

人才 · 创新 · 战略

趋势的力量

Talent · Innovation · Strategy
— The Power of Trend

2017 项目管理大会

Project Management Congress 2017

2017年9月23-24日 中国 · 上海

23-24 SEP. 2017 Shanghai · China

全球化背景下的新产品精益研发

Operation Excellence of New Product Development in
Global Environment

2017-9-24

Agenda 主题

- Global Environment of New Product Development
新产品研发的全球背景
- Product and Lean Product Development of Ingersoll Rand
英格索兰产品与新产品精益研发
- Knowledge Reuse and Modular Design
知识的再利用与模块化设计
- Modeling and Simulation
数值仿真与模拟
- Summary

总结

新产品研发的全球背景

加速推向市场的紧迫性

93%项目经理
感受到新产品
加速推向市场
的压力

法规要求

"We see compliance as a source of competitive advantage. The sooner we do regulatory projects, the faster we can move in the market."

PMO Leader
Healthcare Organization

客户期望

"Customers are expecting more and more from our organization. The need to execute on rapidly shifting strategic priorities is critical. We can't afford to wait."

Head of Business Change
Retail Bank

商业机会

"Business partners push for speed because our competitors are using the same technologies as we are to gain a business advantage. If we don't get there quickly, that advantage is gone."

PMO Leader
Multinational Oil and Gas Company

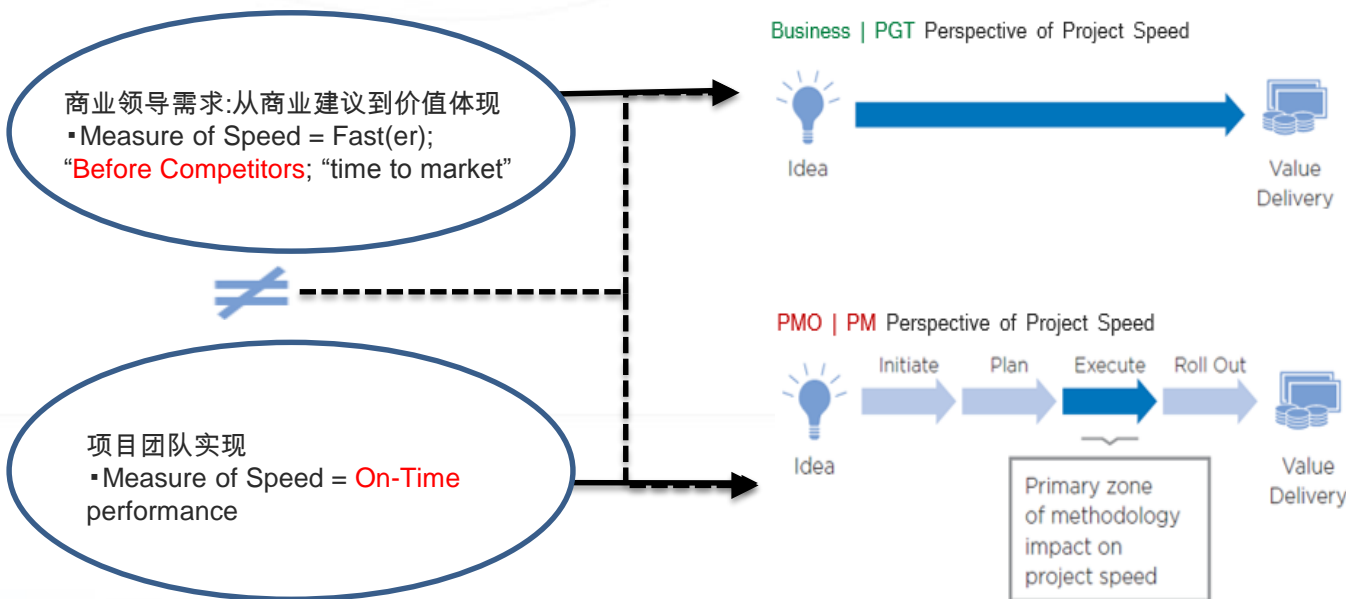
n = 94 PMO Organizations
Source: CEB 2015 [PMO Peer Perspectives Poll](#)

全球化特性：创新，变化，快速

新产品研发的全球背景

项目管理者与商业领导对项目速度的不同视角

How do different leaders see the problem?



