WELCOME TO THE WORLD OF HIGH PERFORMANCE GAS COOLING SYSTEMS

M/s NASEQUIP Systems Pvt Ltd

NASEQUIP

DIRECTOR'S PROFILE

The Founder Director of **NASEQUIP** Systems Private Limited, Mr. Rajendran Nair, BE Mechanical from College of Engineering Trivandrum, India is having more than four decades of rich industrial experience. He has more than three decades of practical experience in GAS CONDITIONING SYSTEMS and has successfully designed, manufactured and installed more than 500 no's of customized systems in India and Overseas. Undergone training in Germany & USA for nozzles. Undergone training in Germany for DeNox Systems. Practice based knowledge is his USP. Visited Cement Plants worldwide and presented various papers in international forum.

Director of **NASEQUIP** Systems Private Limited**,** Mr. Manish Ganguli (Alumni - IIM Ahmedabad),MBA in Marketing Management has overall 25 years of enriching industrial experience and has worked with leading cement companies in near past. Undergone Training in Australia for Environmental Monitoring Systems. Presented papers on innovative monitoring and abatement technologies for emission. Participated in various international exhibitions & seminars worldwide.

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ABOUT US

- We at **NASEQUIP** Systems Private Limited are offering process calculations, engineering solutions, design, manufacturing, automation, installation, supervision and after sales services for developing and providing customized **GAS CONDITIONING SYSTEMS** solutions for process industries such as Cement, Power Plants, Steel, Chemicals and all those areas where the gases are treated for the purpose of **cleaning**, **cooling** and **conditioning**.
- All our **GAS CONDITIONING SYSTEMS** are based on customer focus, quick payback period, higher efficiency, less maintenance, user friendly design with compact structure, simple operational logic and safe working conditions.
- We offer customer oriented solutions and our primary purpose is to support each one of our customers by offering cost effective qualified solutions, valued customized product and timely services right from onsite assessment till after sales services. This is achieved by close relationships with our customers identifying the practical needs to improve or optimize existing installations in operation and their future projected systems.
- We have a remarkable broad process knowledge that leads catching up the same frequencies with our quality conscious customers.

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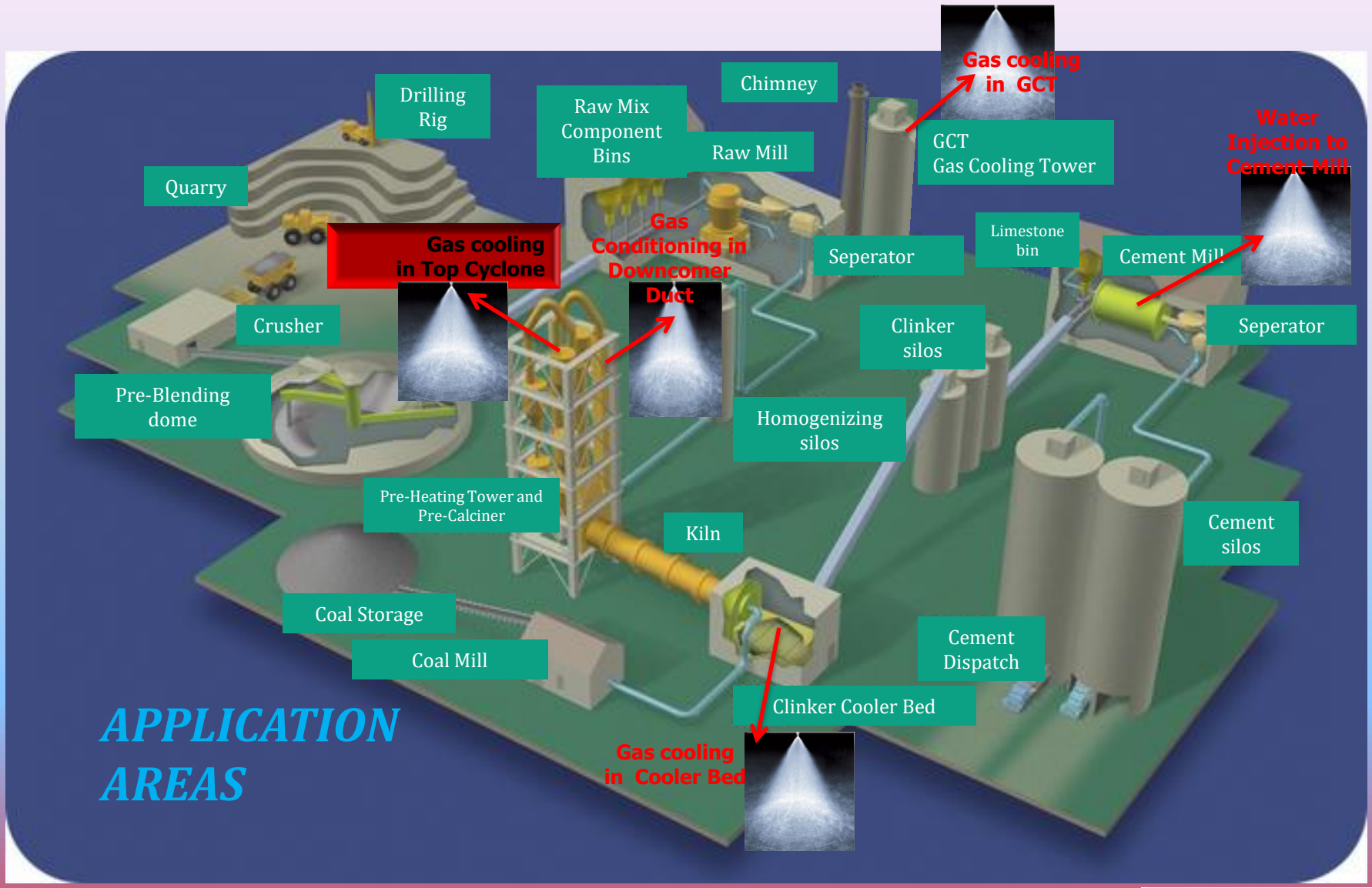
KEY APPLICATION AREAS



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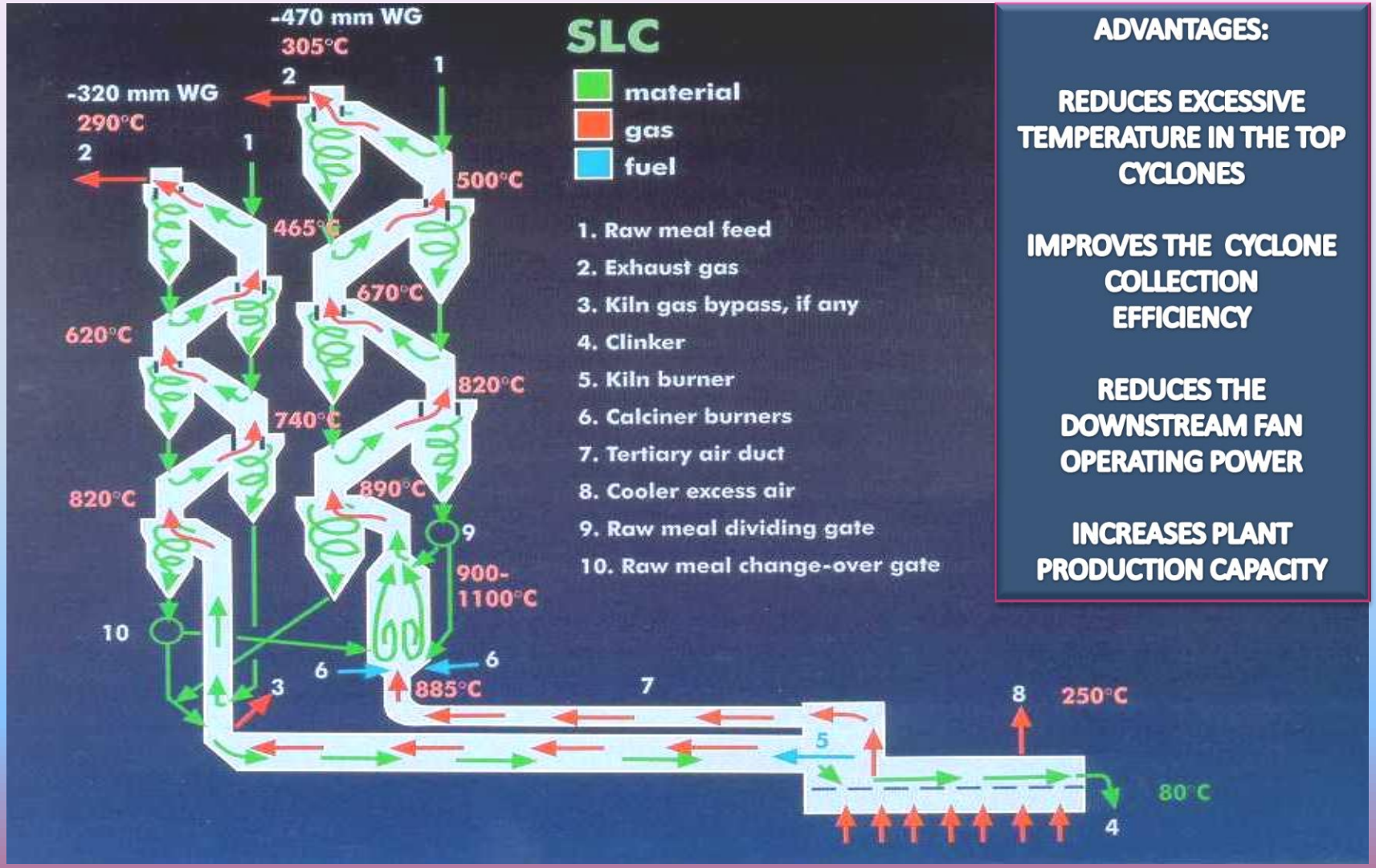
GAS COOLING IN THE TOP CYCLONES



