FAN SELECTION SOFTWARE & FEI

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Webinar Moderator

- Joined Asia AMCA in 2013
- Responsible for AMCA memberships in the Asia Region
- Responsible for Marketing activities & events in the Asia Region

Introductions & Guidelines

- Participation Guidelines:
  - Audience will be muted during the webinar.
  - Questions can be submitted anytime via the GoToWebinar platform and will be addressed at the end of the presentation.
  - Reminder: This webinar is being recorded!

Q & A

To submit questions:

- From the attendee panel on the side of the screen, select the “Questions” drop down option.
- Type your question in the box.
- Click “Send”
- Questions will be answered at the end of the program.
- If all of today’s questions are not able to be answered live, we will follow up with the questions that are submitted in the question box via email.

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Presenter - Andy Philpott

Internet Development Manager
Computair, AMCA Associate

- Over 30 years in engineering software design & Internet related systems.
- Managed many Internet related HVAC projects.
- Developed Computair WebFAN, now in use throughout the world for fan selection.
- Strong interest in FEI

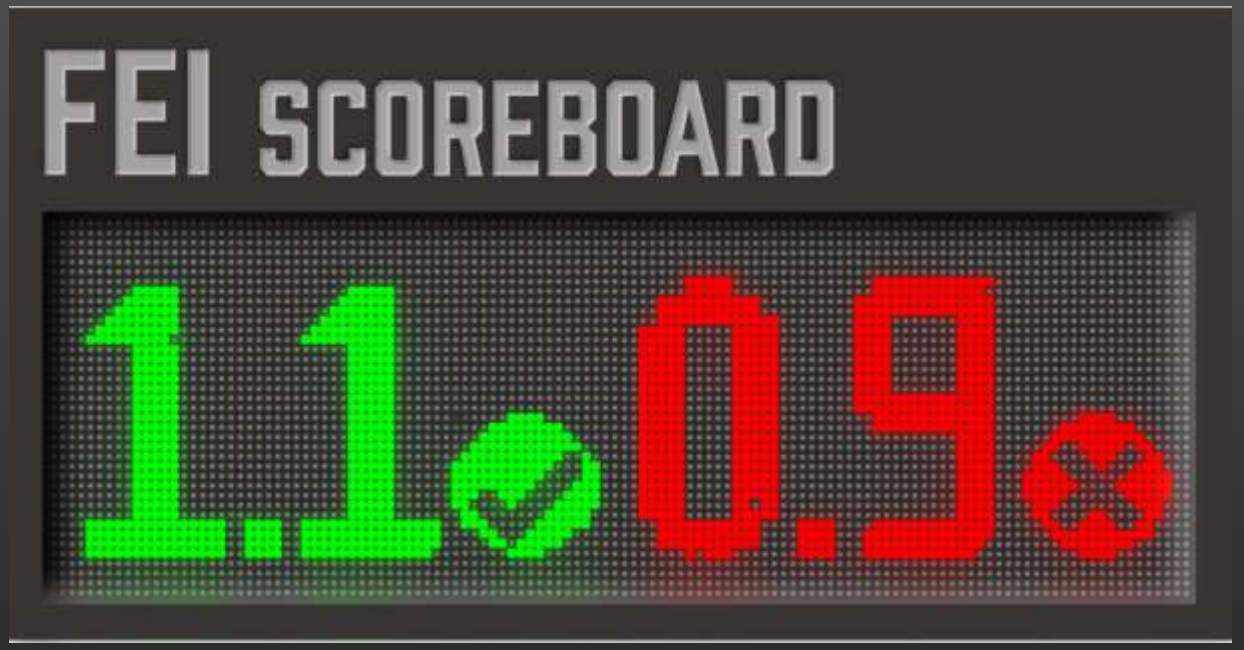
Fan Selection Software & The Fan Energy Index – FEI
风机选型软件和FEI风机能效指数

An insight to implementing the AMCA 208 FEI standard

实施 AMCA 208 FEI 标准的见解

Andrew Philpott - Computair

Presentation Summary 演示摘要



- Who is Computair
- 谁是 Computair

- Sharing of ideas
- 分享想法

- Fan selection overview
- 风机选型概述

- The Fan Energy Index *(FEI)*
- 风机能效指数 （FEI）

- Implementing FEI today
- 立即实施 FEI

- Selection software going forward
- 未来选择软件

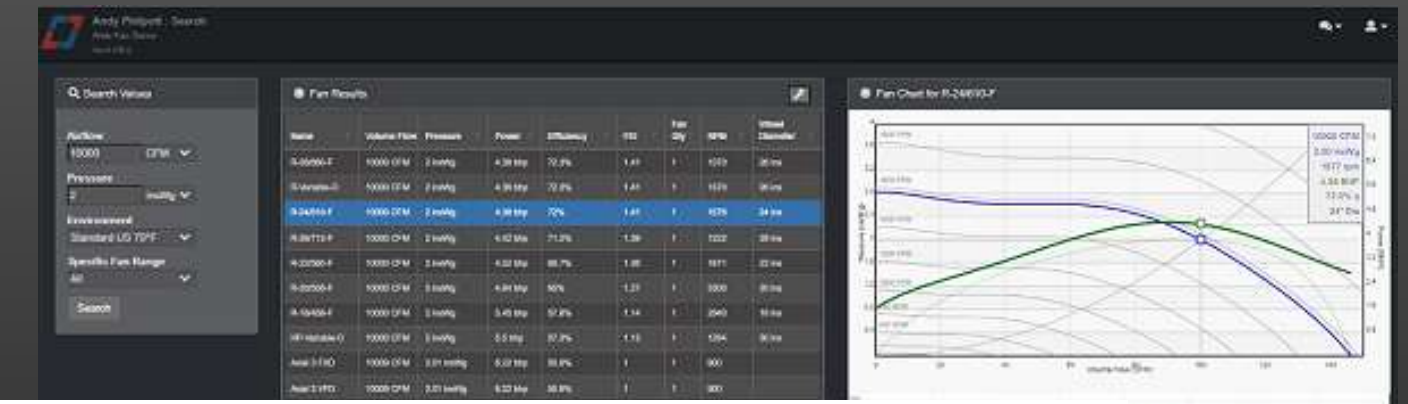
- Quick demo, Summary and Q+A
- 快速演示、总结和问答

