شركة كونتك الدولية للصيانة

CONTECH

Contech International Maintenance Co.

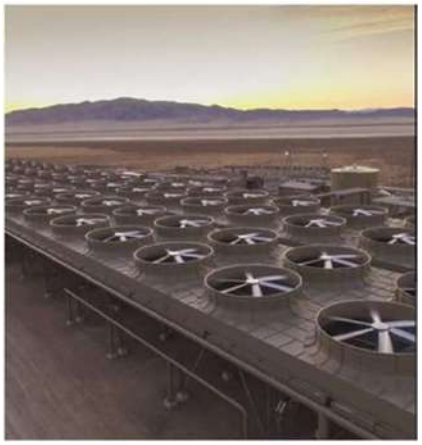
THE REVOLUTIONARY "UNIQUE SYSTEM"

axial fans int srl

Innovation and Reliability

Products and Services

- Production of axial fans **Rotors** for industrial cooling system (CT, AFC, ACC) in the range 0.8m - 12m

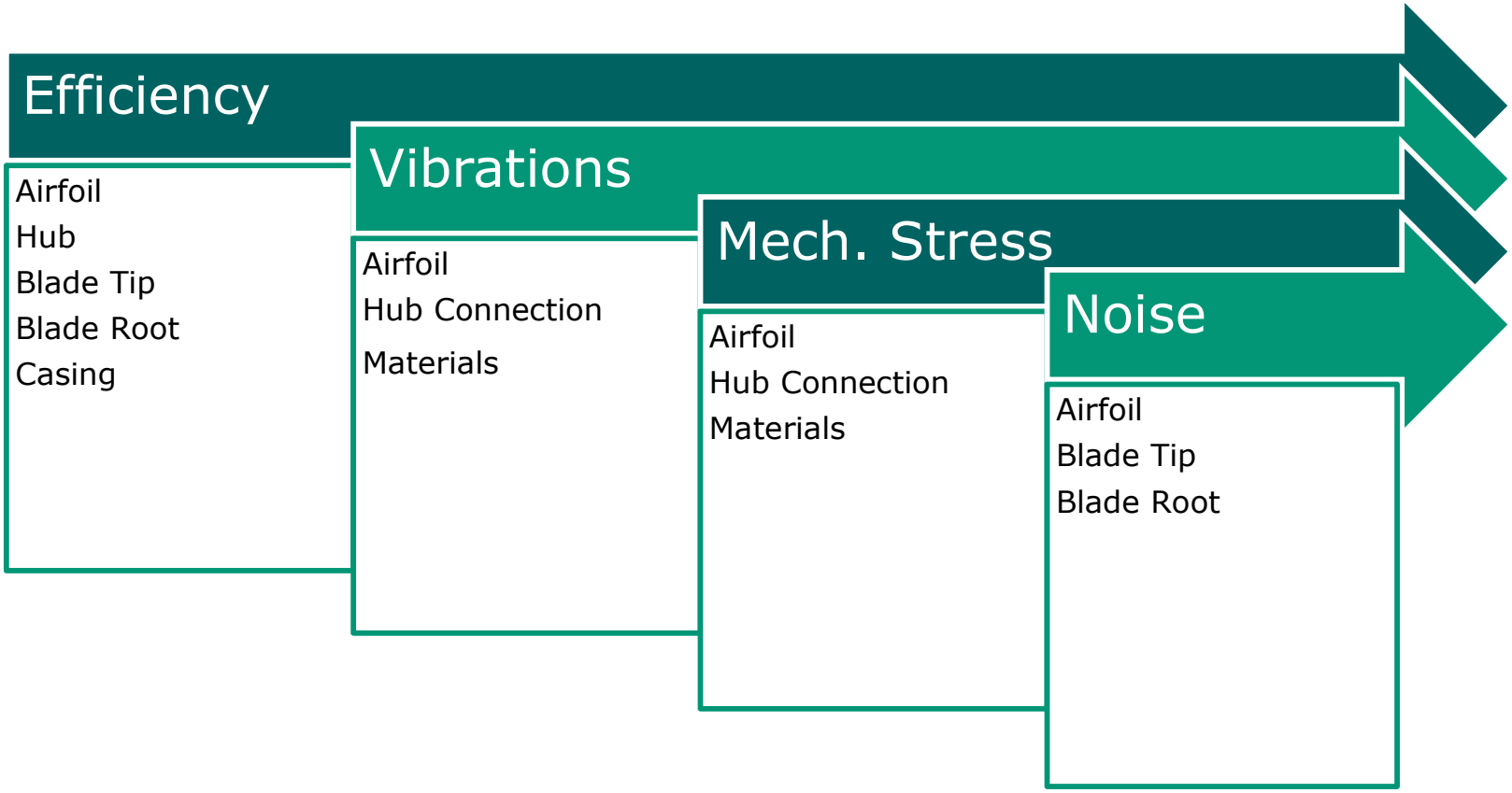




- Production of **Fan Units**


- Global **Service** and **Revamping** of cooling systems

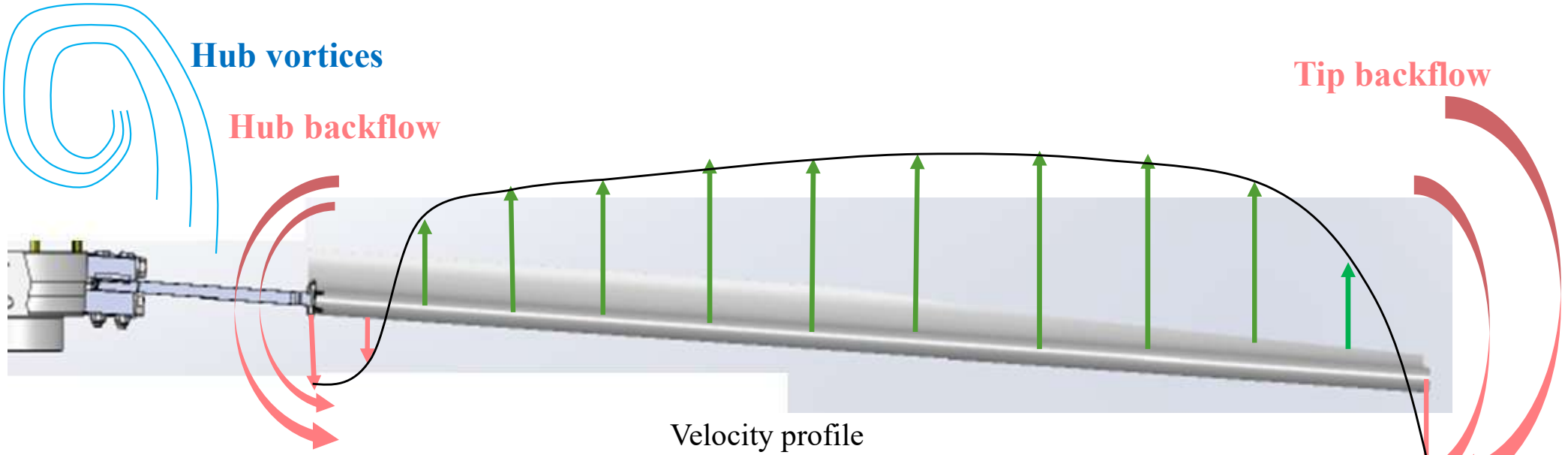

*smart*fan™ Technology

The latest innovative approach applied to all our fans, both standard and Unique System



AERODYNAMICS

- In perturbed flow, the pressure field depends on:
  - Obstructions
  - Inlet/outlet shape
  - Tip arrangement
  - Hub arrangement
  - Flow disturbances
- The result is a strongly non uniform pressure distribution mainly caused by:
  - Backflow at the ends of the blade
  - Hub vortices



HIGH EFFICENCY – UNIQUE SYSTEM

- New **Holistic Design Concept** (impeller construction, airfoil edges effects, casing, obstacles, sealing…)
- **CFD** modeling and **field tests** to investigate impact on the efficiency of the fan due to:
  - Casing Inlet/outlet
  - Obstructions/obstacles
  - Tip arrangement
  - Hub arrangement
  - Pressure distribution
- Development of a patented «**UNIQUE**» fan system able to:
  - Re-distribute and optimize air pressure gradients
  - Optimize air flows and sealings
  - Minimize electric power consumption,
  - Overall increase performances