ADVANTAGES:

REDUCES EXCESSIVE TEMPERATURE IN THE TOP CYCLONES

IMPROVES THE CYCLONE COLLECTION EFFICIENCY

REDUCES THE DOWNSTREAM FAN OPERATING POWER

INCREASES PLANT PRODUCTION CAPACITY

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GAS COOLING IN THE TOP CYCLONES

- In the Cyclone Water Spray System – cooling water is injected close to the dip tube against the gas flow in an absolute fine mist form to cool down the hot gas.
- While the high pressure water mist spray enables to condition & cool the hot gas, it also agglomerates & forces the dust downwards back in to the system, thus improving the collection ratio & efficiency.
- The cooled gas leaving the Cyclone occupies less volume, enabling substantial power savings for the PH fan.

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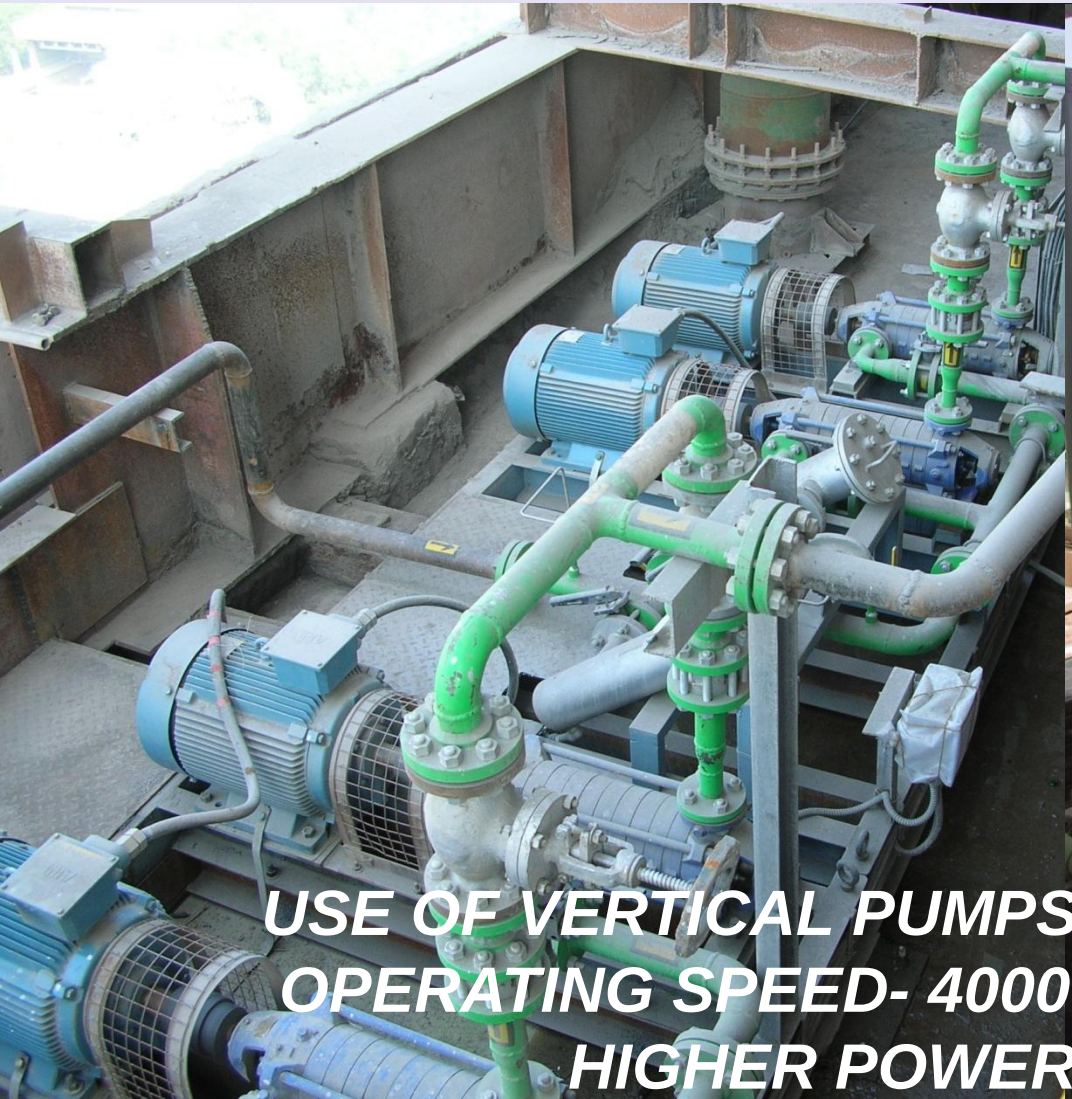
THE MAJOR COMPONENTS OF ***GAS COOLING SYSTEM IN THE TOP CYCLONES***

PUMP STATION : Pumps are VFD controlled. – ENERGY SAVING



USE OF VERTICAL PUMPS RECOMMENDED – OPERATING SPEED- 4000 TO 5000 RPM FOR HIGHER POWER SAVINGS

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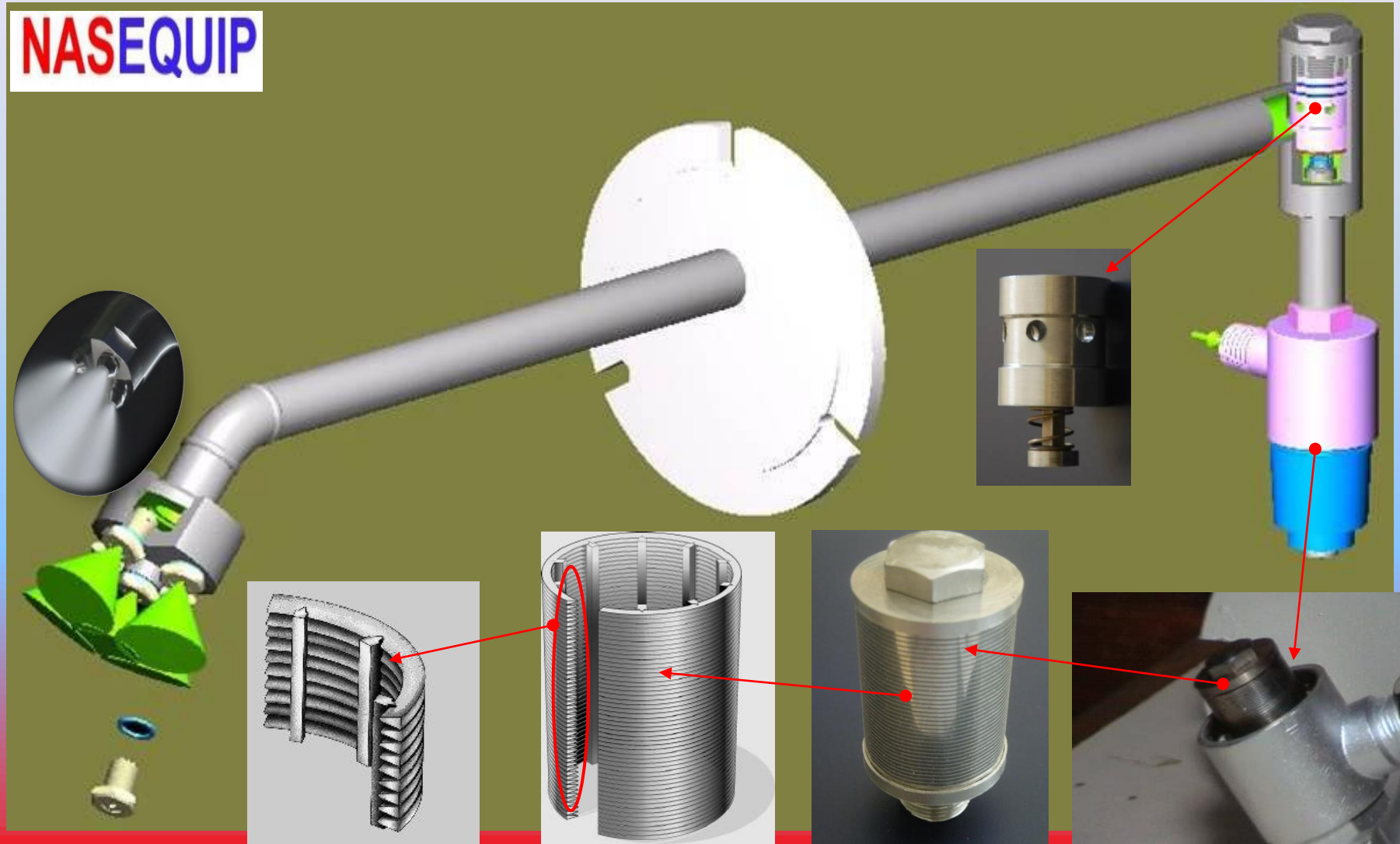
THE MAJOR COMPONENTS ***GAS COOLING IN THE TOP CYCLONES***

