HYBRID SOLUTIONS INDIA

FACTORY CONDITIONING

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Demand for Factory conditioning

- Work Environment
- Employee Comfort
- Increased Productivity

Factory Conditioning

Challenges are

HEAT

DUST

Layout

Movement of men and material

ENERGY EFFICIENT FACTORY CONDITINING

The objective of this document is to discuss comfort

- When we talk of human comfort, various aspects are important:
  - Thermal Comfort
  - Acoustic
  - Lighting
  - Psychological
  - Ergonomics etc.
- In this document we are addressing "Thermal Comfort"

THERMAL COMFORT" OF A HUMAN BEING IS INFLUENCED BY:

- Individual factors
  - Activity
  - Clothing
- Environmental factors
  - Air Temperature
  - Relative Humidity
  - Air Speed
  - Mean Radiant temperature

A DISCUSSION WITH ANY AIR-CONDITIONING COMPANY OR CONSULTANT WOULD RECONFIRM ABOVE FACTS

- In addition reference would be drawn to the relevant ASHRAE standard, namely Standard 55 - 1981

COMPLYING WITH ASHRAE 55 OR ISO 7730 WOULD MEAN:

- Maintain operative temperature between:
  - 20.0 to 23.5° C in winter
  - 22.5 to 26.0° C in summer
- Maintaining Rh between 30 to 60%

- ISHRAE, the Indian Counterpart also refers to the same ASHRAE standard in their handbook.

CONVENTIONAL AIR-CONDITIONING NO DOUBT PROVIDES COMFORT, BUT ALSO COMES WITH THE FOLLOWING ISSUES...(PROBLEMS??)

- SBS (Sick Building Syndrome)
- IAQ (Indoor Air Quality)
- Ozone depletion

- ***MOST IMPORTANTLY THIS TECHNOLOGY IS ENERGY INTENSIVE at around 1.3 kW / TR of AC***

ISHRAE Handbook

Table 34 CO_2 levels measurements in Delhi (Measurements taken by ASHRAE India Chapter in the year 1994)

The ASHRAE – India Chapter had recently conducted a survey in Delhi to measure Indoor Air Quality levels in dense and select areas of the capital using CO_2 as the measurable variable to arrive at some indication about the quality of air inside and outside. A wide spread sample of hospitals, hotels, restaurants, banks, offices, showrooms were taken to gauge the pollution levels existing indoors and outdoors. An interesting data emerged.

Type of Spaces	Time (AM-PM)	Outdoor CO_2 level (PPM)	Indoor CO_2 (Air-conditioned) level (PPM)
• Hotels			960 – 1400
• Fast Food joints / • Restaurants			1550 – 2000
• Showrooms • Departmental Stores	10AM – 5PM	440	To 650
• Hospitals / Nursing Homes			784 - 1025
• Offices			1050 – 1340

THE QUESTION WE WISH TO RAISE IS:

- Is there an universal norm for comfort?
- Is there an Indian or should we say, a tropical view to it?

As a tropical country we have:

- Adopted to the environment, physically, physiologically and attitudinally.
- Wear dresses that have evolved over time.

Hence the temperature range for our comfort could be different from an "American" or an "European" perspective

IF THE COMFORT RANGE FOR INDIANS GETS RE-DEFINED, IT IS MORE LIKELY TO SHIFT UPWARDS:

- If we take the following range for an example:
  - Say...26 to 29^0 C
  - Higher Rh spread say up to 70%

The impact would be enormous as....

- While we thought Air-Conditioning is the only alternative, newer alternatives will become more applicable now:
  - Air cooling
  - Ventilation for cooling
  - Newer technologies....?

VIEWED IN THIS PERSPECTIVE WE ARE PLEASED TO PRESENT :

HYBRID COOLING SYSTEM"

The energy saving alternative to sensible cooling....