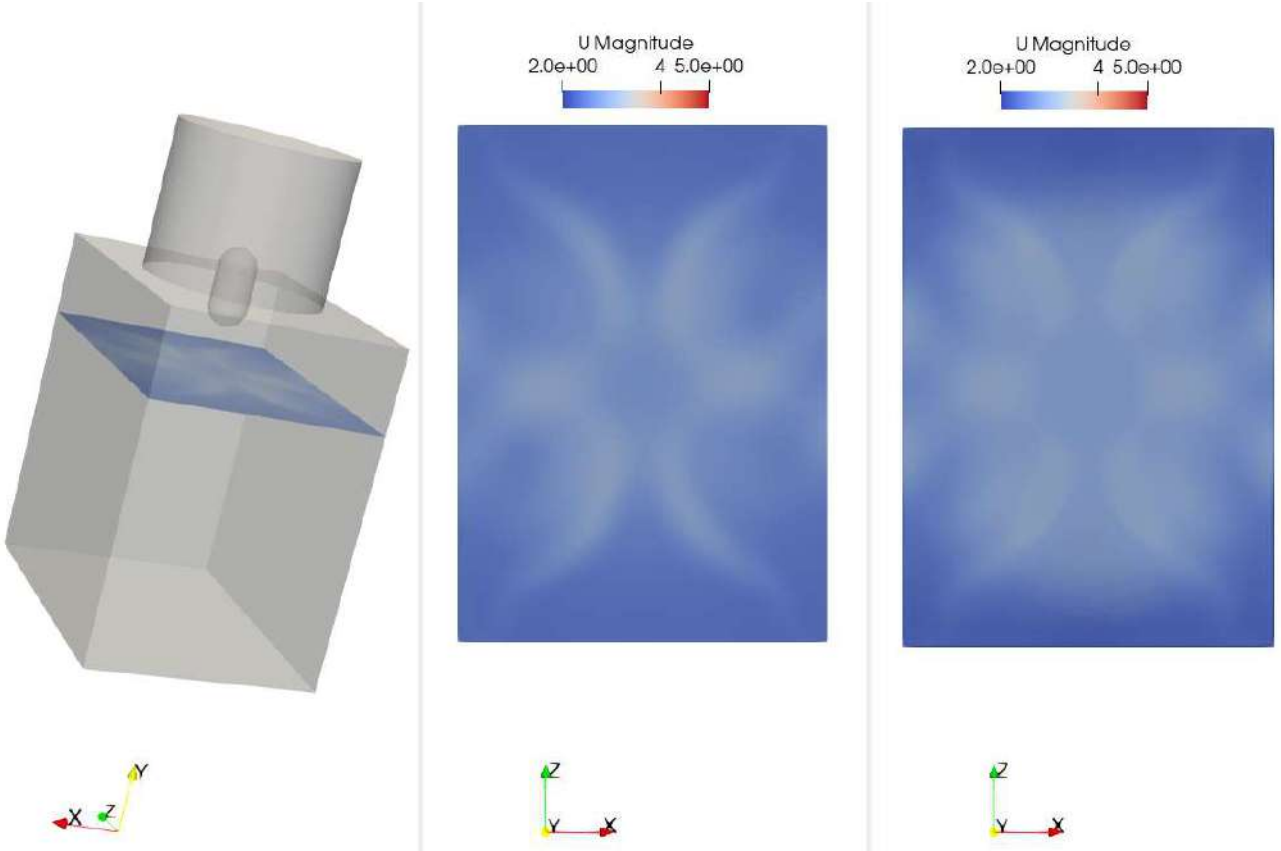
HIGH EFFICENCY – UNIQUE SYSTEM

Thanks to the higher efficiency, the Unique system will grant the possibility to reduce considerably the CO2 emission, allowing sites to remain within the restriction that, year by year, are becoming more stringent

Usually, the power absorption reduction obtained through Unique is 15%. Tentatively, it can be considered that the installation of qty 1 Unique can bring to a reduction of the CO2 emission by 11 ton per year.
If we multiply the saving obtained on one fan for all the fan installed in the plant, the overall CO2 emission reduction will increase considerably.

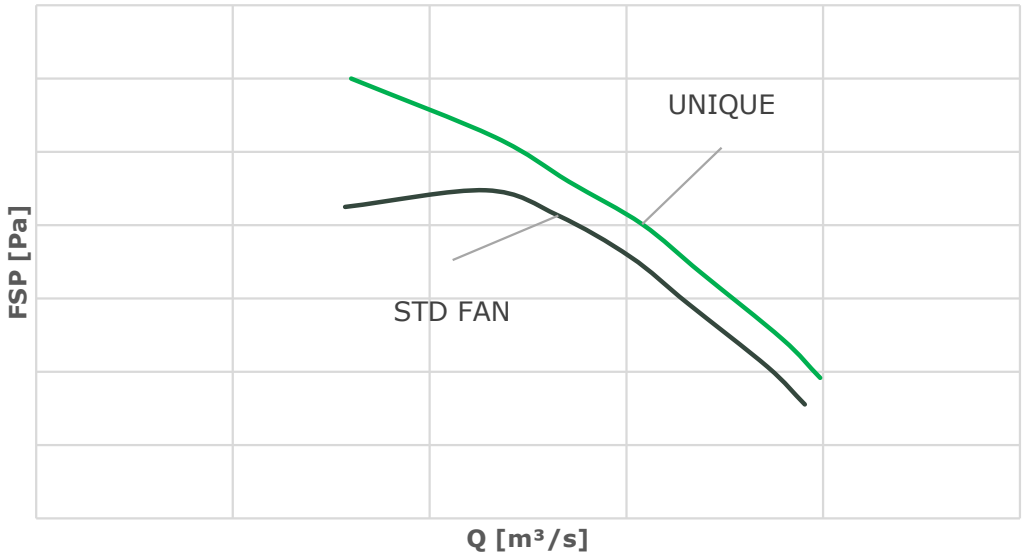
HIGH EFFICENCY – UNIQUE SYSTEM

- Re-distribution and optimization of air pressure gradients in the heat exchanger plenum (i.e. cooling tower plenum, fin fan cooler air box) allow a better distribution of the cooling, brings benefits in the exchanging efficiency and therefore in the overall process..