英格索兰公司 Ingersoll Rand



- A \$14 billion diversified industrial company,
140亿美金工业公司
- About 100 manufacturing facilities worldwide
100多个全球化生产基地
- Strategic brands are #1 or #2 in their markets
No1 或 2 品牌战略和市场定位
- Products and services for commercial, industrial and residential markets

商用，家用和工业市场的产品和服务



市场领导品牌 Market-leading Brands

Comfort and Climate Control Brands

 **THERMO KING**

**#1 Worldwide
transport
refrigeration**



 **TRANE**

**#1 US
#2 Worldwide
Commercial HVAC
Equipment**



Industrial Brands

 **Club Car**

**#1 Worldwide
golf cars**

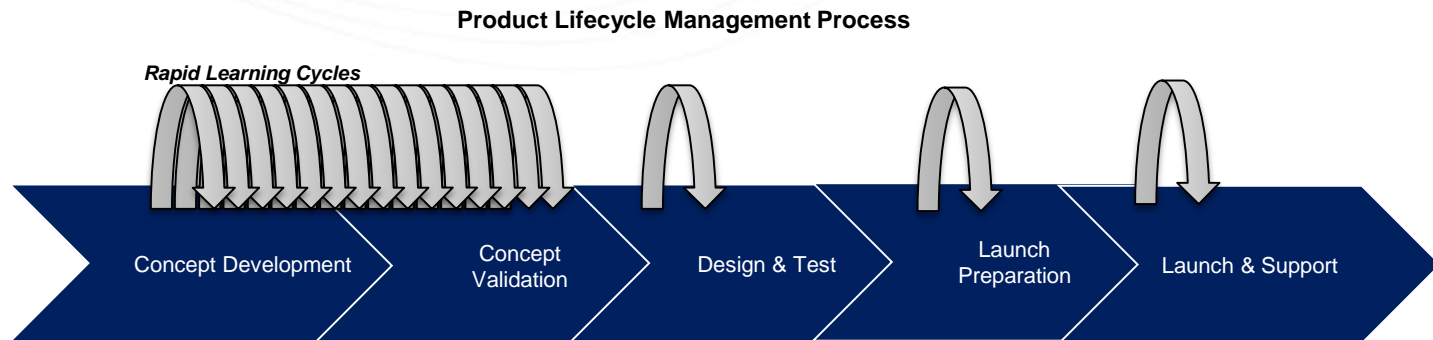


 **Ingersoll Rand**

**#1 North America
air
compressors,
air tools**



新产品研发流程 New Product Development Process



概念设计

概念验证

设计与测试

产品发布准备

发布与支持

新产品研发流程

新产品研发特性：
持续的变化与沟通



What the customer wanted.



How the customer described it.



How the product mgr understood it (PRD)



How the engineers designed it (PDD)



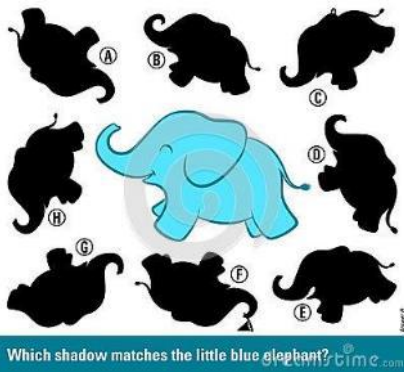
How manufacturing built it.



When it was delivered.

精益研发：项目范围管理

项目范围管理：项目需求分析，需求匹配



- 产品经理的要求：多而且全
MRD “wish-list” by PM requested

- 项目时间是受限制的

Project schedule is constraint

- 项目经理的对策：

只有在必需时才去寻找新的方案

Solution: Go for new only when needed

- 知识的再利用

Knowledge re-use

- 模块化设计

Modular design

知识的再利用 Knowledge Reuse

优势 Benefit

- 功能验证 Function validation
- 性能测试和模拟 Performance testing and simulation
- 部件的合格和可靠性 Parts qualification and reliability



知识的再利用 Knowledge Reuse

核心：知识的理解 Knowledge Understanding

- 关键部件 Key component
- 子系统 Subsystem
- 系统集成 System integration
- 生产工艺 Manufacturing process



