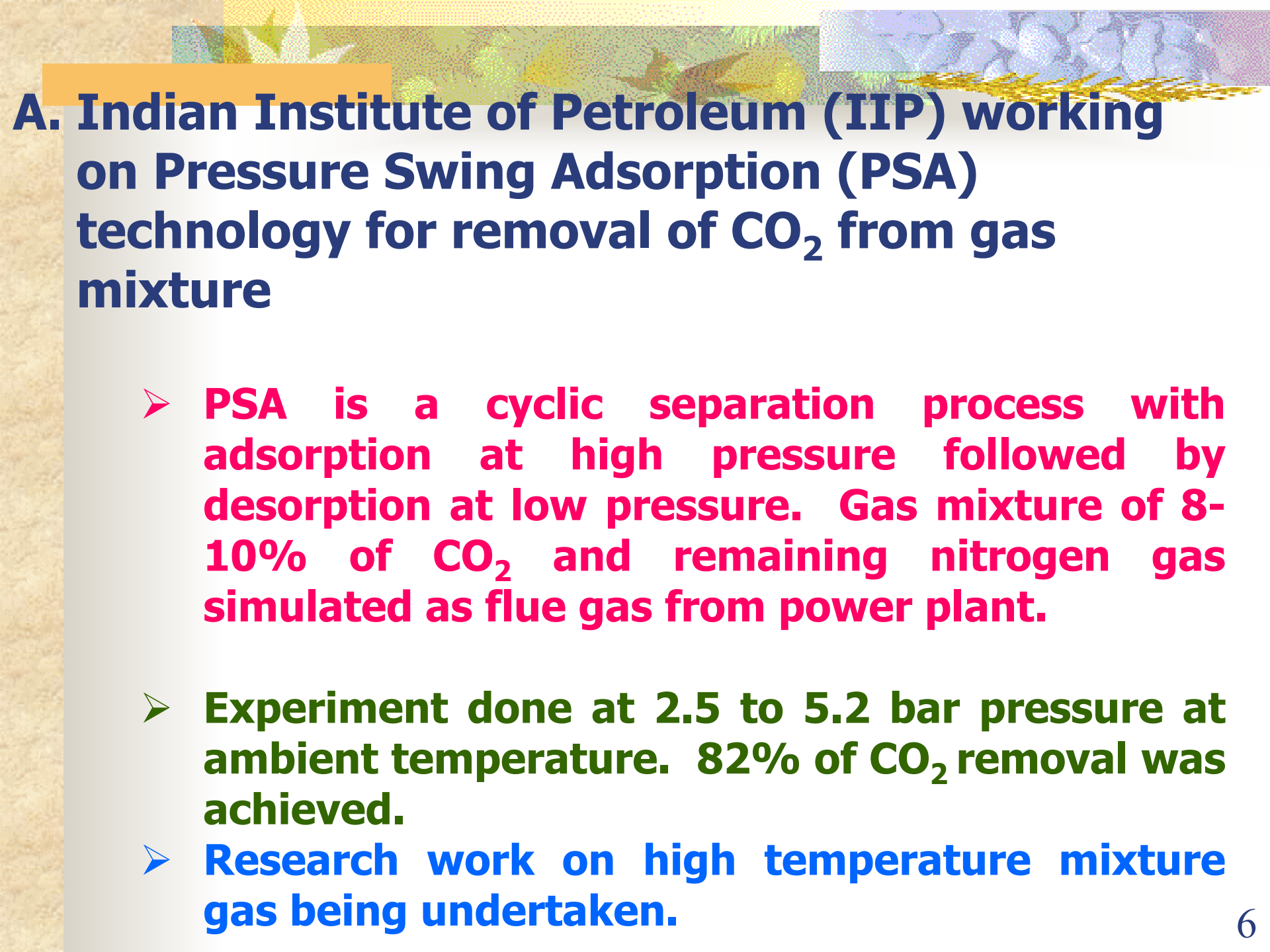


1. INDIAN POWER SCENARIO

	AS ON 31.12.03	ADDITION TILL 2012	TOTAL TILL 2012
COAL	64955.88		
GAS	11802.82		
DIESEL	1172.83		
TOT. THERMAL	77931.53	62418	140349.53
WIND	1869.66		
HYDRO	27885.23	33680	61565.23
NUCLEAR	2720.00	7215	14935.00
TOTAL	110406.42	103323	213729.42



2. R&D works presently being undertaken in various Indian Institutes/Organisations.



A. Indian Institute of Petroleum (IIP) working on Pressure Swing Adsorption (PSA) technology for removal of CO₂ from gas mixture