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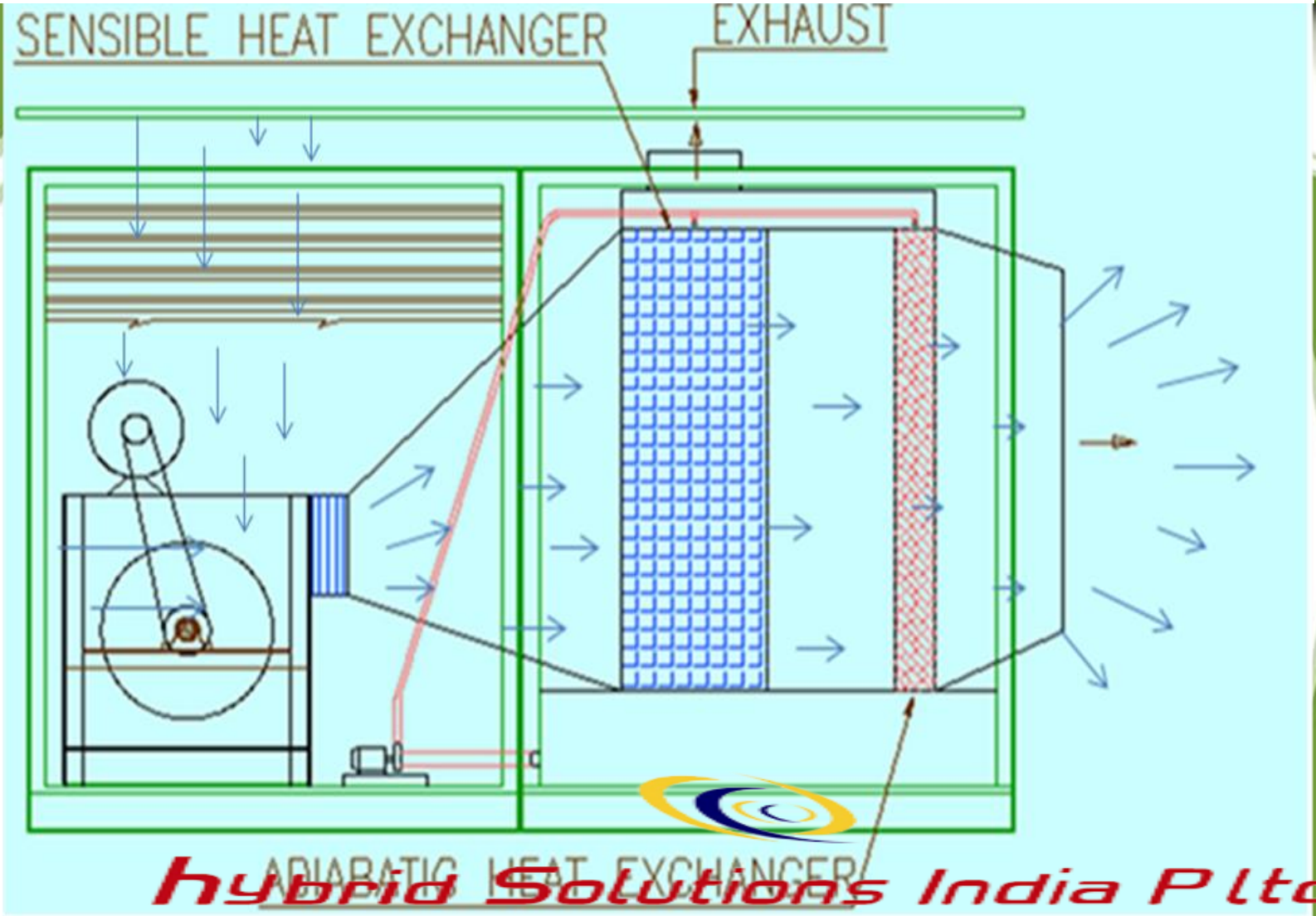
WHAT IS NEW IN HYBRID COOLING SYSTEM ?

- HYBRID COOLING SYSTEM represent a new technology
  - These incorporate a Wet plate, Cross flow heat exchanger, where based on Indirect Evaporative Cooling, sensible cooling is achieved.
  - By incorporating this heat exchanger and combining with Evaporative Cooling. "HYBRID COOLING SYSTEM provide an Energy Efficient Cooling of air to and below the original Wet Bulb temperature".