Who is Computair?
谁是 Computair？

computair
specialist technical software

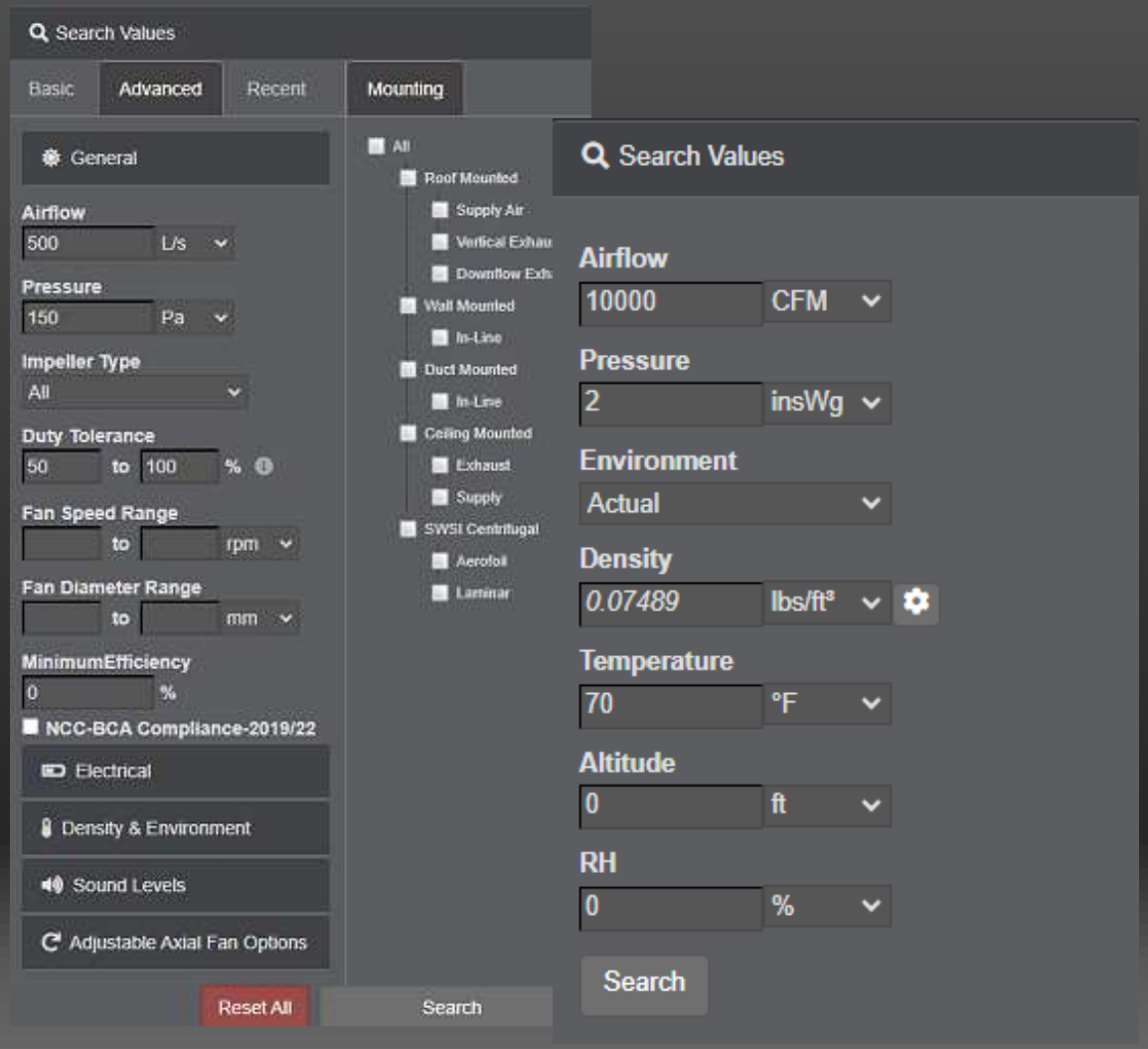
- Industrial engineering software
- 工业工程软件
- Fan selection software
- 风机选型软件
- Air handler design software
- 空气处理器设计软件
- Coil and fan coil related software
- 盘管和风机盘管相关软件
- Specialist engineering software
- 专业工程软件
- Who is the webinar presenter
- 谁是网络研讨会的主持人

Fan Selection Revisited – Overview
重新审视风机选择 – 概述



- What does it do?
- 它有什么作用？
- Finds fans that meet a duty point
- 查找符合工况点的风机
- Extrapolate from lab test data
- 根据实验室测试数据进行推断
- Create sales outputs
- 创建销售产量
- Provide engineering functions
- 提供工程功能

Fan Selection Revisited – Duty point
重新审视风机选择 – 工况点

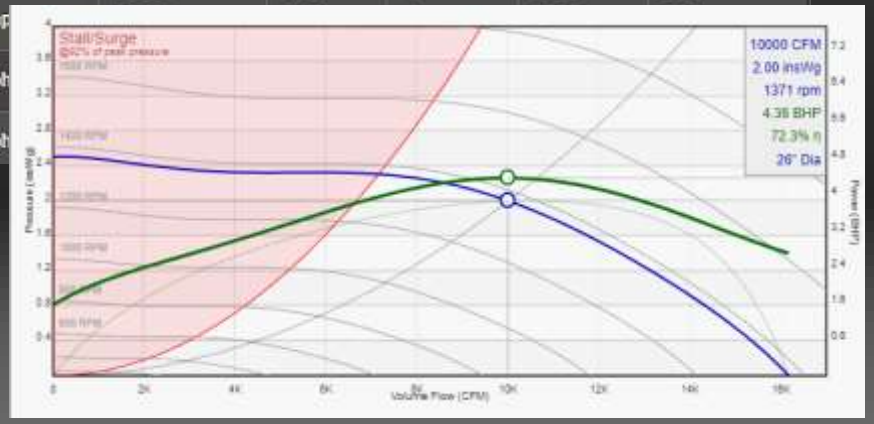


- Airflow requirement
- 风量要求
- Static/total pressure
- 静压/全压
- Air condition/density
- 空调/密度
- Supplementary requirements
- 补充要求
  - Environment and installation type
  - 环境和安装类型
  - Power supply voltage
  - 供应电源电压
  - Sound requirements
  - 声音要求
  - Fan and impeller type
  - 风机和叶轮类型
  - Efficiency constraints
  - 效率限制
  - Dimension constraints
  - 尺寸约束