LANCES & SPRAY NOZZLES : HIGH PERFORMACE HIGH PRESSURE LANCES, NO COMPRESSED AIR IS NEEDED TO MAKE ULTRA FINE SPRAY. *ENERGY SAVING*



SPRAY PATTERN FROM THE HIGH PRESSURE LANCE @ 35 BAR

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Calculations for
GAS COOLING IN THE TOP CYCLONES

NASEQUIP USES THEIR OWN SOFTWARE FOR

''HEAT TRANSFER CALCULATIONS IN GAS COOLING"

INPUT DATA FOR CALCULATIONS		Condn. I	Condn. II
INLET GAS FLOW RATE	Am^3/hr	272,624.00	
	Nm^3/hr	117,244.00	
INLET GAS TEMPERATURE	°C	375.0	375.0
INLET GAS DENSITY	kg/m^3	0.5341	0.5341
DESIRED OUTLET TEMPERATURE	°C	325.0	300.0
COOLING WATER TEMPERATURE	°C	35.0	35.0
BAROMETRIC PRESSURE	mmHg	730.0	730.0
PRESSURE INSIDE GCT (-ive)	mmWC	100.0	100.0
CYCLONE - INSIDE DIAMETER	mm	3180.0	
CYCLONE - EFFECTIVE HEIGHT	m	5.0	
DROPLET SIZE Dmax	microns	300.	300.
D_32 (SMD)	microns	150.	150.
RESIDENCE TIME OF DROPLETS	seconds	2.2	2.2

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Calculations for
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CALCUALTION RESULTS

GAS VELOCITY AT INLET	m/s	4.77	4.77
GAS VELOCITY AT OUTLET	m/s	4.55	4.43
GAS VELOCITY - AVERAGE	m/s	4.66	4.60
AVAILABLE RESIDENCE TIME	seconds	1.1	1.1
COOLING WATER REQUIREMENT	lpm	48.37	74.17
	m^3/hr	2.92	4.46
ADDITION OF MOISTURE	Am^3/hr	8381.2	12250.1
	Nm^3/hr	3905.8	5958.0
OUTLET GAS FLOW RATE	Am^3/hr	259,974	253,328
	Nm^3/hr	121,150	123,202
% OF MOISTURE ADDED (BY Vol.)	% Vol	3.22	4.84

SYSTEM DATA

RECOMMENDED NOZZLE MODEL		**CMQ 0800**	
WATER CONSUMPTION PER NOZZLE	lpm	8.5	13
NUMBER OF NOZZLES		6	6
RECOMMENDED WATER PRESSURE	bar	30	30
TOTAL WATER CONSUMPTION	m^3/hr	3.0	4.5
RECOMMENDED PUMP CAPACITY	**m^3/hr**	**4.5**	**4.5**
POWER REQMNT. FOR PUMP	kWatt		

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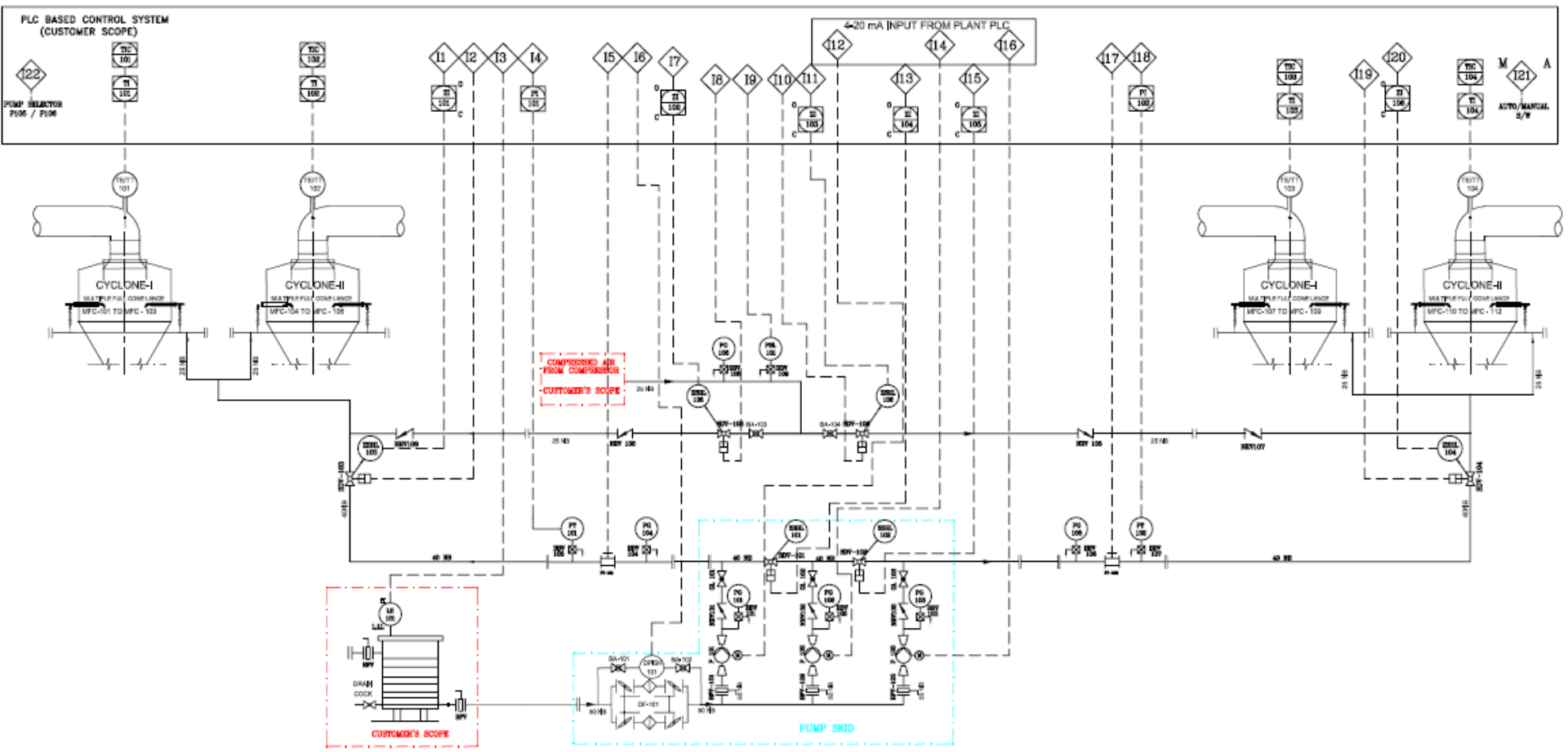
THE CONTROLS OF GAS COOLING IN THE TOP CYCLONES



The overall control of complete system is conducted by existing DCS/ PLC incorporating up-to-date technological advances where microprocessors enable incomparable control of the system, user friendly operation, close loop control and managing almost all components automatically.