模块化设计 Modular design

优势 Benefit

- 开发时间 Developing cycle time
- 工作量 Work load
- 部件重用性 Common parts
- 部件用量 Parts volume



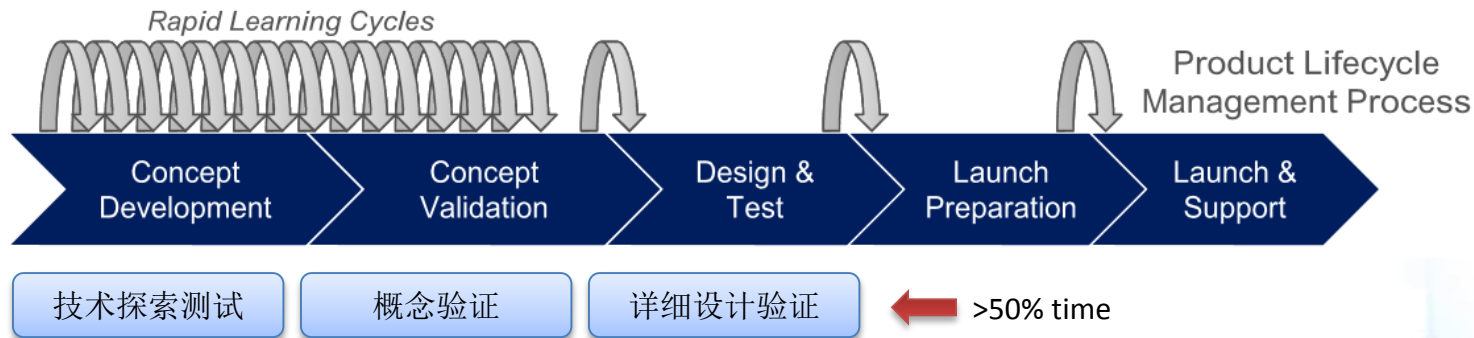
精益研发：风险控制

设计失效模式分析 DFMEA (Design Failure Model Analysis)

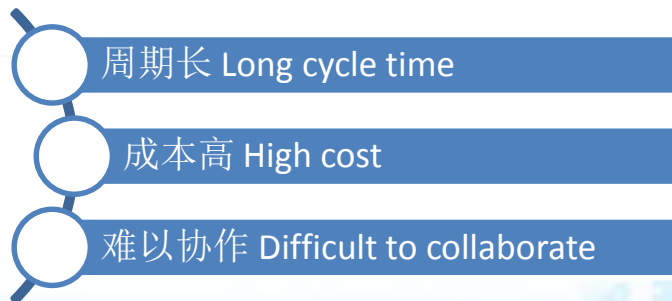
Characteristic or Part	Characteristic or Part Function	Potential Failure Mode	Potential Failure Effects	S E V	Potential Causes	O C C	Current Design Evaluation or Control	D E T
What is the Characteristic or Part under evaluation?	What is the purpose of the characteristic or part?	In what ways does this characteristic lose its functionality?	What is the impact to the Customer (Internal or External)?	How Severe is the effect to the customer?	What causes the loss of function?	How often does cause or FM occur?	What are the tests, methods or techniques to discover the cause before design release?	How well can you detect cause or FM?
评估 部件	部件 功能	潜在 失效 模式	失效 影响	严重 度	失效 原因	频率	检测, 控制 方法	可检 测性

加速产品研发机会 Accelerate Product Development

产品测试验证是关键路径 Product Testing/Verification is critical path



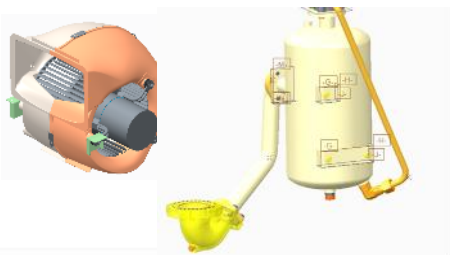
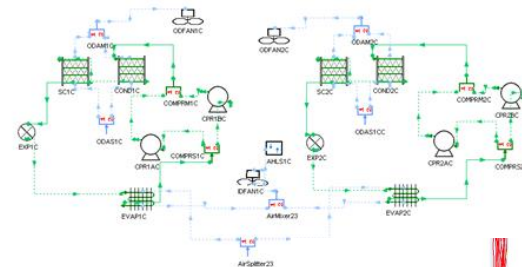
实际产品测试
Physical Testing