Fan Selection Revisited – Selecting capable fans
重新审视风机选择 – 选择理想的风机

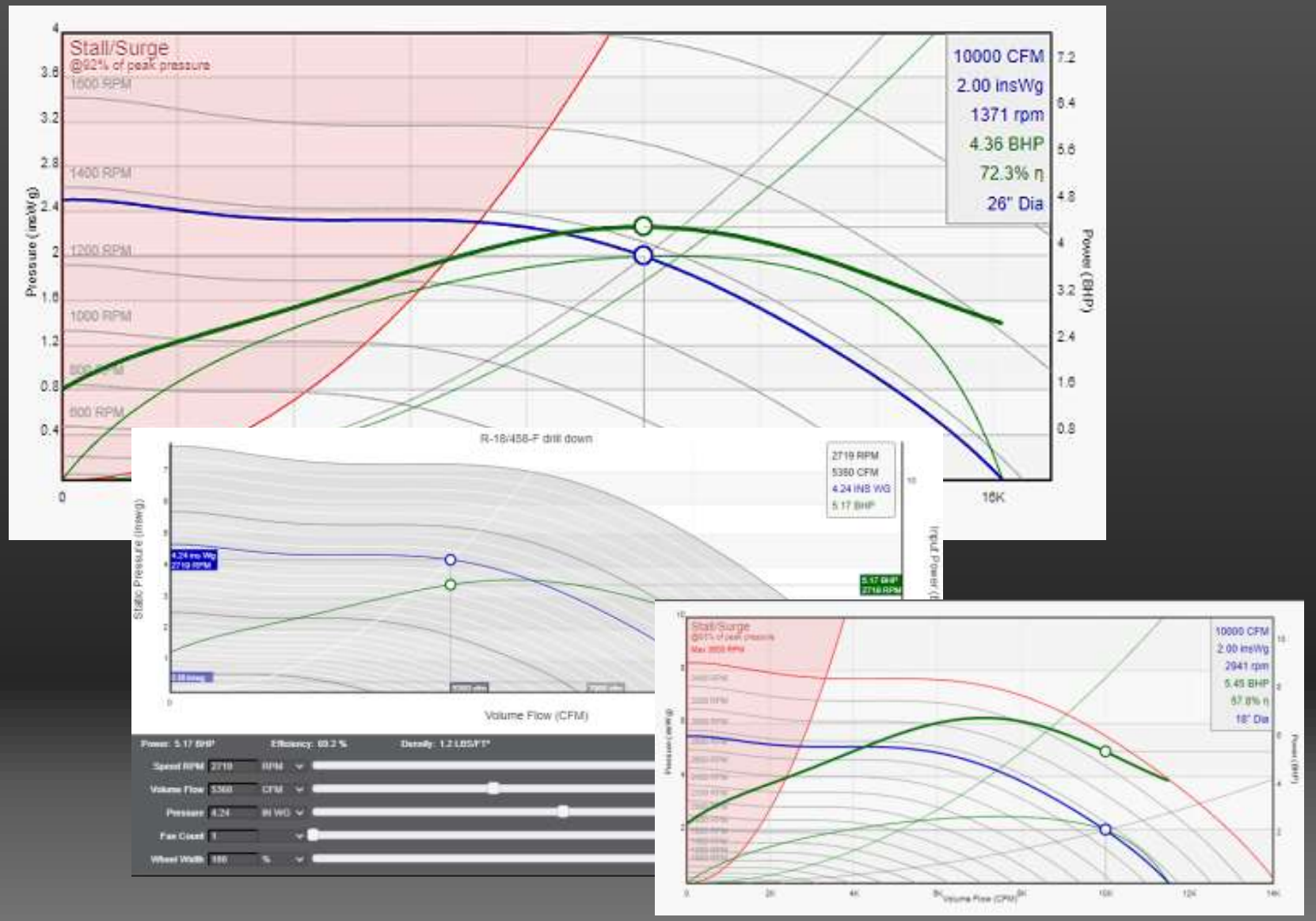
Fan Results

Name	Volume Flow	Pressure	Power	Efficiency	FEI	Fan Qty	RPM	Wheel Diameter
R-26/660-F	10000 CFM	2 insWg	4.36 bhp	72.3%	1.41	1	1370	26 ins
R-Variable-D	10000 CFM	2 insWg	4.36 bhp	72.3%	1.41	1	1370	26 ins
R-24/610-F	10000 CFM	2 insWg	4.38 bhp	72%	1.41	1	1576	24 ins
R-28/712-F	10000 CFM	2 insWg	4.42 bhp	71.2%	1.39	1	1222	28 ins
R-22/560-F	10000 CFM	2 insWg	4.52 bhp	69.7%	1.36	1	1871	22 ins
R-20/508-F	10000 CFM	2 insWg	4.84 bhp	65%	1.27	1	2300	20 ins
R-18/458-F	10000 CFM	2 insWg	5.45 bhp	57.8%	1.14	1	2940	18 ins
HP-Variable-D	10000 CFM	2 insWg	5.5 bhp					
Axial 3 FXD	10009 CFM	2.01 insWg	6.22 bh					
Axial 3 VFD	10009 CFM	2.01 insWg	6.22 bh					