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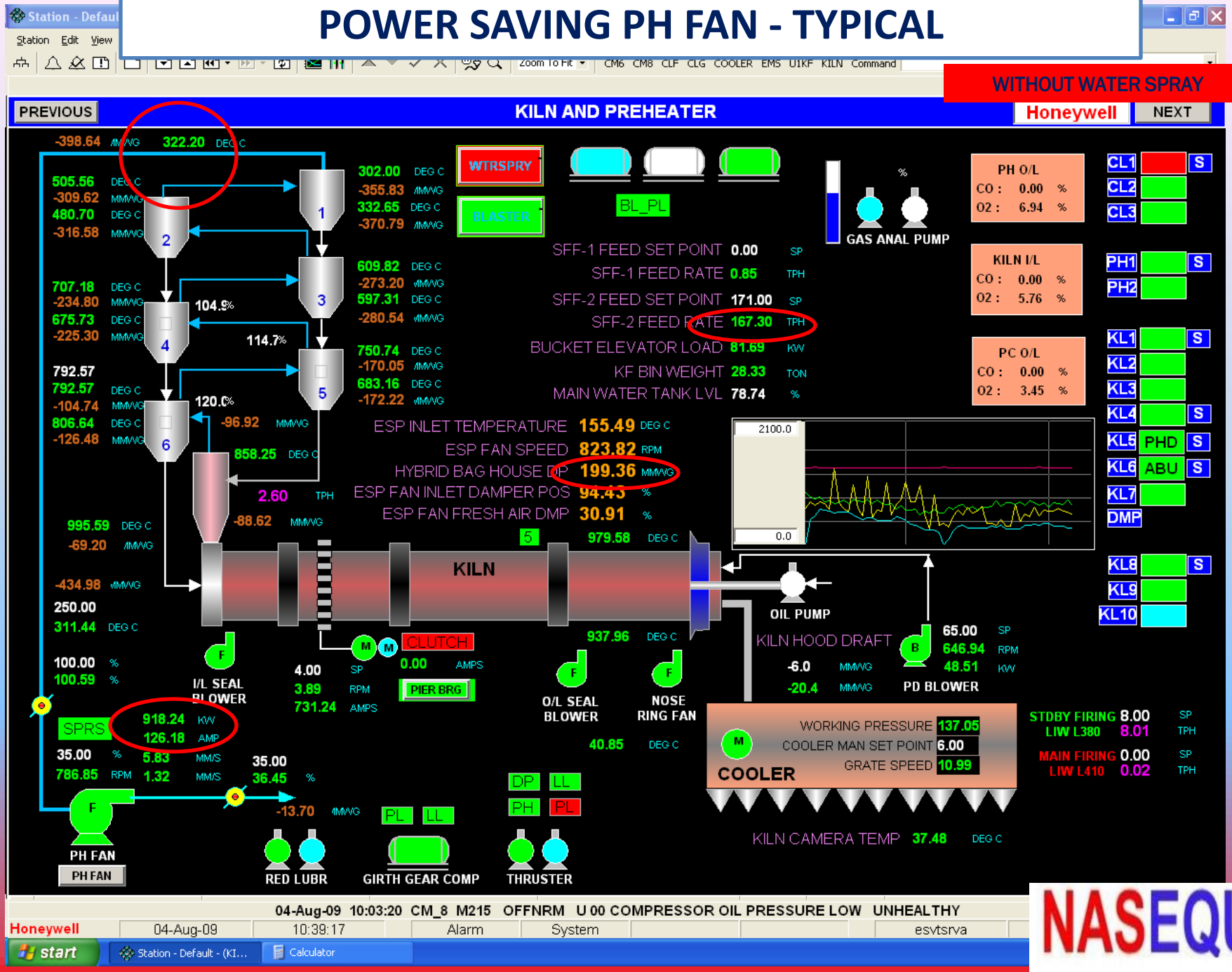
POWER SAVING PH FAN - TYPICAL

WITHOUT WATER SPRAY



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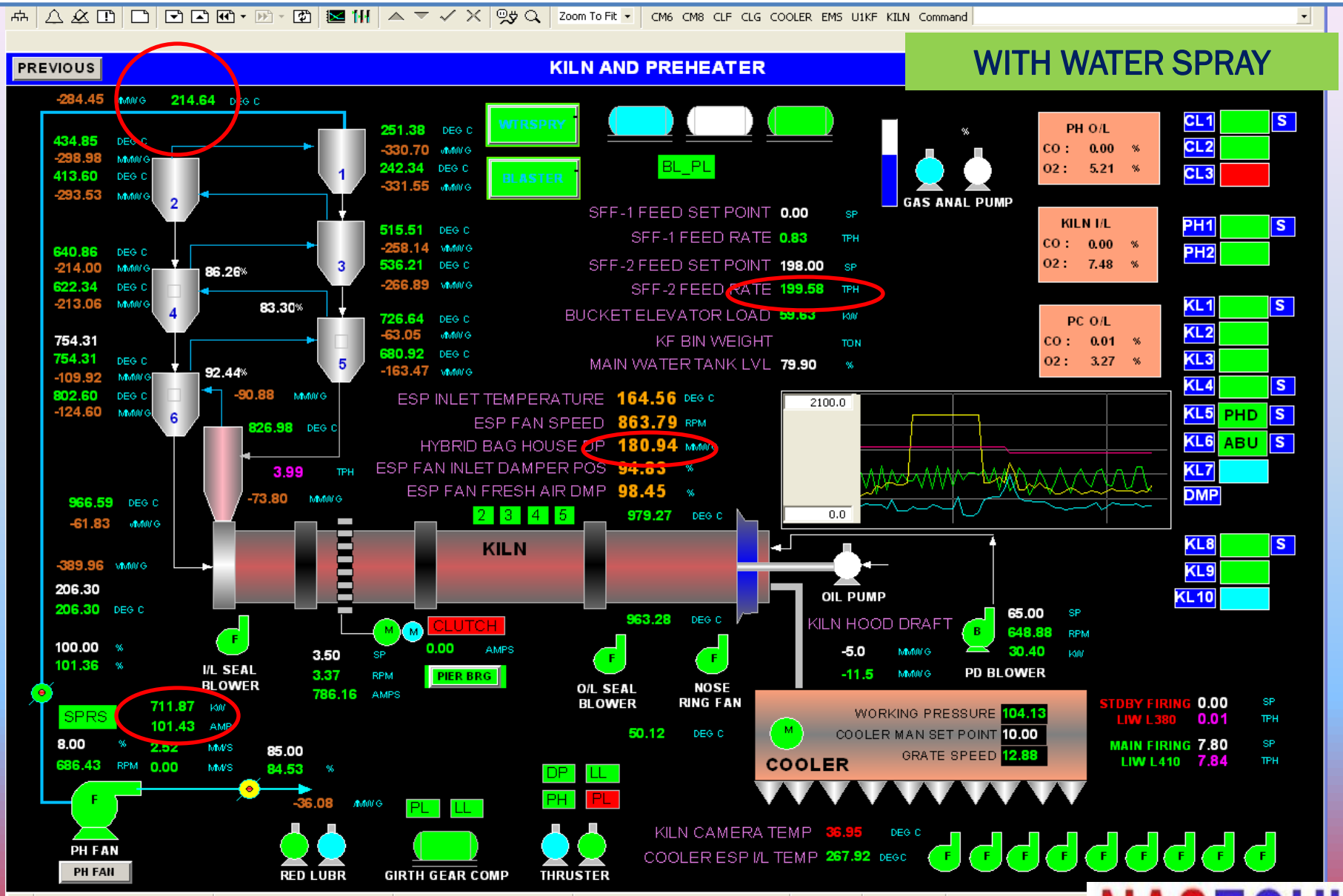

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SUMMARY – GAS COOLING IN TOP CYCLONE

ENERGY SAVING IN ID FAN= YES

ENERGY SAVING IN THE FOLLOWING FANS IN DOWNSTREAM PROCESS = YES

PRODUCTION INCREASE = YES

REDUCTION IN THE RECYCLING RATIO IN THE LINE = YES

INCREASED CYCLONE RETENTION EFFICIENCY = YES

FEASIBILITY STUDY,CALCULATIONS, ENGINEERING, DESIGN, MANUFACTURING, AUTOMATION, INSTALLATION & COMMISSIONING

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The New Generation Gas Cooling Approach
HYBRID GAS COOLING SYSTEMS

- Gas cooling in conditioning towers
  - Return Flow systems
  - Hybrid Systems
  - Dual Fluid Systems
- Solving wet bottom problems
- Reduction in dust load on process filters
- Fan energy saving by reducing the air volume

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TYPES OF GAS COOLING SYSTEMS FOR GCT

SINGLE FLUID SYSTEMS

DUAL FLUID SYSTEMS

PRINCIPLE -I
RETURN-FLOW SYSTEM
Single fluid
water ~38 bars
RETURN-FLOW LANCES
No compressed air
Full automation

PRINCIPLE-II
New generation
HYBRID SYSTEM
Single fluid
water ~38 bar
RETURN-FLOW LANCES
together with
Non-RETURN-FLOW LANCES
No compressed air

PRINCIPLE
DUAL FLUID SYSTEM
Dual fluid
''water + air'' mixture
~5-7 bar
AIR MIST LANCES
Full automation

HYBRID SYSTEMS – LOWEST ENERGY CONSUMPTION

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Hybrid *Gas Cooling System*

- This is a combination of Spillback & High Pressure lances in the tower replacing the conventional Single nozzle or cluster lances.
- These can be fitted in the same protection pipe of the **NASEQUIP** High performance single nozzle lance.
- 50% to 70% lances will be high pressure fixed volume spray – No return-flow control – The lances are with 5 nozzles.
- Balance lances are spillback with return-flow control -These lances are cluster with 3 nozzles.
- This combination allows better atomization and performance of the system.
- The flow control of water will be from 50% to 100% of the total water injection rate. During the stable plant operation this variation is sufficient for control.
- If higher rangeability is required, the high pressure lances can be arranged in 2 or 3 stages with ON/OFF valves for each stage.