HIGH EFFICENCY – UNIQUE SYSTEM

- Increased efficiency solution (from +15% to +25%)
- Integrated solution easily applicable to retrofitting and upgrading
- No additionale maintenance required
- Comply with the standard technical requirements
- Improve reliability aspects
- Recently tested by a CTI (Cooling Technology Institute) authorized party



Cooling systems are the crucial element for most of the common industrial processes, from power generation to petrochemical and steel mills.

Being 24/7/365 operating equipment, saving any fraction of power consumption on cooling towers and air coolers, means creating important benefits at the end of the year on the balance of such industries.

HIGH EFFICENCY – UNIQUE SYSTEM – Package CT

315 Pa - 302 Pa

	A	B	C	D				
punti di misura[mm]	velocità misurate [m/s]				portata [m³/s]	potenza assorbita [kW]	Eff. Statica motor [%]	Eff. Statica fan [%]
59	4,1	4,3	4	3,5	13,5	7,7	52,73%	61,32%
192	5,2	7	7,2	6,6				
356	6,4	7,4	6,7	7,2				
593	3,1	2,7	3,2	3				
59	0,5	0,6	2,4	2,1	13,5	6,6	65,08%	77,47%
192	5,8	7	7,9	8,1				
356	8,6	9,4	8,9	9				
593	4	2,3	2,7	2,4				

+16,2%

- The same fan was tested during CTI test
- Same CT capability was fixed
- Power saving 1.7 kW (24%) from 7,1 kW to 5,4 kW
- Annual energy saving 13 600 kWh (@8000 h/year)
- Annual cost saving 1400 € ÷ 8000 € (@ 100 ÷ 600 €/MWh)

APPROACH PHYLOSOPHY

To define the best solutions to increase the cooling system performance, AFI commonly proposes the following activities:

- REFERENCE POINT ASSESSMENT *(Base line)*:
  - site measurement of the actual fan performances to define air flow and power consumptions.
- DESIGN OF THE BEST SOLUTIONS:
  - New fan
  - New transmission system (VFD, Synchronous motor, gear reducer, belt & pulley…)
  - Patented fan ring inlet and sealing
- SUPPLY and INSTALLATION OF ONE OF THE DESIGNED SOLUTION
- FINE TUNING OF INSTALLED SOLUTION
  - Set-up of proposed system to provide the same air flow of REFERENCE POINT
  - Measurement of power saving for calculation of rental rate
  - As an alternative: increase fan air flow by using all the available motor power saved due to the high efficiency installed system

Axial Fans Int s.r.l.

is a member of

Heat Transfer Research, Inc

HTRI

COOLING TECHNOLOGY INSTITUTE CTI EST. 1950

HIGH EFFICENCY – UNIQUE SYSTEM – Process AFC

- **Case Study**: Sonatrach Augusta – Italy ME 862-2 Fin Fan Cooler Revamping
  - Testing of the actual operating point (PUNTO 0)
  - Installation and testing of UNIQUE at same air flow (PUNTO 1)
  - Setting of UNIQUE for maximum performances (PUNTO 2)
  - Development of a Maintenance and test Software
- @ PUNTO 1: Electric Power Saving of **4 kW**, equivalent to OPEX saving of **10.000$/year**
- @ PUNTO 2: Increase of **13%** air flow at max available electric power.

punto 0 **data** 01/03/2022

CALCOLO POTENZA ASSORBITA		CALCOLO PORTATA						
[V]	380	diametro [mm]	3353					
[A]	40.5	avarage gap [mm]	15					
cos(φ)	0.834	posizioni di misura[mm] (da virola)	1	2	3	4	5	
T aria [°C]	9		87	276	495	765	1157	
kW	19.98		V1[m/s]	V2[m/s]	V3[m/s]	V4[m/s]	V5[m/s]	MEDIA[m/s]
		raggio A	1.4	5.8	6.8	5.8	6.3	5.2
		raggio B	1.0	5.0	4.5	6.0	6.8	4.7