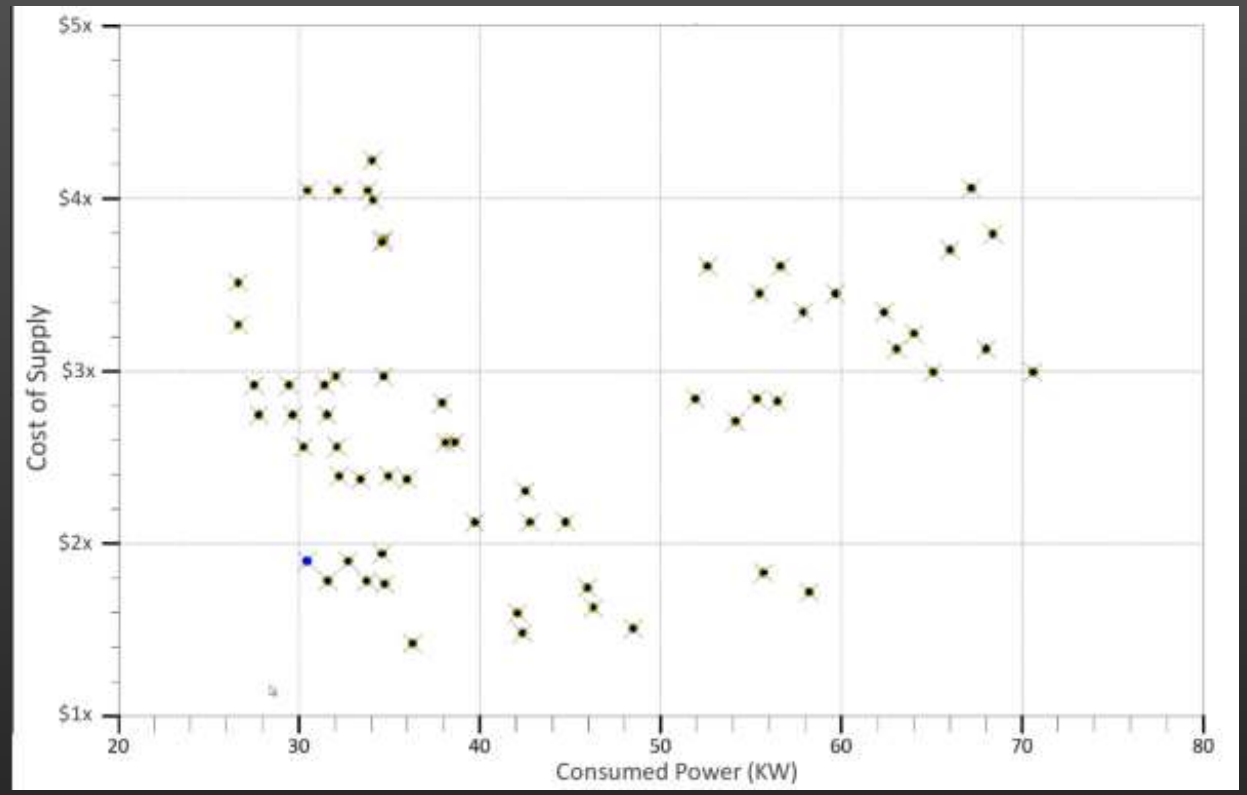
- Find matching fans solutions
- 查找匹配的风机解决方案
- Use fan laws for all fan types
- 对所有风机类型采用风机定律
- Calculate secondary values
- 计算次要值
- Allow user to decide on best
- 允许用户来作出最佳决定
- List sort order relevance
- 列表排序顺序相关性

Fan Selection Revisited – Fan Chart
重新审视风机选择 – 风机图表



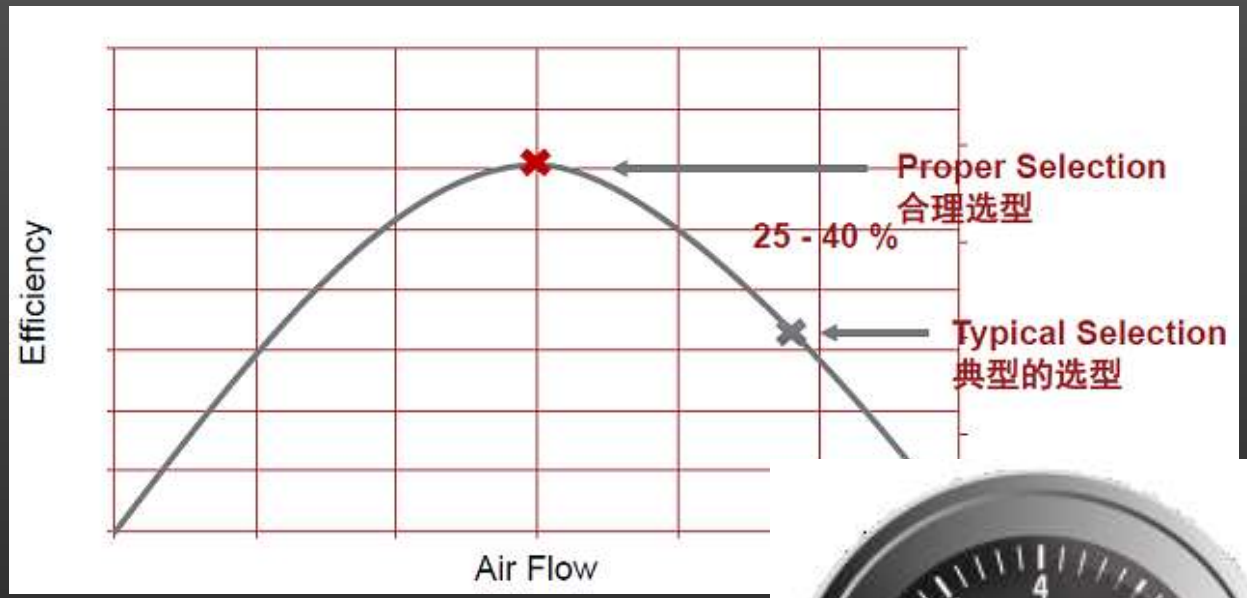
- Pressure and power curves
- 压力和功率曲线
- System curve & RPM lines
- 系统曲线和转速曲线
- Surge/Stall region
- 喘振/失速区域
- Maximum RPM performance
- 最大 RPM 性能
- Efficiency curve
- 效率曲线
- The sweet spot
- 理想点

Fan Selection Revisited – Adjustable fans & cost
重新审视风机选择 – 可调节风机和成本



- If fans adjustable, we have options!
- 如果风机可调，我们有选择！
- Can be cheap and efficient.
- 既便宜又高效。
- Variable axial pitch
- 可调叶片角度
- Wheel diameter, width & fan count
- 叶轮直径、宽度和风机数量
- Pulley gearing
- 皮带轮传动装置
- Variable speed control
- 变速控制
- Cost vs power scatter chart metric
- 成本与功耗散点图指标

Fan Selection Revisited – Decision criteria
重新审视风机选择 – 决策标准



- Cost drives decision making
- 成本驱动决策

- Smaller faster fans are cheaper to buy/sell
- 转速高的小风机，买卖成本越低
- Smaller faster fans less likely to stall
- 转速高的小风机，失速的可能性就越小
- Easier dimensional fitting
- 尺寸配合更简单