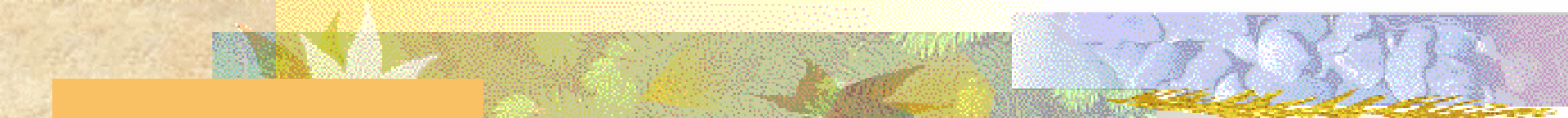
- **PSA is a cyclic separation process with adsorption at high pressure followed by desorption at low pressure. Gas mixture of 8-10% of CO₂ and remaining nitrogen gas simulated as flue gas from power plant.**
- **Experiment done at 2.5 to 5.2 bar pressure at ambient temperature. 82% of CO₂ removal was achieved.**
- **Research work on high temperature mixture gas being undertaken.**



B. BHEL developing IGCC technology for Indian Coal:

➤ **Pilot scale plant of 6.4 MW capacity has been put up by BHEL using Indian coal having high ash content.**

➤ **Concentrated efforts being made to develop 100MW plant using indigenous coal.**



C. Development of molecular sieves from power plant fly ash, to capture CO₂ by National Environment Engg. Research Institute (NEERI):

➤ **NEERI has successfully developed molecular sieve from fly ash being generated at the thermal power plant on experimental basis.**

➤ **Zeolite-5A is a resin type material which can adsorb CO₂ from any gas mixture.**

➤ **The CO₂ adsorbed on zeolite can be transported to the location where CO₂ can be removed by using PSA technology.**

D. NEERI developing artificial photosynthesis by using artificial sunlight (UV energy) and Zeolite material to convert captured CO₂ to useful products

E. Capture of CO₂ by augmentation of carbonic anhydrase enzyme activity:

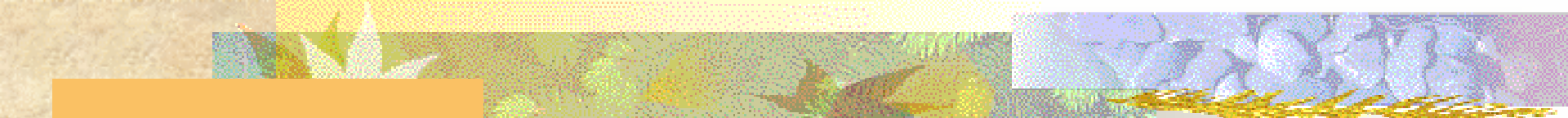
- **Experiment indicate that micro organism found in water reservoirs can be developed for capturing atmospheric CO₂.**
- **Due to enzyme reactions, carbonate ions formed in water, increased the formation of algal biomass which can be exploited for further various applications.**



F. Carbon sequestration through forestry:

➤ **Thick forest developed at a place in (Maharashtra) where manganese mines were abandoned.**

G. National Institute of Oceanography (NIO) – Goa has been actively engaged in research on natural processes concerning the oceanic biological pump (which involves the “fixation” of CO₂ in the surface waters). NIO has been carrying out studies on mapping the distribution of partial pressure of CO₂ (pCO₂) in surface water for understanding the controlling processes.



H. Indo Gulf Fertilizer (IGF) developed the process to capture CO₂ from the flue gas of their processing unit using chemical monoethanolamine (MEA) solvent which absorbs CO₂ and after heating it releases pure dry CO₂.



3. Areas where knowledge sharing is proposed with CSLF member countries.

- A. Present status of pre-combustion and post-combustion CO₂ capture technologies and work being done to bring down the cost of CO₂ capture.**
- B. CO₂ sequestration process which could be economical and can be integrated/Retrofitted with existing power plants without much modification.**
- C. New farm management and new varieties of plants for carbon sequestration.**

D. CO₂ separation using nuclear technology.

E. Research work on effective PSA cycle for capturing CO₂ from flue gases of power plants .

F. Research work on Plasma technology to capture carbon from flue gases.

G. Research work undertaken to manufacture catalytic material from fly ash of power station and used for CO₂ capture from flue gas.

H. Studies on direct injection of CO₂ into deep oceans, cost optimisations & biogeochemical cycles of ocean.



**4. Areas/Projects where India
can associate with other CSLF
countries.**

- A. Pilot project in India for separating CO₂ from power plant flue gas with cost economic technology.**
- B. Feasibility study for CO₂ injection in coal beds having CBM with techno-economics.**
- C. Association with the design and development of 275 MW prototype zero emission plant being undertaken by USDOE.**
- D. Feasibility study on direct injection of CO₂ in sea at one of coastal power station with techno-economics.**

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- E. Collaborative Research on Agro-forests for CO₂ sequestration.**
 - F. Collaboration with Institutes/ Organisations working on CO₂ compression, transportation, storage and monitoring/verification technology.**
 - G. Opening of Regional Centre of CSLF in India.**



THANK YOU