salva e disegna

punto 1 **data** 26/04/2022

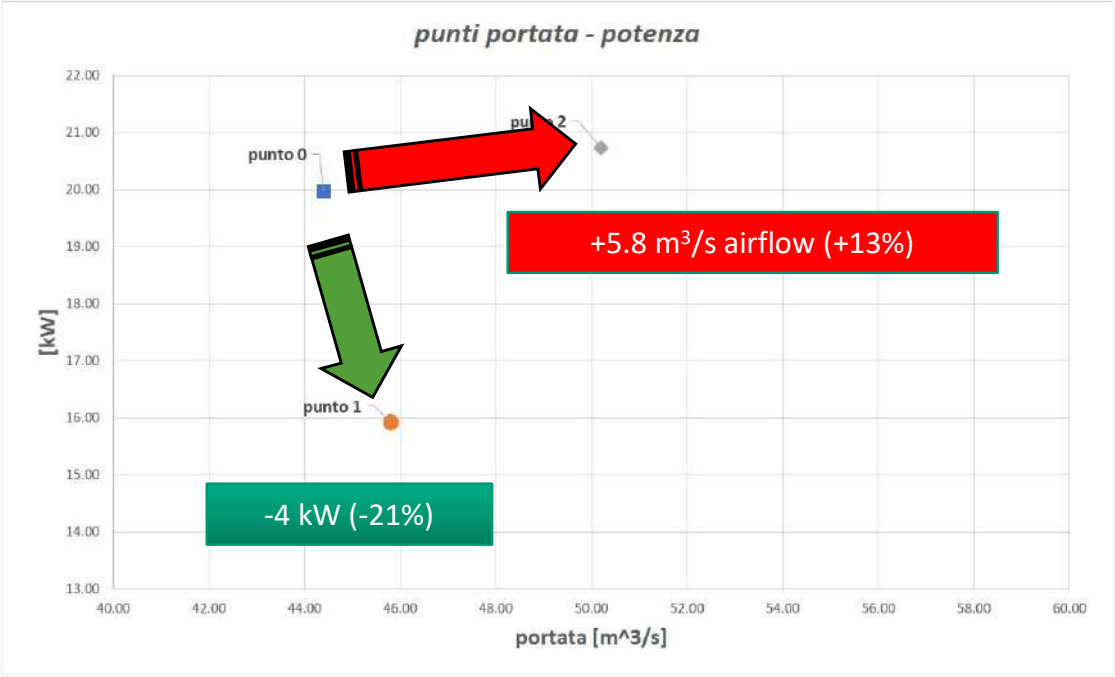
CALCOLO POTENZA ASSORBITA		CALCOLO PORTATA						
[V]	380	diametro [mm]	3353					
[A]	33.3	avarage gap [mm]	15					
cos(φ)	0.834	posizioni di misura[mm] (da virola)	1	2	3	4	5	
T aria [°C]	18		87	276	495	765	1157	
kW	15.92		V1[m/s]	V2[m/s]	V3[m/s]	V4[m/s]	V5[m/s]	MEDIA[m/s]
		raggio A	2.8	5.9	6.1	5.7	6.0	5.3
		raggio B	2.6	4.8	4.5	6.2	6.4	4.9

salva e disegna

punto 2 **data** 22/06/2022

CALCOLO POTENZA ASSORBITA		CALCOLO PORTATA						
[V]	380	diametro [mm]	3352					
[A]	37	avarage gap [mm]	15					
cos(φ)	0.834	posizioni di misura[mm] (da virola)	1	2	3	4	5	
T aria [°C]	27		87	276	495	765	1156	
kW	20.73		V1[m/s]	V2[m/s]	V3[m/s]	V4[m/s]	V5[m/s]	MEDIA[m/s]
		raggio A	6.1	6.3	5.8	5.9	5.3	5.9
		raggio B	5.3	5.7	5.3	5.2	5.1	5.3
		Net Area[m^2]	8.98					
		PORTATA [m^3/s]	50.2					

salva e disegna punto



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HIGH EFFICIENCY – UNIQUE SYSTEM – Reference Letter

سوناطراک
sonatrach

Sonatrach Raffineria Italiana S.r.l. con socio unico

Augusta, October 2022

Subject: REFERENCE LETTER

On the air fin coolers installed on its plants, SONATRACH RAFFINERIA ITALIANA uses the new UNIQUE ventilation system, developed by Axial Fans Int srl, which substantially reduces the electrical power consumption and/or increases the cooling performance of the air fin coolers.
SONATRACH RAFFINERIA ITALIANA is therefore very satisfied with the system installed and the service provided by AFI.

Signature

HIGH EFFICENCY – UNIQUE SYSTEM – Package CT

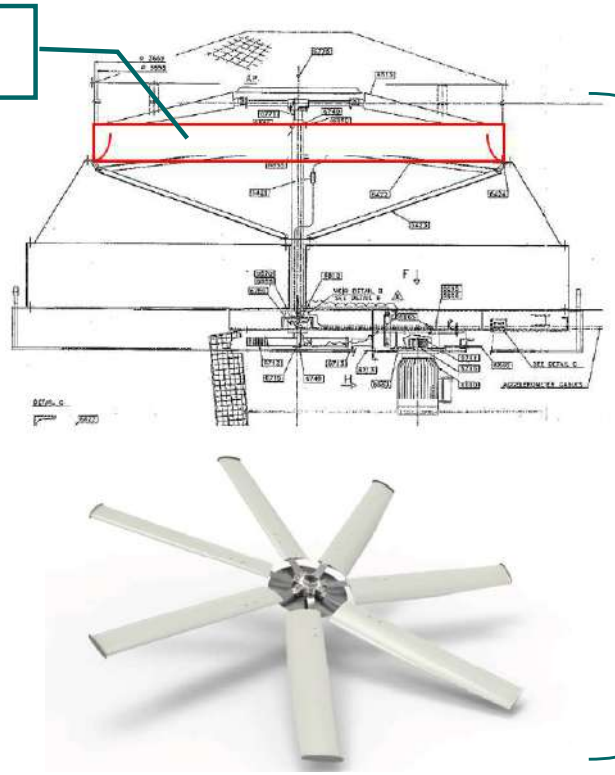
Performance improvement Nigeria

Main fields of improvement

- Condenser performances during hottest days
- Belts failures
- Fan-motor control and field feedback
- Cooling fans regulation, during raining season
- Bundles cleaning
- Mechanical group maintenance