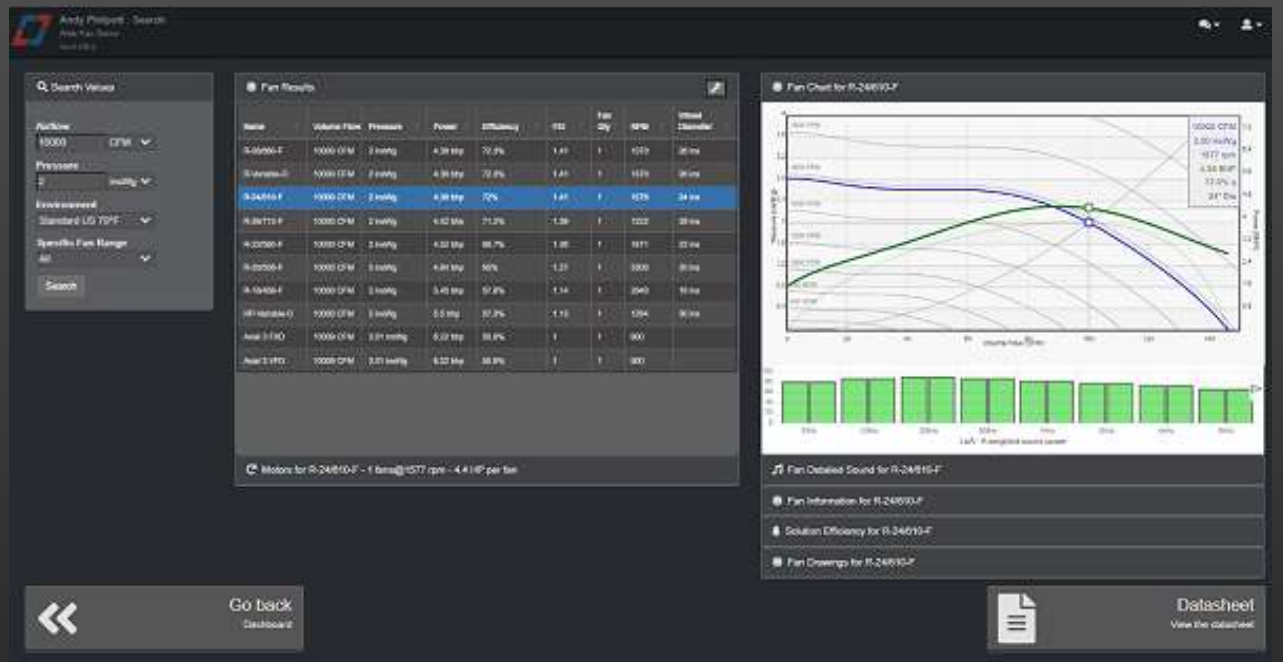
- Larger slower fans are more efficient
- 转速低的大风机，效率越高
- Efficient fans are cheaper to run
- 高效风机的运行成本更低
- Single larger fans cost more to supply
- 单台大风机的供应成本更高

- Often running costs not paid by purchaser
- 通常运行成本不由采购者支付
- Efficiency vs market pressures
- 效率与市场压力
- Need for regulation
- 监管的必要性
- Software assists with regulatory pressures
- 软件有助于应对监管压力

Fan Selection Revisited – Importing Test Data
重新审视风机选择 – 输入测试数据

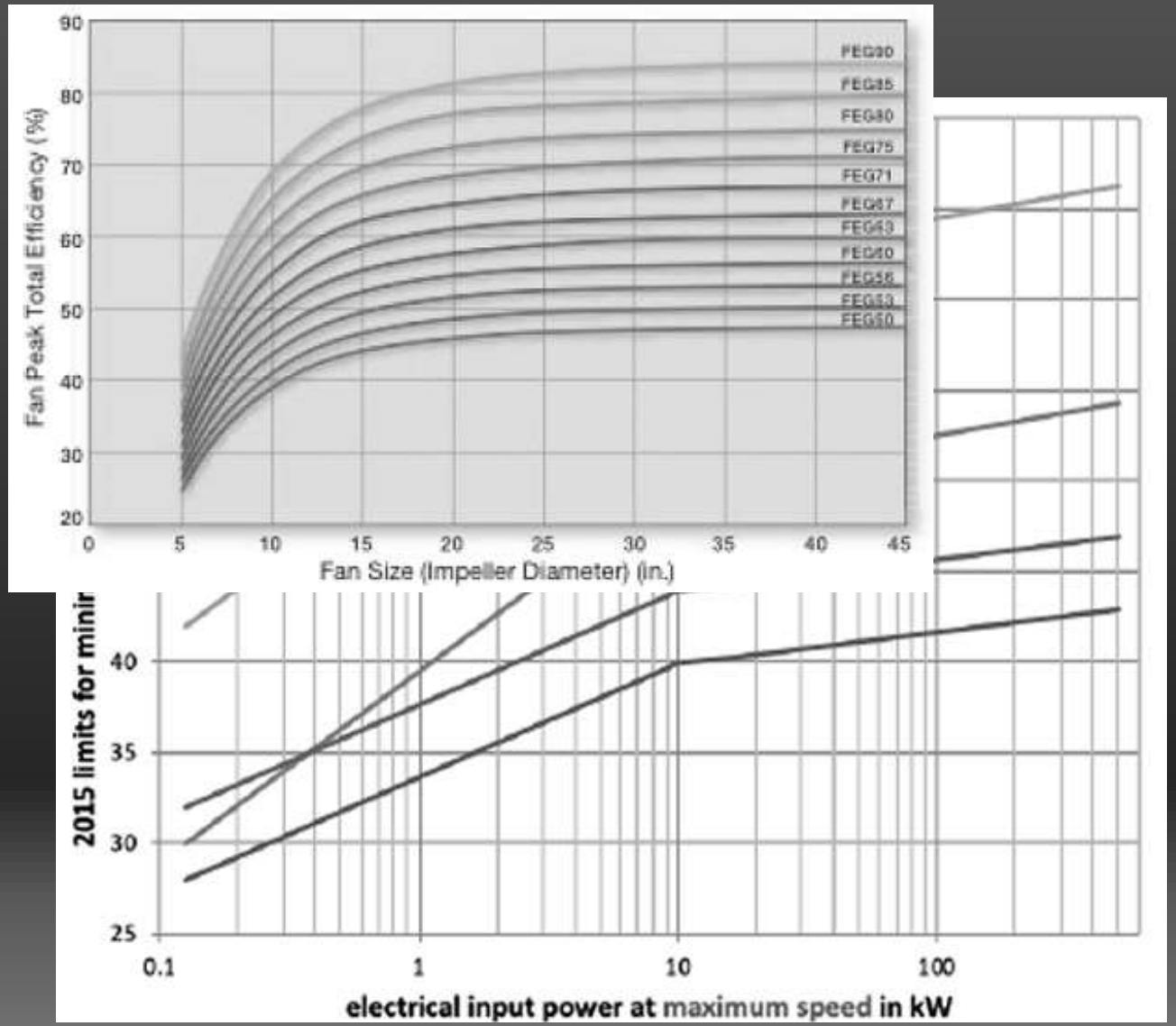
- Loading in lab data should be easy!
- 加载实验室数据应该很容易！
- Straight from lab into the software
- 直接从实验室资料进入软件
- AMCA XML file import
- AMCA XML 文件的输入
- Reduces risk of inaccuracies
- 降低不准确的风险
- Custom schema imports
- 自定义架构输入
- Reliable selection made easy
- 轻松选择可靠