PRINCIPLE BEHIND WORKING OF HYBRID COOLING SYSTEM

- HYBRID COOLING SYSTEM effect a two stage cooling of air:
  - Stage 1:
    - Sensible cooling through an Cross Flow heat exchanger.
  - Stage 2:
    - Adiabatic exchanger where part of the sensible heat is converted to latent heat

Schematic Diagram



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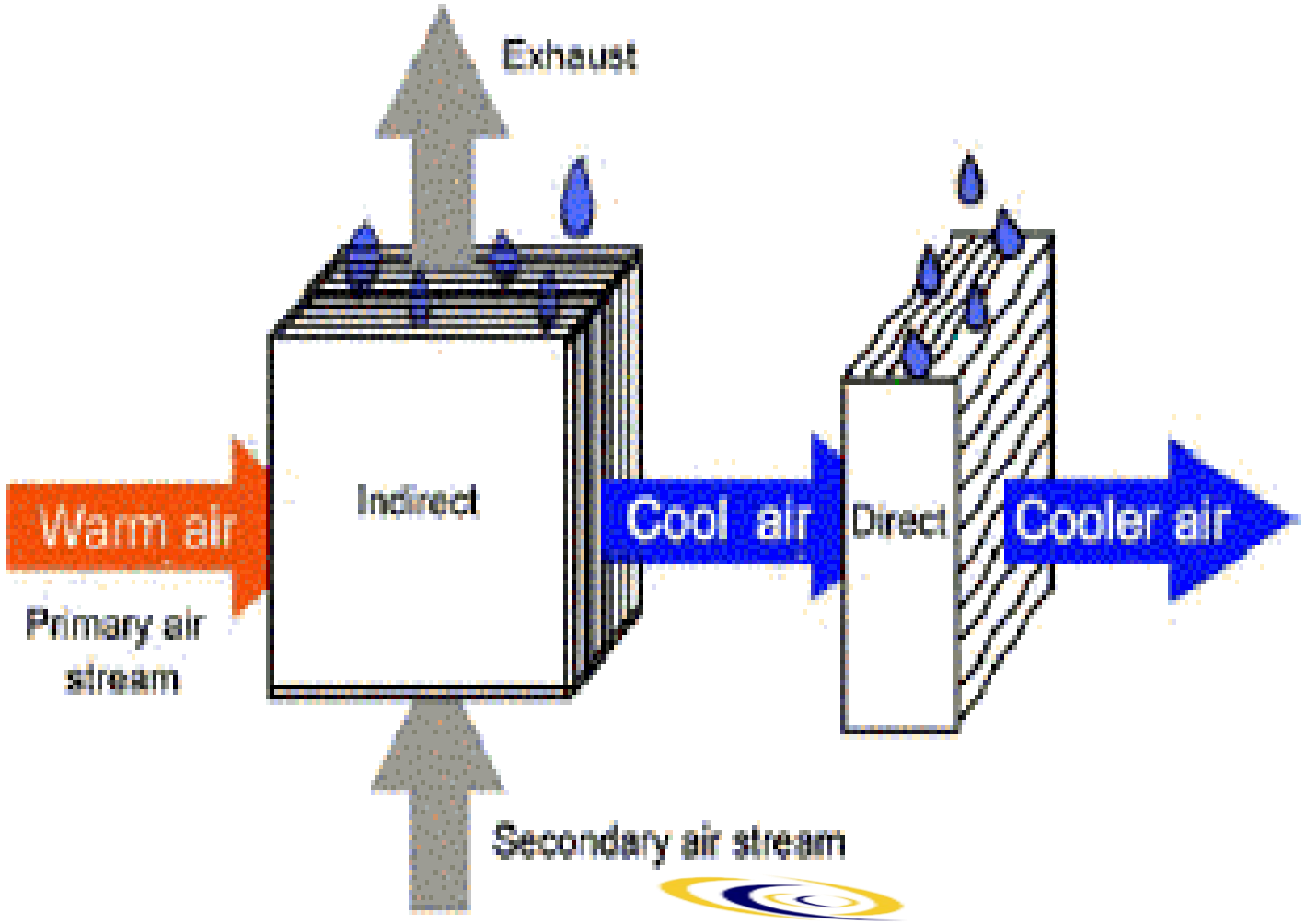