Condenser improved performances are reached by

- Installation of AFI high efficiency fans provided by
  - Optimized aerodynamic profiles
  - ***Smart****Fans technology* that allows reduction of fan stress and vibration
  - **Unique** fan technology to enhance fan performance and overcome installation defect that jeopardize the efficiency. The system further the fan efficiency will improve the air distribution across the condenser bundles with a secondary benefit of better heat exchange across the cooler area.
- Replacement of existing pulley and belt transmission, optimizing fan rotation speed and improving system reliability



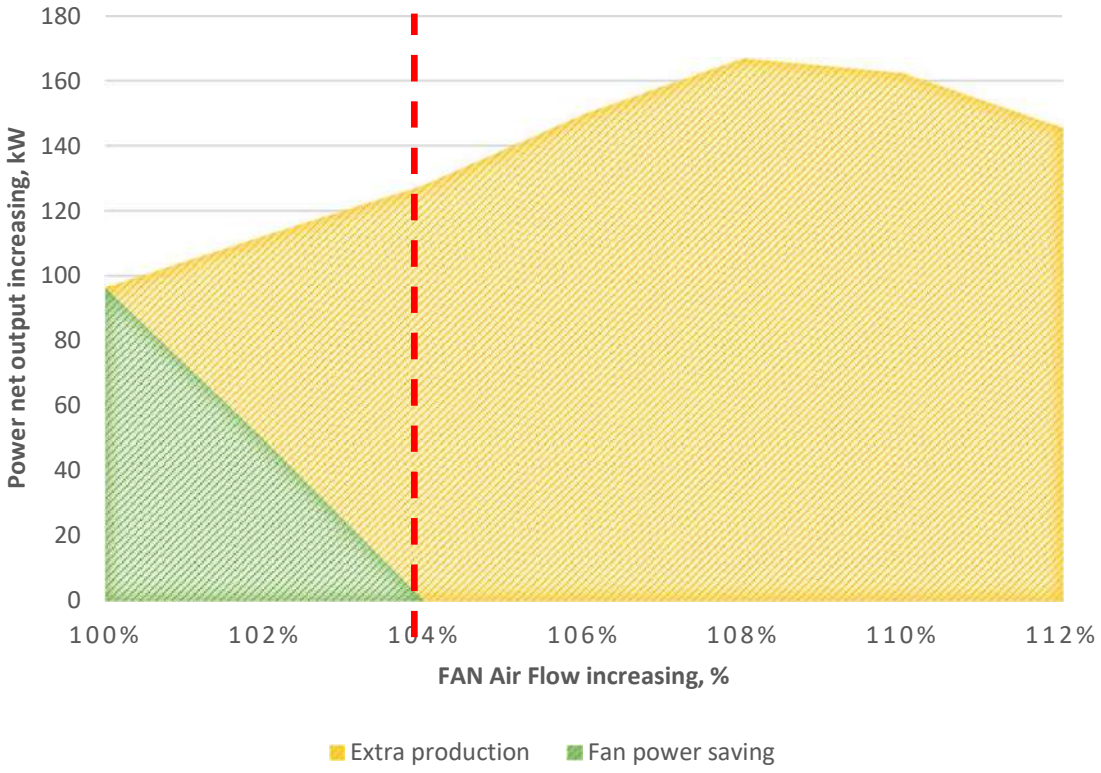
Condenser design

- Fluid flow 2417184 kg/h
- Heat duty 189252 kW

Condenser improved design