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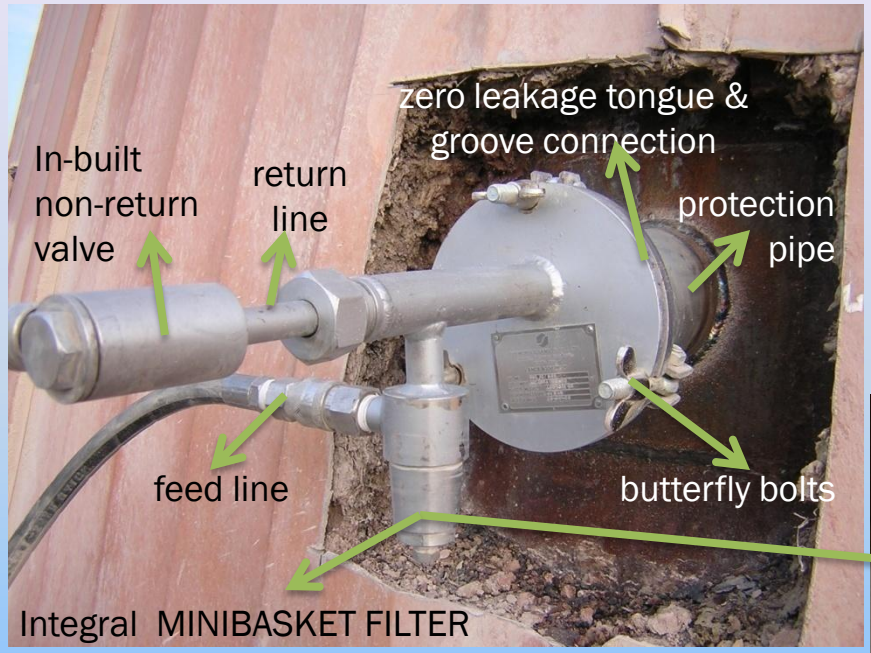
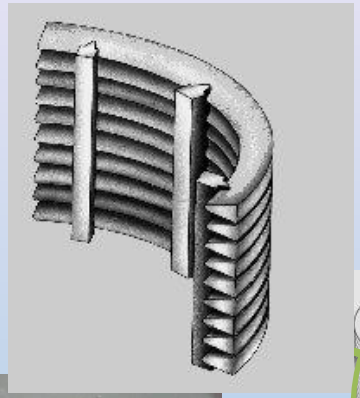
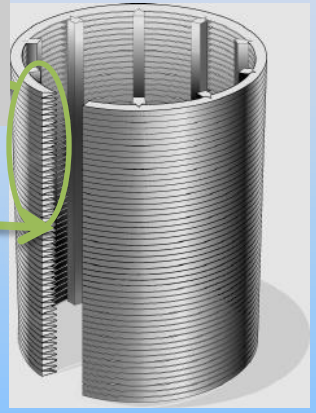
HIGH PERFORMANCE LANCES







1. The most important component in the gas conditioning system is the New generation high performance lances, which has an inbuilt filter and an NRV as integral part of the lance.
2. These are user friendly, light and robust for the application.
3. The inbuilt filter ensures non-clogging feature to the nozzle & increases the nozzle life doublefold.

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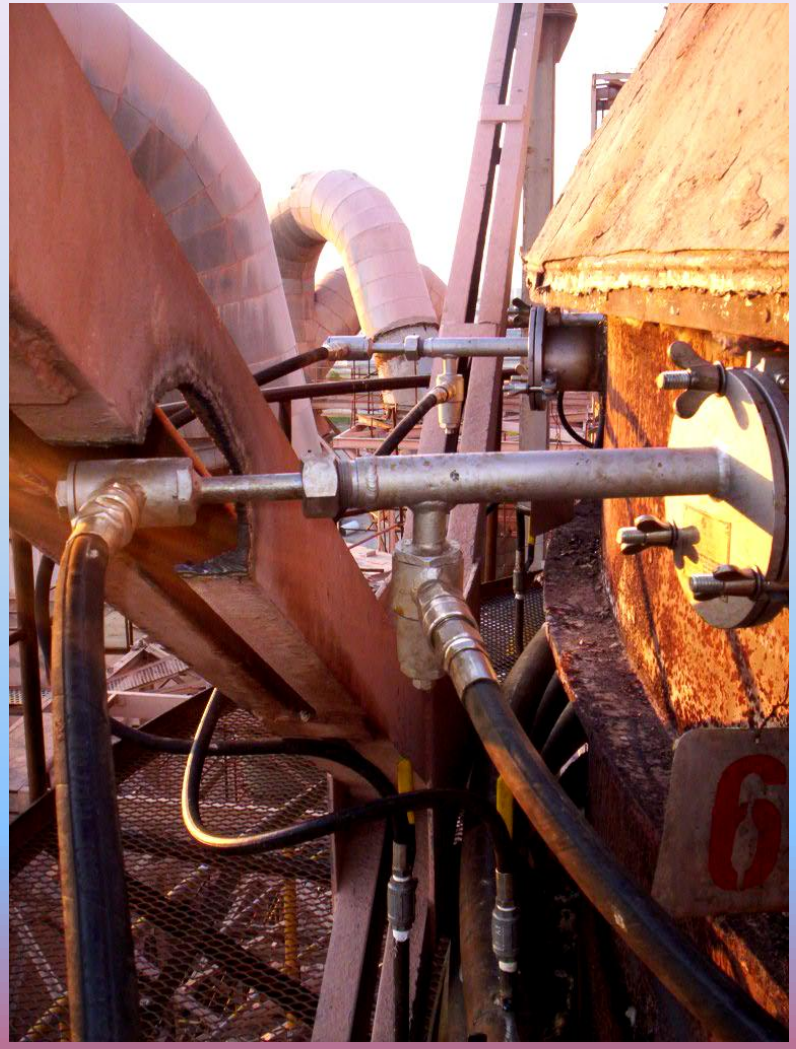
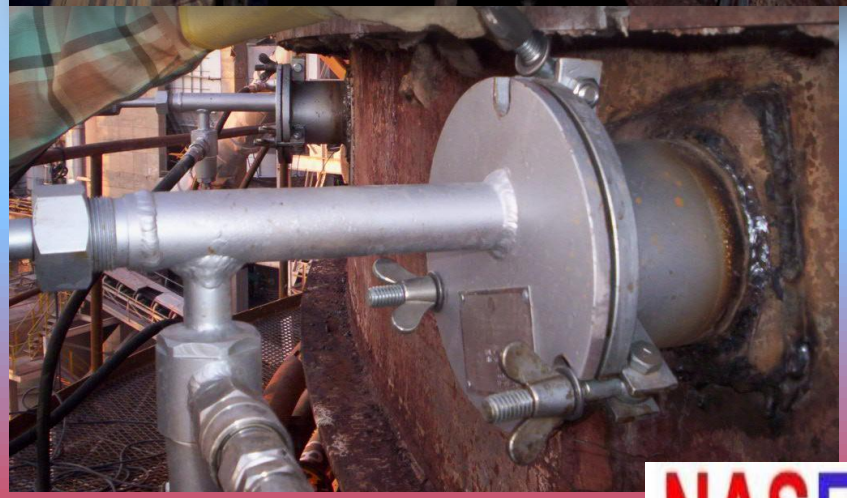
HIGH PERFORMANCE LANCES





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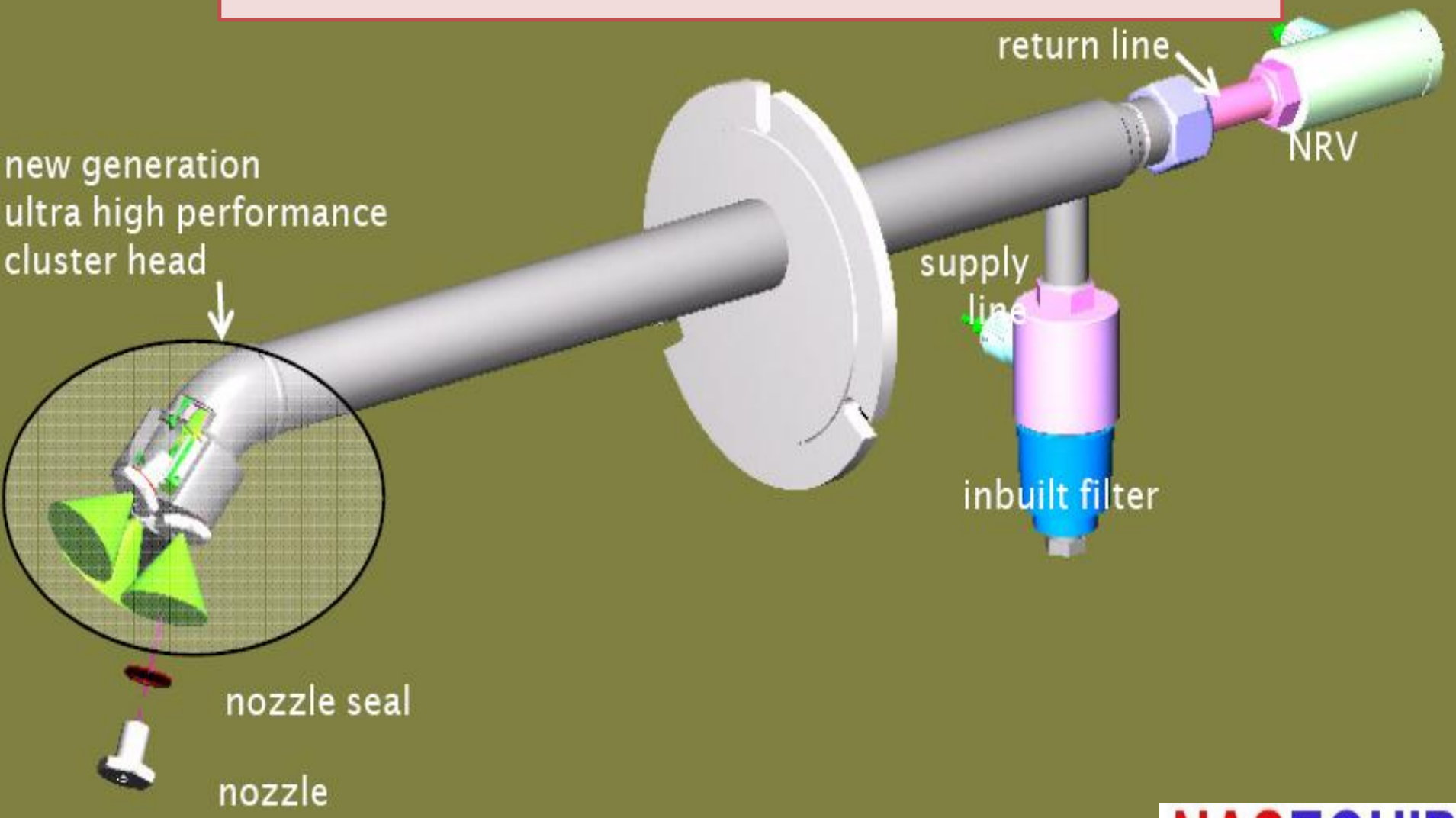
HIGH PERFORMANCE RETURN-FLOW LANCES