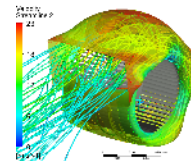
数值仿真与模拟 Modeling and Simulation



系统仿真 (1D)
System Modeling



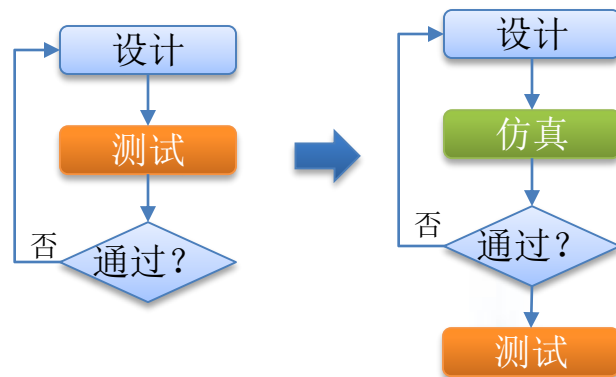
部件模拟 (3D)
Component Simulation



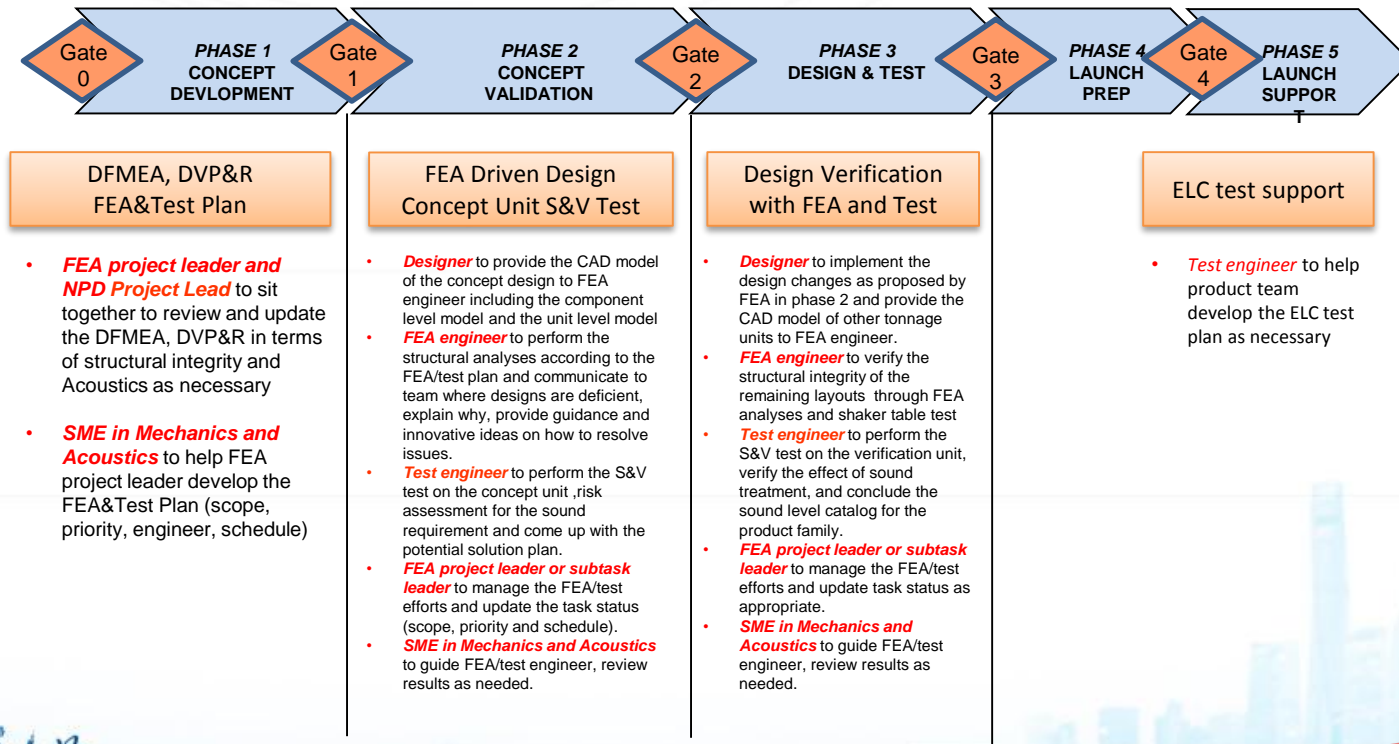
- 缩短开发时间 Reduce Cycle Time
- 提高产品性能和可靠性 Improve Product Performance and Reliability
- 积累组织过程资产 Accumulate Organizational Assets