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OBJECTIVE

- The objective of this presentation is to:
  - ❖ introduce HYBRID COOLING SYSTEM
    - ➢ Reference to contemporary international work
    - ❖ Principles behind working of HYBRID COOLING SYSTEM
    - ❖ Applications
    - ❖ A few case studies
    - ➢ Photographs of a installations
    - ❖ Customizing new projects

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INTRODUCTION

- HYBRID COOLING SYSTEM is an innovative product offering to Indian market, that has been successfully commercialized
- It is an energy efficient eco-friendly product
  - Effect significant energy saving
  - Eco friendly product, as it dose not use any CFC or GHG (green house gases)

A FEW INTERNATIONAL REFERENCES

- Internationally, systems working on similar principles are called IDEC systems or two stage evaporative cooling system
  - This systems are indentified as zero O D P (ozone depletion potential) and zero (global warming potential) system

Research references are available from:

- D OE- department of energy, U S A
- CEC- California energy commission
- LBL- Lawrence Berkeley laboratory

Principles of Working Hybrid Cooling System

- Ambient air is drawn across filters (5/10/20 microns depending upon requirement) and passed through two heat exchange
  - Sensible heat exchanger: Air is cooling sensibly without adding any water. This works on the principle of indirect evaporative cooling of air.
  - Adiabatic heat exchange: Air from HE 1, is passed through an adiabatic heat exchange for evaporative cooling of air. In this heat exchanger sensible heat is converted into latent hear