Fan Selection Revisited – Summary Bullet Points
重新审风机选择 – 总结要点



- Approximate field performance
- 近似现场性能
- Prepare sales submittals
- 准备销售送审
- The business drives
- 业务驱动力
- Low cost wins out
- 低成本胜出
- Pressure on software to emphasize η
- 对软件施加压力，强调η

The Fan Energy Index (FEI) – *Background*
风机能效指数 （FEI） - 背景

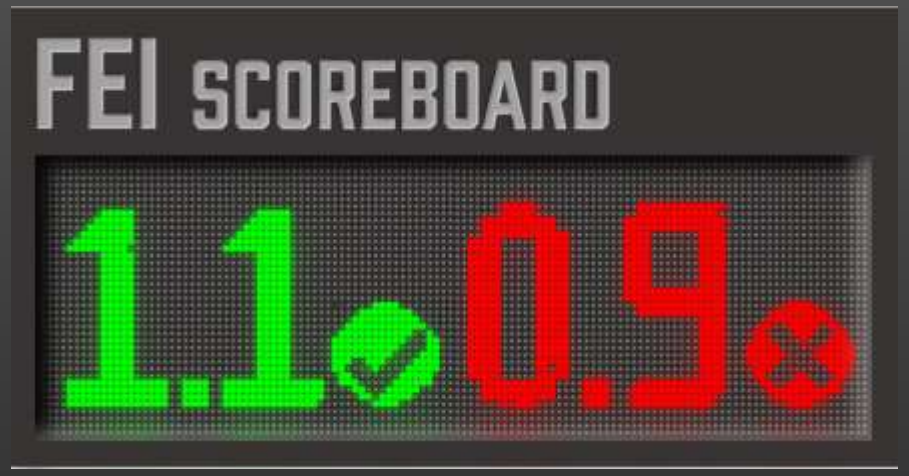


- **Need for better efficiency**
- **需要更高的效率**
- Lower running costs
- 降低运行成本
- Less energy consumption
- 降低能耗
- Less pollution & land-fill
- 减少污染和垃圾填埋

- **Various previous standards**
- **各种以前的标准**
- FEG shaft power - single point peak η
- FEG轴功率 - 单点峰值η
- FMEG wire to air - single point peak η
- FMEG - 单点峰值 η
- Focused on testing not selection
- 专注于测试而不是选择

- **AMCA 208 standard from 2018**
- **AMCA208 标准- 2018年**
- Selection efficiency not peak
- 选择效率不达标
- Now being regulated against
- 现在受到监管

The Fan Energy Index (FEI) – *Fundamentals*
风机能效指数 （FEI） - 基本面



$$FEI = \frac{\textit{Reference Fan Electrical Input Power}}{\textit{Actual Fan Electrical Input Power}}$$

- FEI is a simple concept… must be >1
- FEI是一个简单的概念……必须为 >1
- Complete Wire to Air metric
- 完整的从供电输入到气动输出的指标
- Uses a benchmark to a reference fan etc
- 使用参考风机等的基准测试
- More emphasis at selection time
- 更加强调选型
- Removes ambiguity so easily regulated
- 消除歧义，如此容易监管
- Must be handled by selection software
- 必须由选型软件处理

The Fan Energy Index (FEI) – *Calculations*
风机能效指数 （FEI） - 计算

$$FEI = \frac{\textit{Reference Fan Electrical Input Power}}{\textit{Actual Fan Electrical Input Power}}$$

- Designed by air movement experts
- 由空气运动专家设计

- Implemented by software programmers
- 由软件程序员实现

- Fixed air power duty point (flow*pressure)
- 固定空气动力工况点（流量*压力）

- *Input* power benchmarked to reference fan
- 以参考风机为基准的输入功率

- Allowances for just fans (shaft power)
- 仅风机的余量（轴功率）

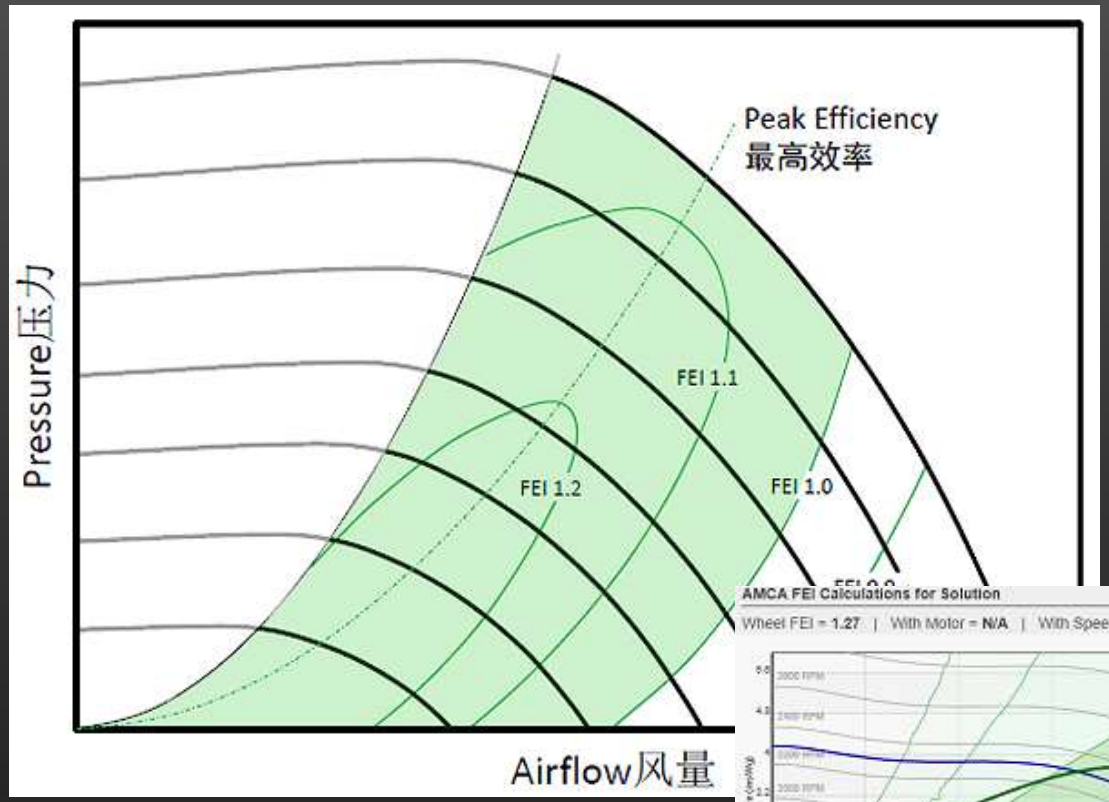
- Need motor and drive efficiencies/FEP
- 所需电机和驱动器的效率/FEP