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HIGH PRESSURE CLUSTER LANCE SPRAY PATTERN

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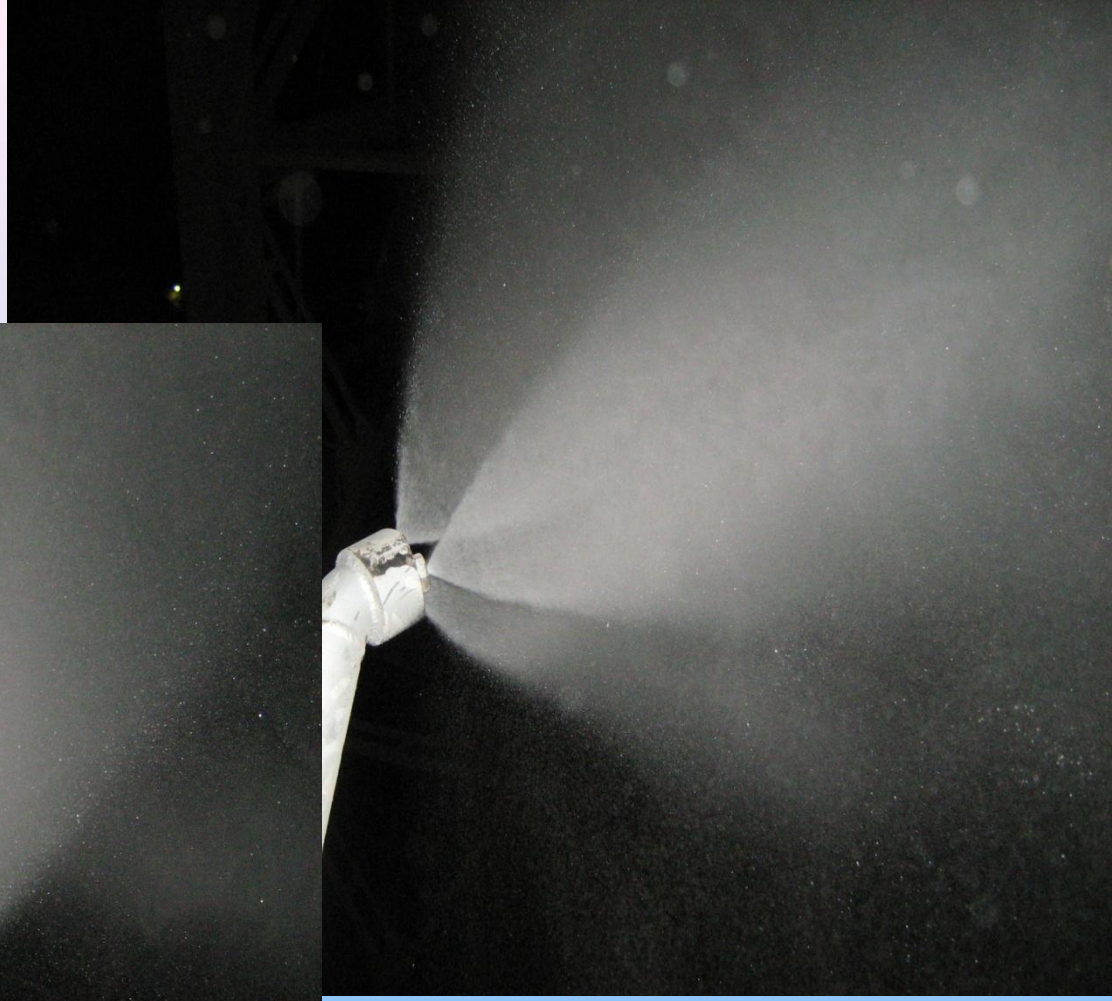
HIGH PRESSURE CLUSTER LANCE SPRAY PATTERN



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HYBRID GAS COOLING TOWER OUTSIDE VIEW

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SKID MOUNTED PUMP STATION

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CONTROL VALVE STATION

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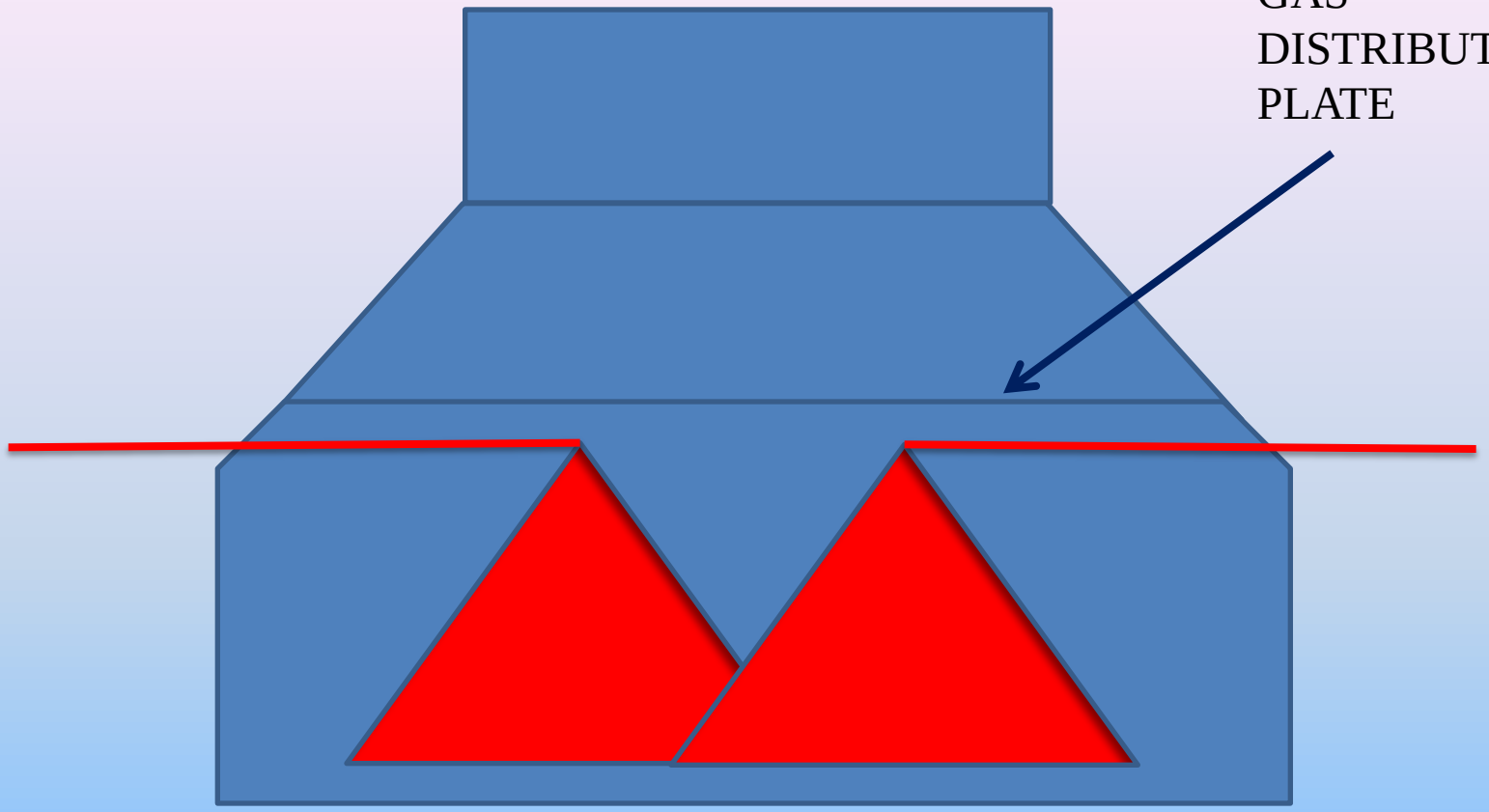