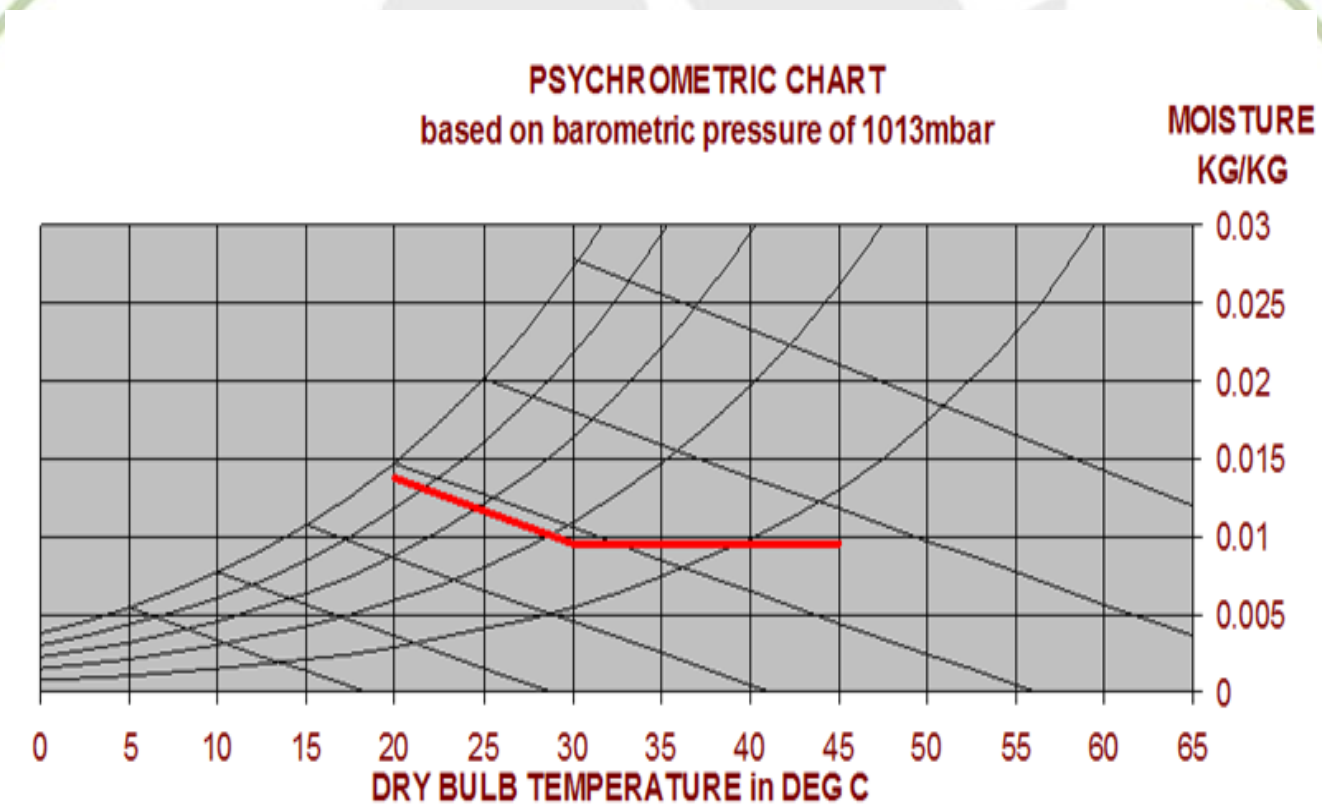
WHAT IS NEW

- HYBRID COOLING SYSTEM represent a technology
  - These incorporate a wet plate cross flow heat exchanger, where based on indirect evaporative cooling, sensible cooling is achieved.
  - This forms the core technology of hybrid cooling

KEY FEATURE OF AMBIATOR

- HYBRID COOLING SYSTEM are:
  - Energy efficient(EER of over 25)
  - Eco friendly (no CFC is used)
  - HYBRID COOLING SYSTEM come with an integrated control panel with options such as:
    - ❖ variable speed drives
    - ❖ PLC/ Micro controller based control systems
    - ❖ Remote management
    - ❖ Integration with existing control system/ BMS/ energy management

PSYCHOMETRIC CHART



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APPLICATIONS

- HYBRID COOLING SYSTEM can be used as an energy efficient alternative to air conditioners
- It presents an innovative and unique technological solution for
  - Comfort conditioning
  - Industrial ventilation and cooling
  - Pre cooling for compressors/ Gas turbines
  - Hybrid air conditioners
  - 100% fresh air applications

PRODUCT ENDORSEMENT

- TERI (Tata energy research institute) has conducted a detailed research and brought out its report vide document DCS 001(in collaboration with G T Z and BEE)
  - TERI, confirms the energy saving potential of HMX ambiator.
  - PCRA- papers have been presented during various workshops/seminars at PCRA

INCREASE RELEVANCE OF HYBRID COOLING SYSTEM

- ✓ Tropical country advantage
  - As a tropical country, we have dry hot summers, and in several places extended summers !!!!!
  - Integrated solution encompassing:
    - climatology
    - environment
    - energy