- Fluid flow 2590000 kg/h **(+7%)**
- Heat duty 203165 kW **(+7%)**

Geothermal plant: UNIQUE case study



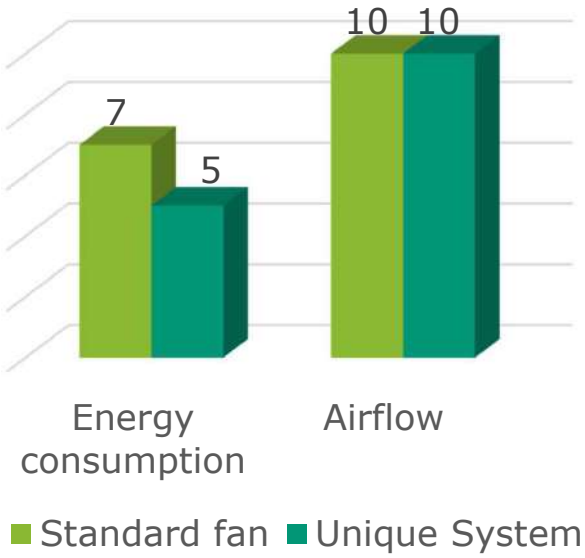
Plant design data

- Nominal production 18 MWe
- ORC fluid n-butane 97%, iso-butane 2% propane 1%
- ACC fans 40
- ACC fan power 22 kW
- ACC fan diameter 22 ft
- ACC back pressure 3,25 bar
- ACC simulated by HTRI software

HIGH EFFICENCY – UNIQUE SYSTEM

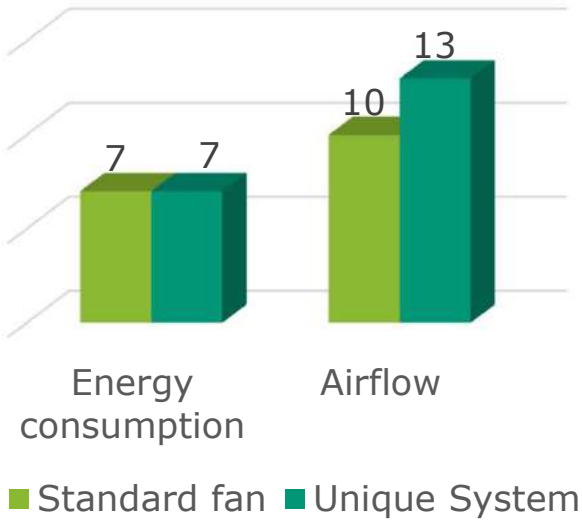
Here below a simple example of the different performances of the Unique System respect to a standard fan.
In this simple case, we are considering that the motor max power is equal to 10.

Scenario 1
Consumption saving



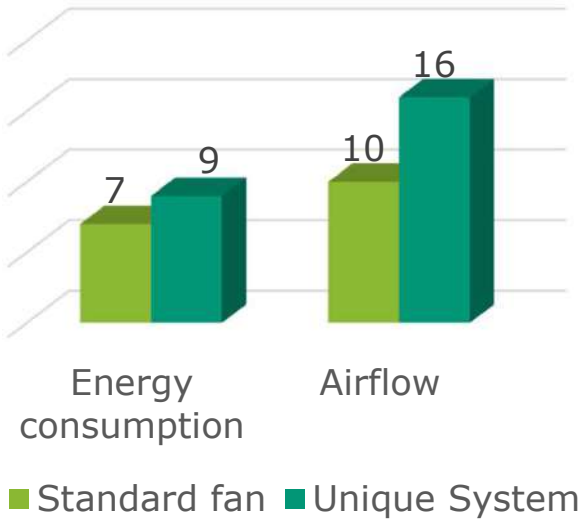
The standard fan needs more energy to produce the same airflow