- Can use AMCA 207 for TEFC & ODP motors
- 可采用AMCA 207里的TEFC和ODP电机

- Covers variable speed ‘Wire to Air’
- 覆盖变速“从供电输入到气动输出”

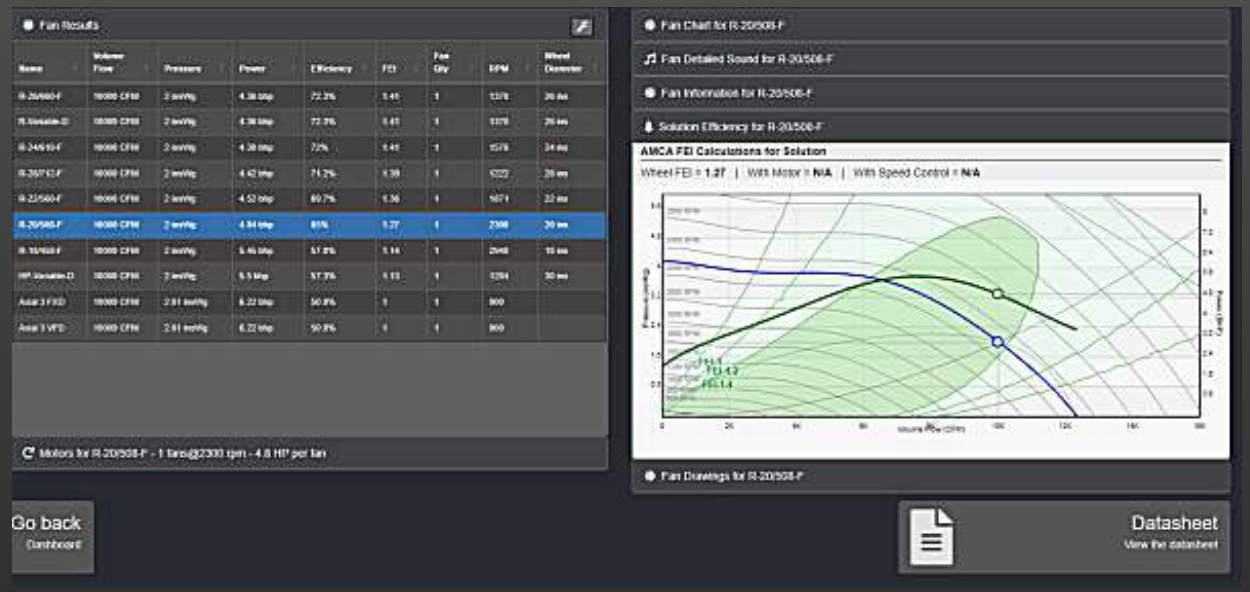
- Requires exact motor/drive η at duty point
- 需要在工况点上的精确电机/驱动η

The Fan Energy Index (FEI) – *Bubbles*
风机能效指数 （FEI） - 气泡



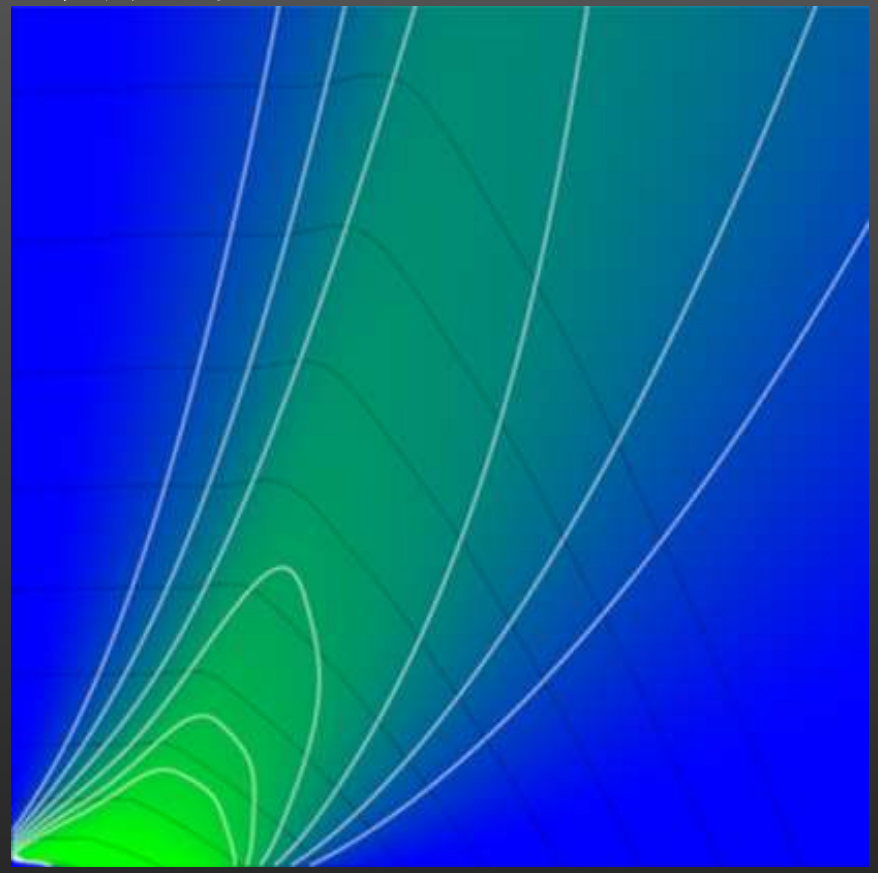
- FEI regions can be shown on a fan chart
- FEI 区域可以显示在风机曲线图上
- Gives an instant view of fans efficiency
- 即时查看风机效率
- Can show where selection duty point lies
- 可以显示选择工况点的位置