ADVANTAGE TO THE CUSTOMER

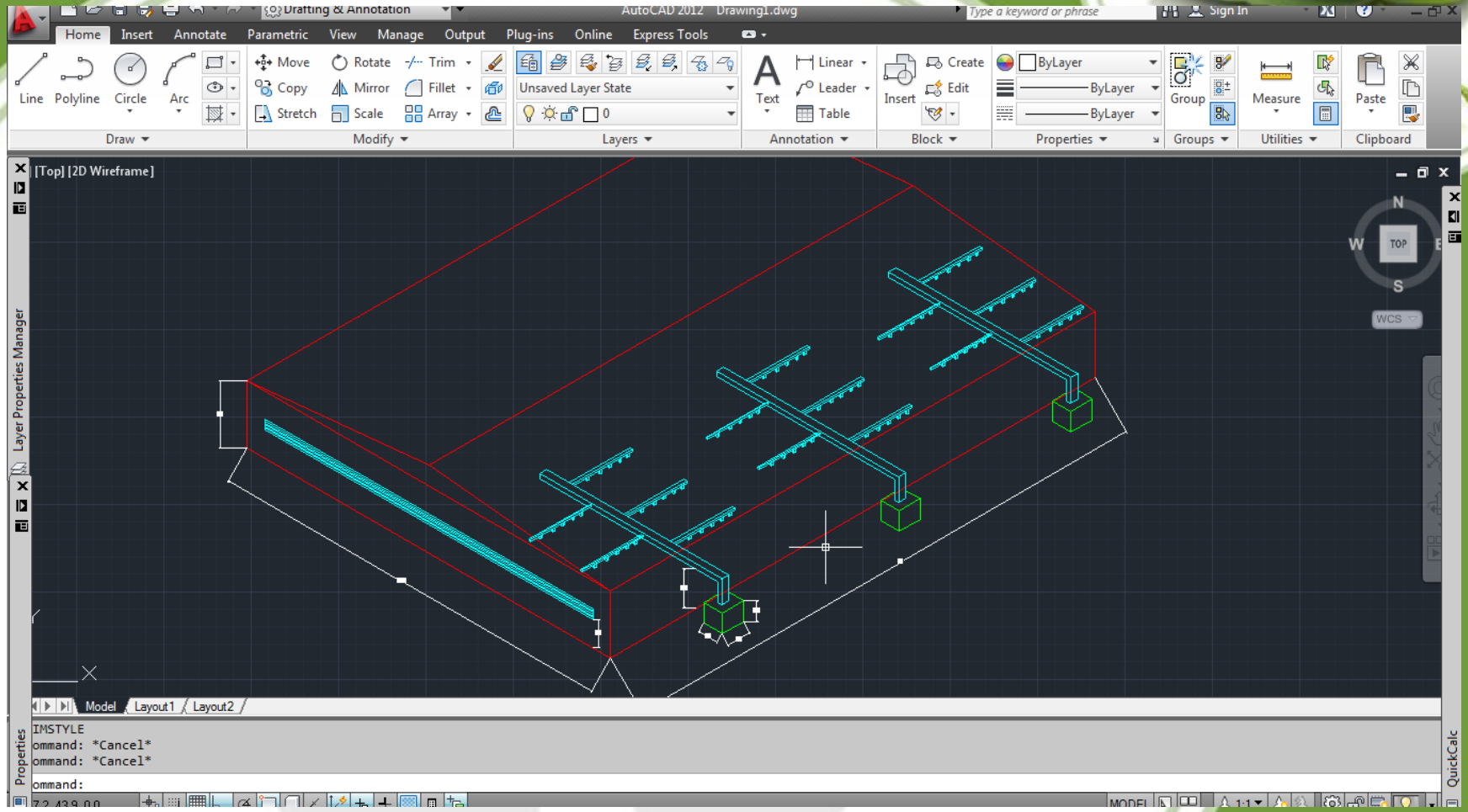
- comfort conditioning
  - ✓ energy efficient
  - ✓ lower capital& running costs
  - ✓ lower maintenance costs
  - ✓ No IAQ problems (100% fresh cooled air)