仿真应用 Simulation Application

- 概念设计 Concept Design
 - 方案选择 Concept selection
 - 风险评估 Risk assessment
- 详细设计 Detailed Design
 - 性能、结构验证 Performance and Structure verification
 - 控制系统设计 Control system design
- 产品应用 Product Application
 - 产品选型 Product selection
 - 控制与优化 Control and optimization



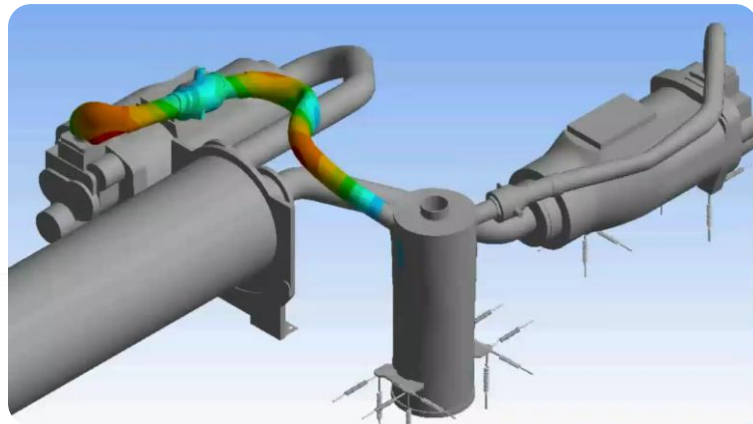
FEA驱动产品开发 FEA in Product Development



仿真案例 Simulation Cases

虚拟管路振动分析 Line Qualification

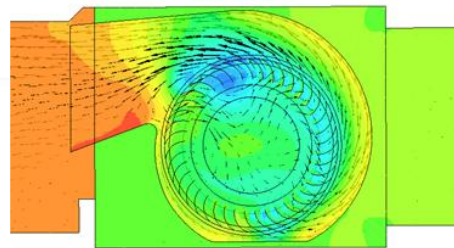
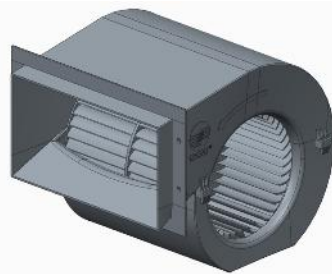
- 在样品制造前优化管路振动 Vibration Control



仿真案例 Simulation Cases

风机盘管产品差异化 Fan Coil Product Differentiation

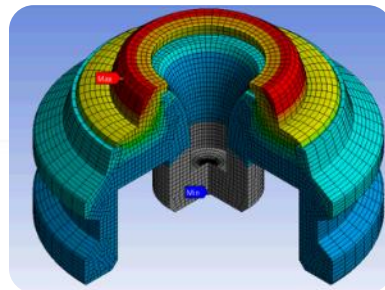
- 超薄设计 Compact design
- 风量提升5% Airflow increase 5%
- 噪音降低 2~4 分贝 Noise reduction 2-4 dB



仿真案例 Simulation Cases

截止阀热循环模拟 Thermal Cycle Simulation of Check Valve

- 基于有限元分析 FEA Analysis
- 减少了900小时测试时间 Reduced 900 Hours Testing



总结 Summary

- 新产品研发聚焦于商业价值实现 Business Value Realization
- 研发特性：持续的变化与沟通 Change & Communication
- 精益研发方法、工具 LPD Approaches & Tools
 - 知识的再利用 Knowledge Reuse
 - 模块化设计 Modular design
 - 设计失效模式分析 DFMEA (Design Failure Model Analysis)
 - 数值仿真与模拟 Modeling and Simulation



- 谢谢!
- Thank You!