Scenario 2
Increased airflow



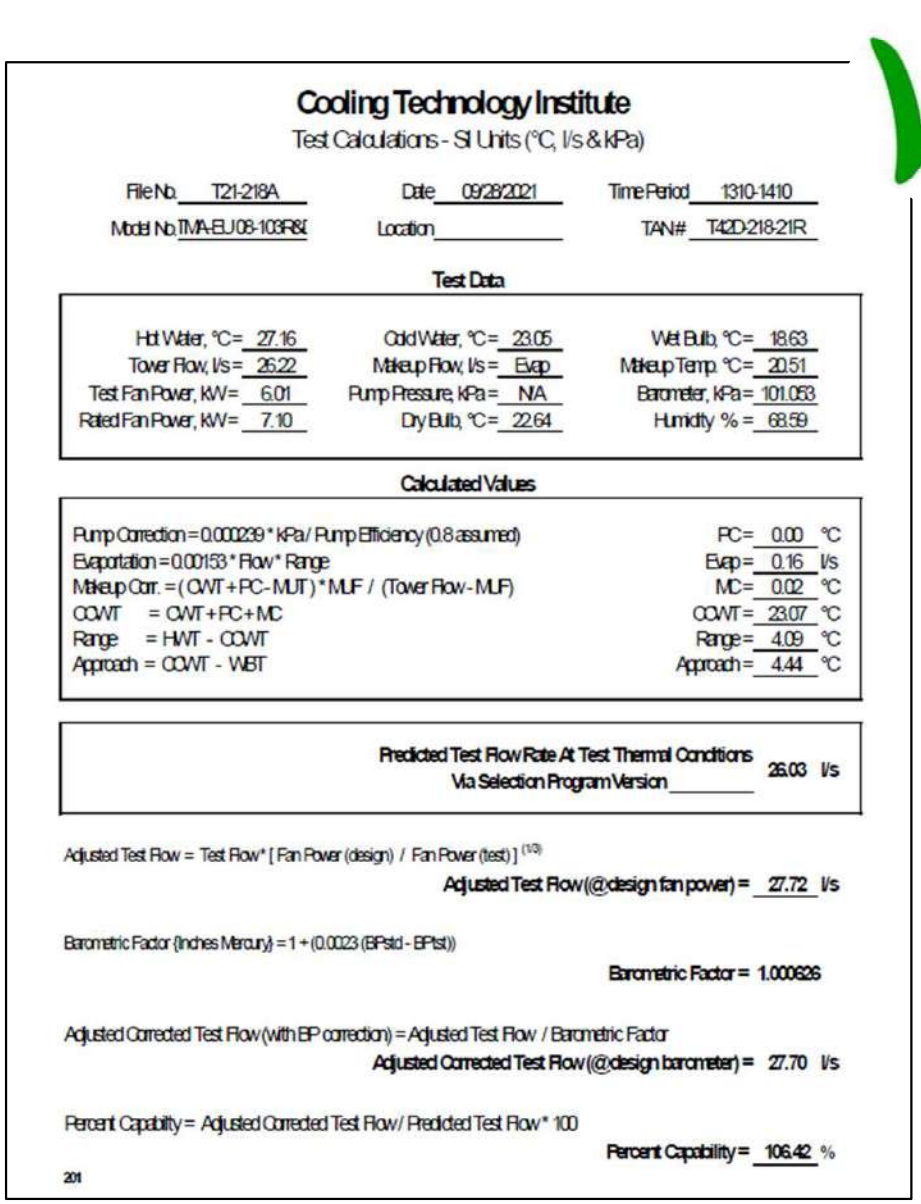
Consuming the same energy, the Unique System is generating more airflow.
To be considered that, usually, standard fans are not able to consume all the energy available, due to their efficiency limit

Scenario 3
Maximum airflow



The standard fan is not able to take advantage of all the power of the motor, even increasing the pitch angle. The Unique system is able to have access to that power, that the standard fan cannot reach, maximizing the airflow

HIGH EFFICENCY – UNIQUE SYSTEM – CTI Certification



Cooling Technology Institute

Test Calculations - SI Units (°C, l/s & kPa)

File No. T21-218A Date 09/28/2021 Time Period 1310-1410

Model No. TMA-EUJ08-103R8(Location _____ TAN# T42D-218-21R

Test Data

Hot Water, °C= 27.16	Cold Water, °C= 23.05	Wet Bulb, °C= 18.63
Tower Flow, l/s= 26.22	Makeup Flow, l/s= Evap	Makeup Temp. °C= 20.51
Test Fan Power, kW= 6.01	Pump Pressure, kPa= N/A	Barometer, kPa= 101.053
Rated Fan Power, kW= 7.10	Dry Bulb, °C= 22.64	Humidity % = 68.59

Calculated Values

Pump Correction = 0.000239 * kPa / Pump Efficiency (0.8 assumed)	PC= 0.00 °C
Evaportation = 0.00153 * Flow * Range	Evap= 0.16 l/s
Makeup Corr. = (CWT + PC - MUT) * MUF / (Tower Flow - MUF)	MC= 0.02 °C
CCWT = CWT + PC + MC	CCWT= 23.07 °C
Range = HWT - CCWT	Range= 4.09 °C
Approach = CCWT - WBT	Approach= 4.44 °C

Predicted Test Flow Rate At Test Thermal Conditions Via Selection Program Version _____ 26.03 l/s

Adjusted Test Flow = Test Flow * [Fan Power (design) / Fan Power (test)] $^{(1/3)}$

Adjusted Test Flow (@design fan power) = 27.72 l/s

Barometric Factor (Inches Mercury) = 1 + (0.0023 (BPstd - BPtst))

Barometric Factor = 1.000626

Adjusted Corrected Test Flow (with BP correction) = Adjusted Test Flow / Barometric Factor

Adjusted Corrected Test Flow (@design barometer) = 27.70 l/s

Percent Capability = Adjusted Corrected Test Flow / Predicted Test Flow * 100

Percent Capability = 106.42 %

201

The cooperation with third party inspection worldwide recognized is fundamental for the development of innovative products. Thanks to this cooperation it is possible to assess the truthfulness of the results obtained and gives to Axial Fans' products more reliability.

Here you can find a certificate released by CTI (Cooling Technology Institute) which attended few tests, releasing a certificate stating the improvement given by our innovative System Unique solution.

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Contech International Maintenance Co.

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Thank you for the attention

Any questions?

Contacts:

Axial Fans Int.

Mr. Luigi Alesi

Email: l.alesi@axialfansint.com

Mobile: +393387138667

Contech International Maintenance Co.

Mr. Mazen Shaat

Email: mazen@contechksa.com

Mobile: +966567745164