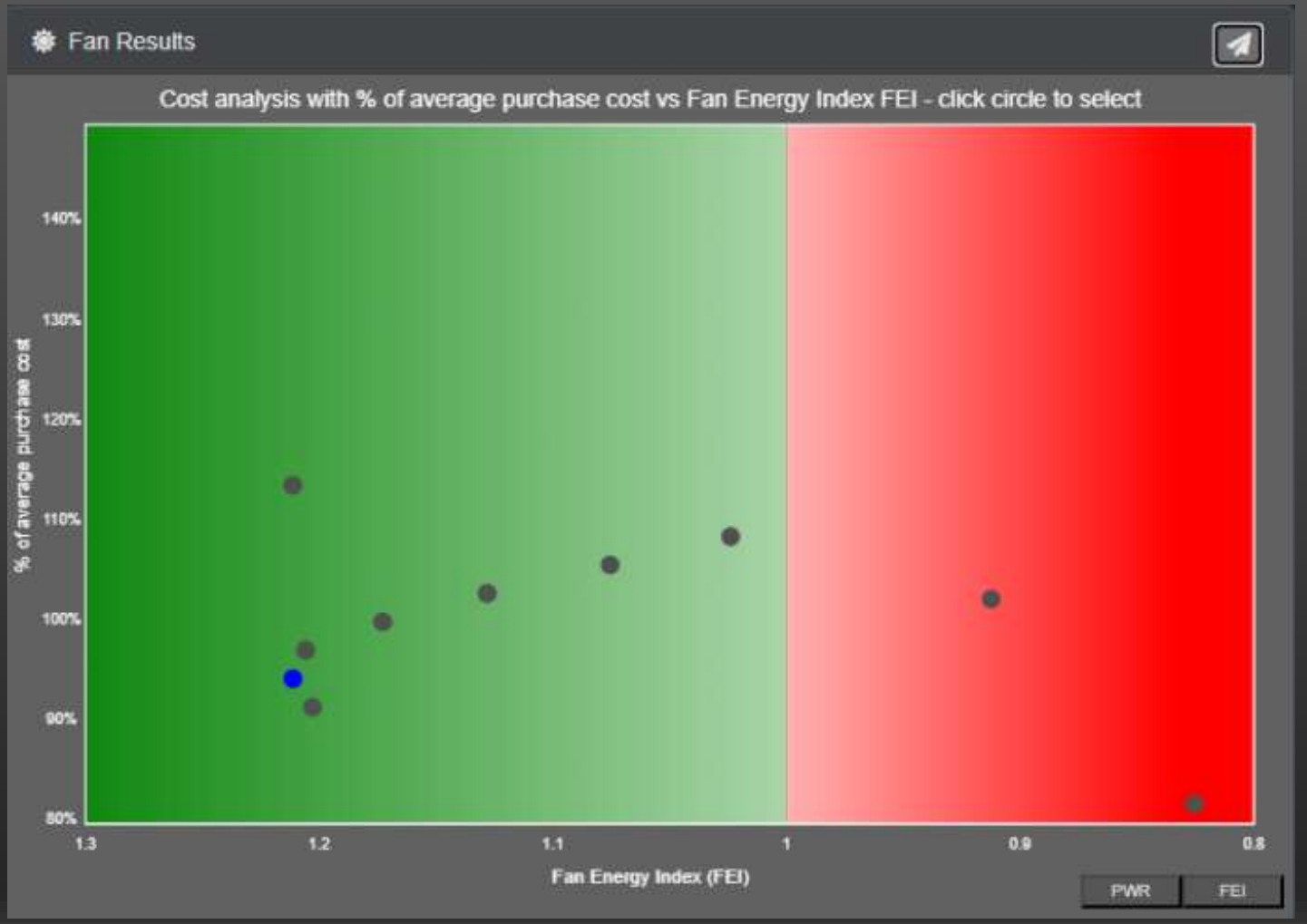
Implementing FEI Today
立即实施 FEI



- Simple FEI values addition
- 简单的 FEI 值加法
- Illustrate FEI value in fan results
- 阐明风机结果中的 FEI 值
- Illustrate FEI with motor/drive
- 阐明带电机/驱动器的 FEI
- Include FEI on datasheets/submittals
- 在数据表/送审中加入 FEI
- Allow audit of calculations
- 允许审核计算
- Show bubbles to help visualization
- 显示气泡以帮助可视化
- Work to do getting exact motor η
- 要做的工作是获得精确的电机η
- Regulation may be on its way
- 监管可能即将到来
- CEC / DOE

Implementing FEI Tomorrow
明天实施FEI





- Examine lifetime costs closer 更仔细地检查生命周期成本
- Emphasize running costs vs supply costs 强调运行成本与供应成本
- Regional power generation costs 区域能源成本
- Power to CO_2 conversion & global warming 电力到二氧化碳的转换和全球变暖
- Make FEI a familiar selection metric with graphic enhancements 通过图形增强功能，使 FEI 成为熟悉的选择指标

- Example - Revamped scatter chart
- 示例 - 改进的散点图

Demo / Summing up / Q+A　演示 / 总结 / Q+A

- Let’s look at some software with a demonstration 让我们看一些带有演示的软件

• Just a quick look at fan selection & FEI	快速浏览一下风机选择和 FEI
• FEI is a complete dynamic ‘Wire to Air’ metric	FEI是一个完整的动态“从供电输入到气动输出”指标
• FEI is easy to adopt into software if the data is available	如果数据可用，FEI很容易被应用到软件中
• Software has a moral obligation to use it even if not regulated	软件有道德义务使用它，即使不受监管
• May result in slightly increased supply costs	可能导致供应成本略有增加
• Offset by improved running costs - so may level out	通过改善运行成本来抵消 - 因此可能会趋于平稳
• The way to go for a more efficient world	打造更高效世界的必经之路

- Questions and Answers (Q+A)　问题与解答 （Q+A）

Andrew Philpott - Computair