LANCE ORIENTATION

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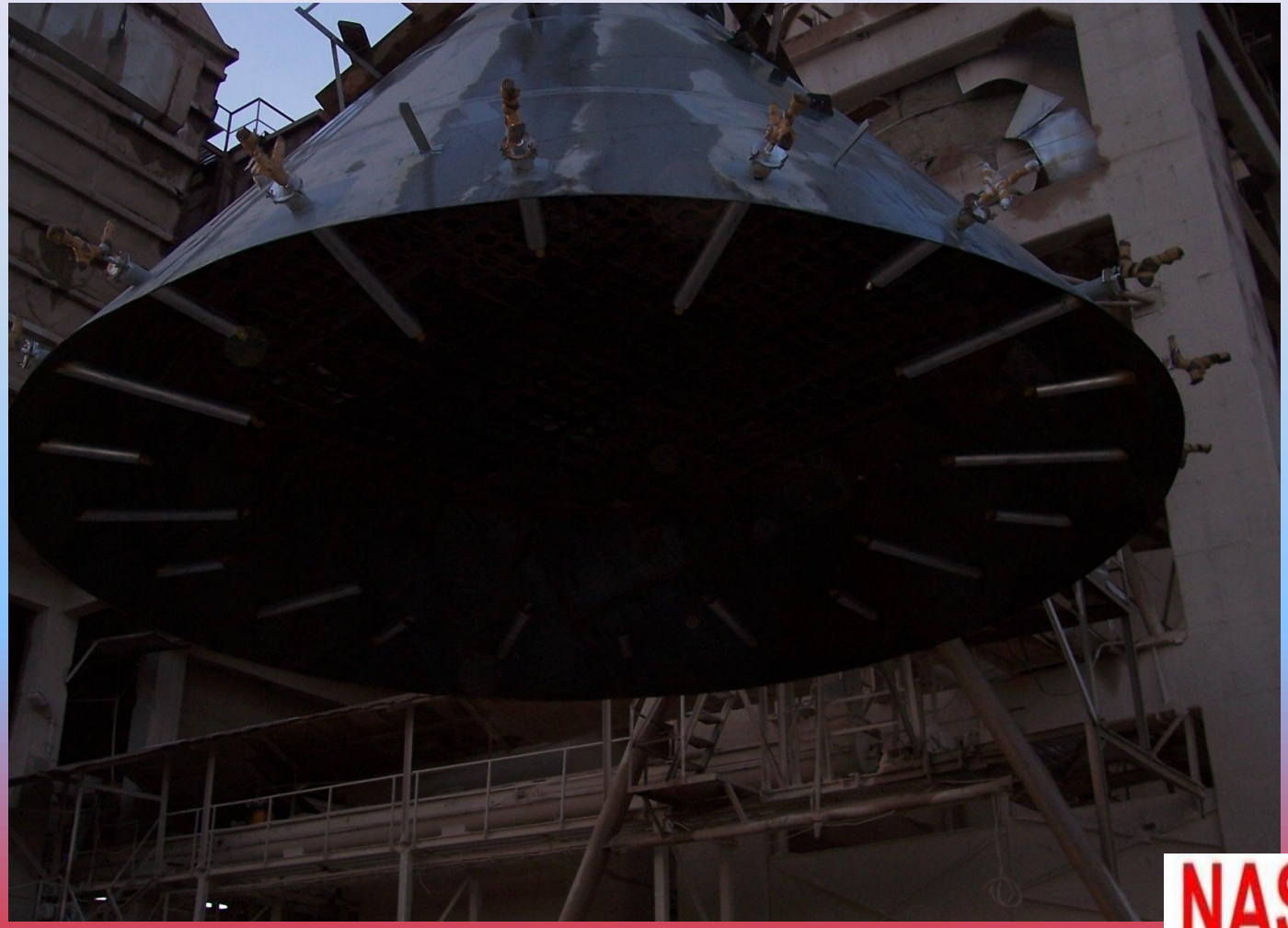
GCT INLET CONE WITH LANCE MOUNTING



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TWIN GAS DISTRIBUTION PLATES ERECTED IN GCT INLET CONE

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GAS CONDITIONING IN DOWNCOMER DUCT

Double fluid, no return, Gas Cooling Systems (~5 bar Air + ~4.5 bar Water)

Water spray is performed directly in the downcomer duct where water collides with compressed air inside the nozzle just before the nozzle orifice leading high breaking effect on water and generating much finer droplets. That's why full evaporation comes true in very short reaction lengths without the risk of any wetting.

BASIC PROPERTIES

Fluid: Double, water + air

Principle: air water mixture

Pressure: ~5 bar air- ~4.5 bar water

Droplet size D_{max} : ~200 microns

Droplet size D_{32} : ~100 microns

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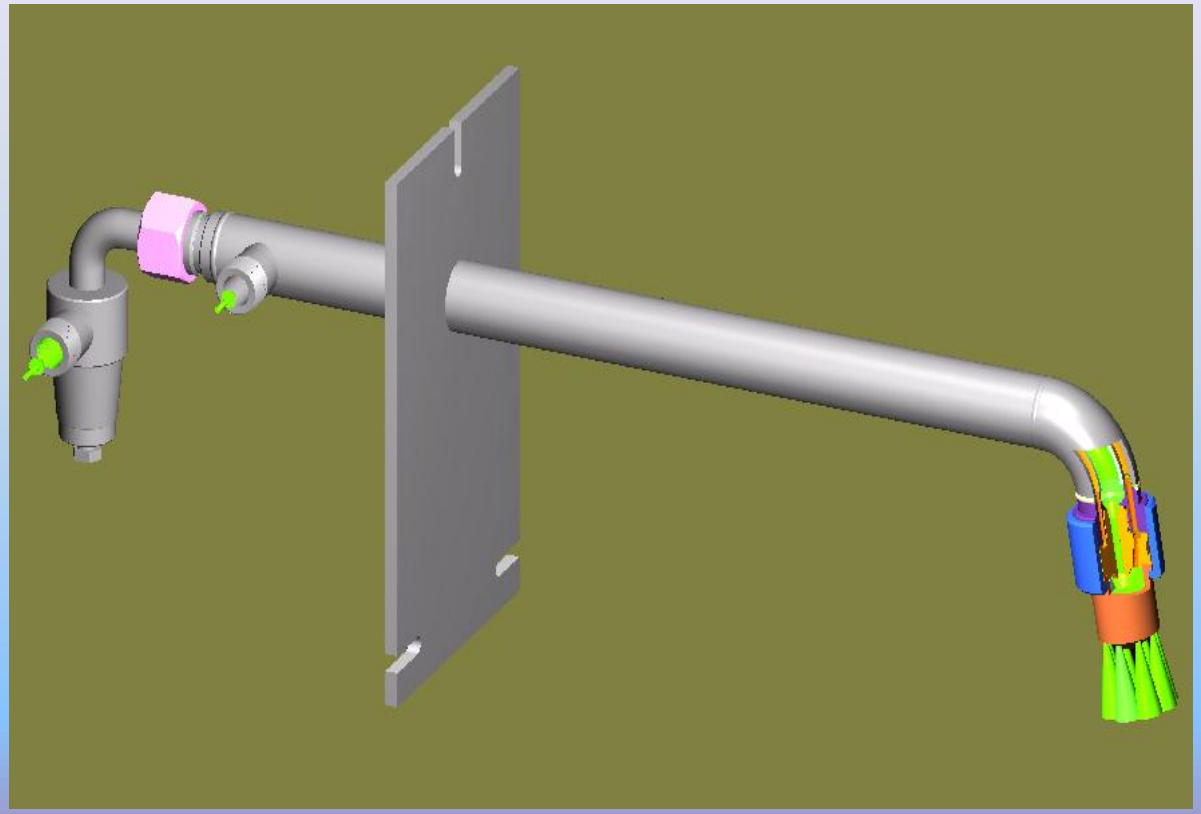
HIGH PERFORMANCE DUAL FLUID LANCES