CON…

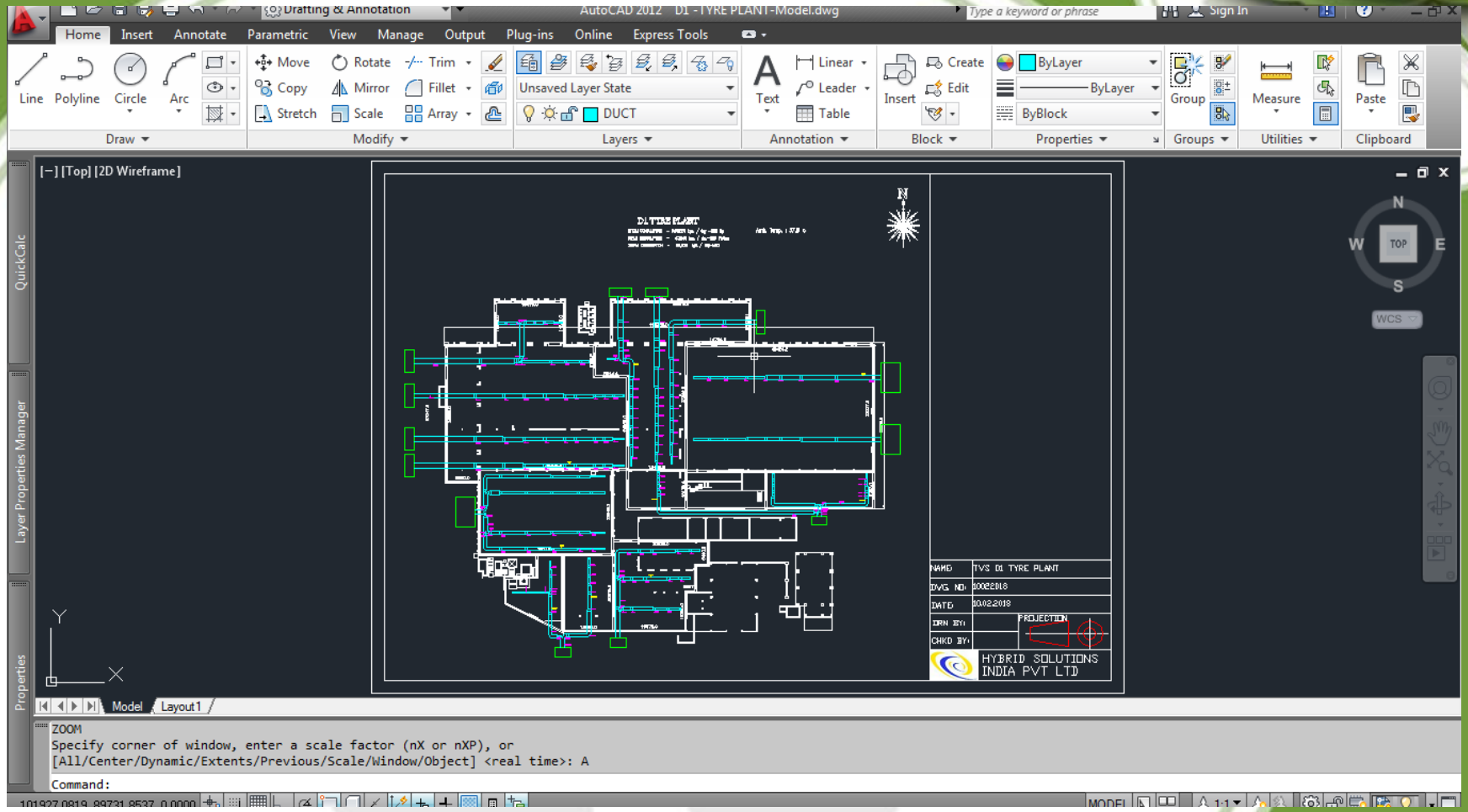
- Industrial ventilation & cooling
  - Increased comfort
    - Comfortable working environment
      - » Temperature, RH, FRESH AIR
      - » D ust free environment
    - ➢Increased productivity
    - ➢Low energy requirement

- Because Comfort would need to be viewed from a holistic view point...the individual, the organization and the society at large.