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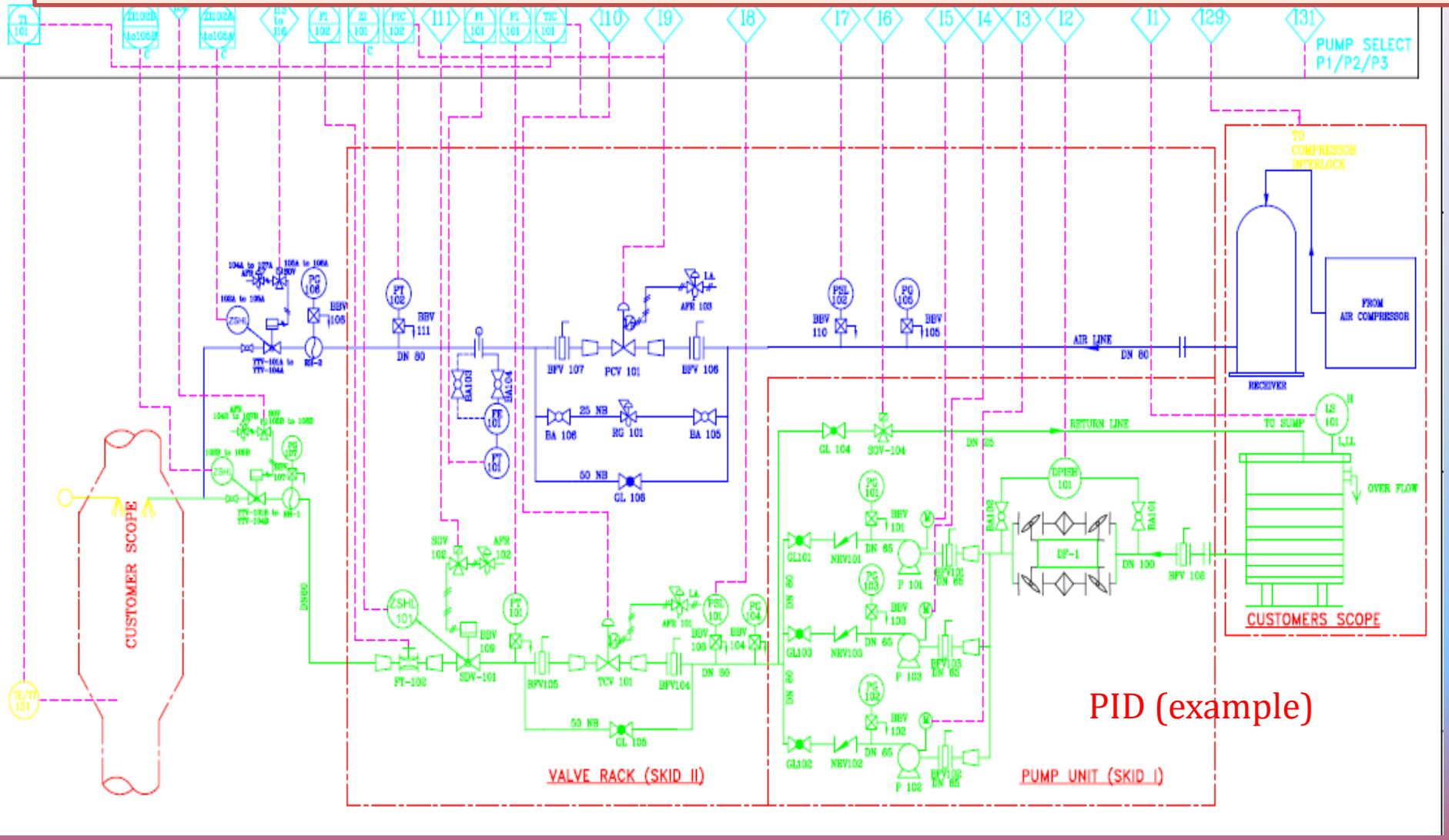

PID (example)

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AIR MIST NOZZLES

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CLINKER COOLER WATER SPRAY SYSTEMS

Gas cooling and Clinker cooling in Clinker Coolers

Single Fluid, no return,(12-20 Bar Pressure)

- Solving problems of instant temperature increases.
- Fan energy saving by reducing the air volume.
- Reduce the load on process filters.
- Reduction in Clinker Temperature.
- Solving problems at the pan conveyors due to higher clinker temperature.

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Water spray is generally perfomed 2 banks of lances which generates 3 different flowrates in three steps.

1st step: Only primary lances with relatively lower flow are in operation

2nd step: Only secondary lances with relatively higher flow are in operation

3rd step: Both primary and secondary lances are in operation at the same time

The data coming from temperature element installed at the entry of cooler ESP,and the set values of the cooling system define the amount of water to spray. The system is fully automated, no maunal intervention is required.

12 – 20 bar is the typical pressure used in the system to achive needed droplet size and grant temperature reduction on time.

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MILL WATER INJECTION SYSTEMS

- Gas cooling in vertical or horizontal mills
- Single Fluid operation
- Tailor made lances according to mills
- Ultra fine atomisation
- Quick Temperature Drop
- Solving problems of dehydration of gypsum
- Solving problems of wet clogging of gypsum
- Solving problem of deterioration of cement quality

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WATER INJECTION TO CEMENT MILL

Single Fluid, no return, Gas Cooling Systems (~5-6bar)

Water injection is possible from both sides

All in one, ready to use units

Single fluid and relatively low pressure

Low investment and running costs

Special lances in respect to mill design

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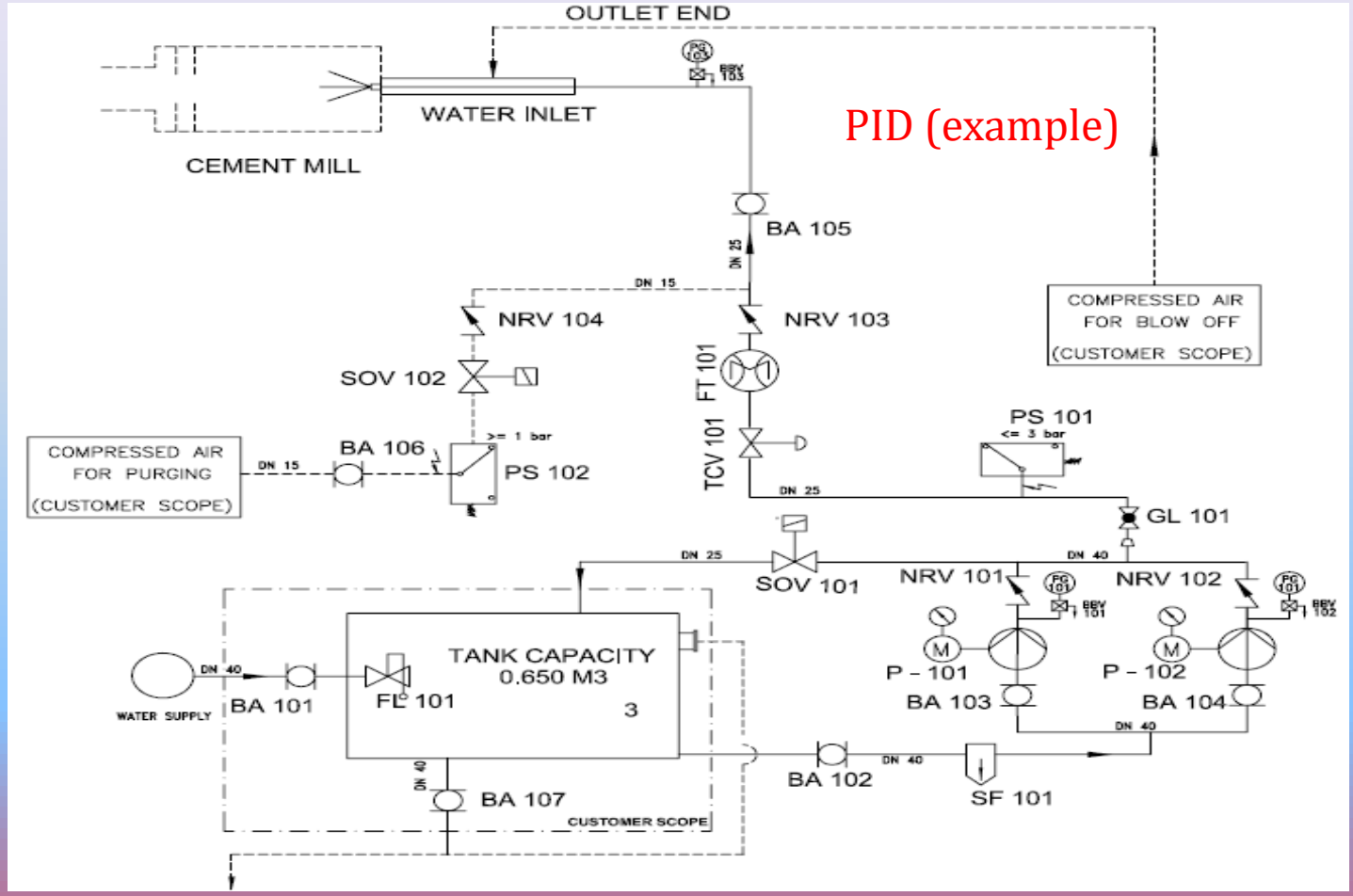
WATER INJECTION TO CEMENT MILL

Single Fluid, no return, Gas Cooling Systems (~5-6bar)



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THANK YOU

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