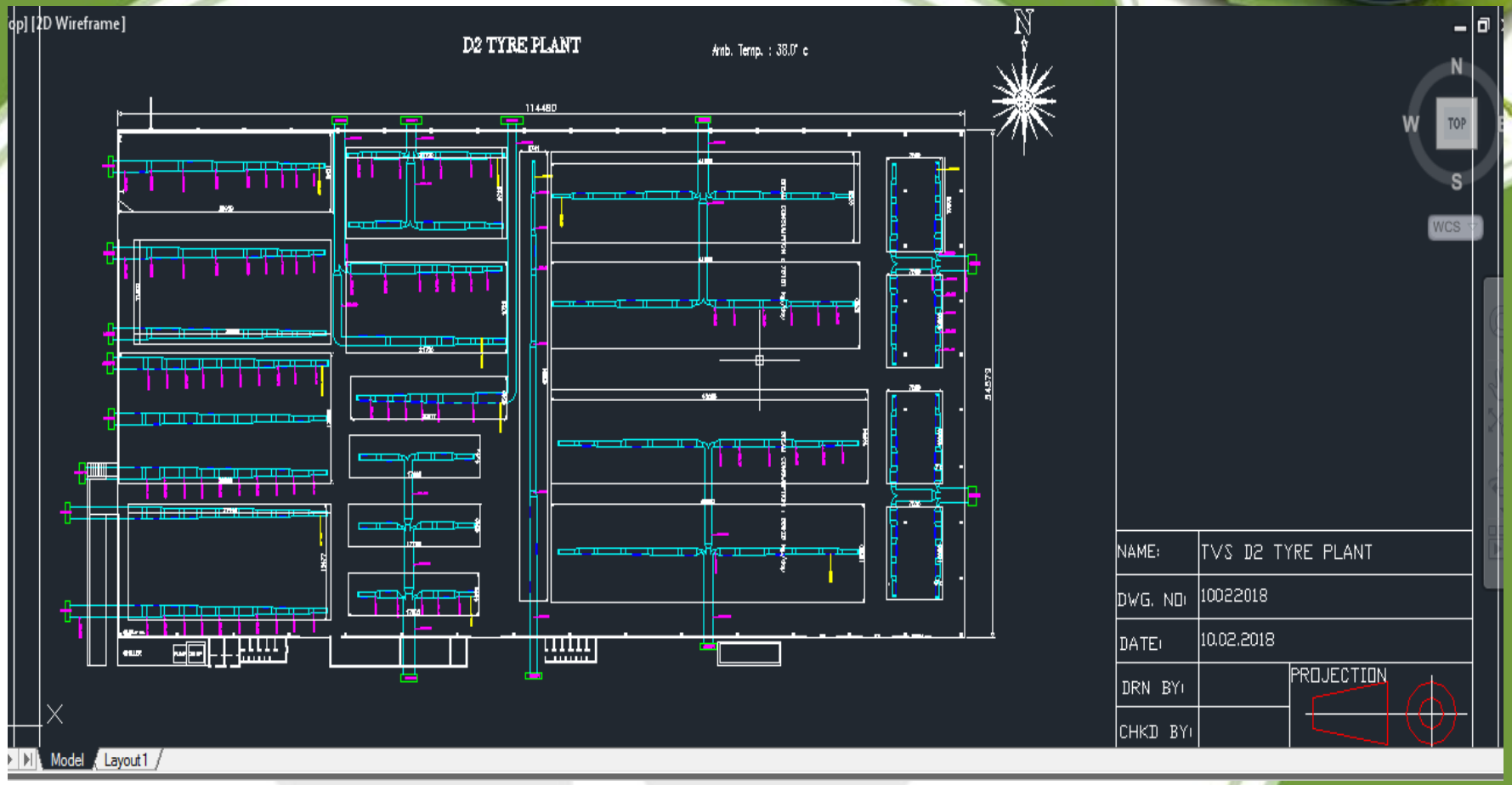
Typical conditioning layout



Factory conditioning Layout



Comfort Air distribution

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ONE OF THE INSTALLATIONS

TYPICAL INSTALLATION

CUSTOMIZED SOLUTION FOR

MASONRY DUCTS

COMPLETED DUCTS

PLANT ROOM STRUCTURAL'S

IEC MODULE – HE1

HE 2 N BLOWER SECTION

DEC MODULE – HE2

BLOWERS


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CUSTOMIZING A SOLUTION

- location of the project
  - climatology imperatives
  - integrating Air conditioning, ventilation & Air distribution
  - optimizing energy
- user requirements
- optimum recommendation

OUR CUSTOMERS....

JKM MANUFACTURING, INC.

WIPRO Applying Thought

DELPHI-TVS Diesel Systems Limited

BIEC

SAINT-GOBAIN

ITC Limited

SMR Engineering & Development

MICO

ICRISAT Science with a human face

TATA

TAJ Hotels Resorts and Palaces

BOSCH Invented for life

Ford

K.P.R.MILL LIMITED

Amara Raja

Valeo

HINDUJA Global Solutions

seco komos

SUN PHARMACEUTICAL INDUSTRIES LTD.

Simpson & Co. Ltd

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Your Requirement

- Factory Conditioning

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DESIGN CONDITIONS

- Offered Inside Conditions:
- Filtration: Supply air would be filtered in single stage or Multistage
- Primary filters with 20 microns or less
- Temperature 28± 2° C or even less

THANKING YOU

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