Manufacturers Alliance
Sharing Education & Resources Peer to Peer

PRESENTS

EDUCATIONAL SEMINAR

Lean Product Design

Brian Johnson
VP of Global Engineering

REELL

Innovative Torque Solutions

Fair, Genuine, Honest, ***Trustworthy***

Agenda

- Company Overview
- Commercialization Process
- Standardized Tools
- Project Examples
- Lessons Learned
- Take-Aways

Reell

REELL **provides high-quality mechanisms to control position, transmit torque and protect delicate components from excessive load.**

Global Operations

With locations on three continents, Reell has the people to meet your needs, wherever you are in the world

Saint Paul, MN USA – World Headquarters

- Established 1970
- Sales, customer service, design, manufacturing & logistics
- Friction hinges, clutches, precision springs, linear locks, wrap spring devices and engineering services

Elsloo, Netherlands

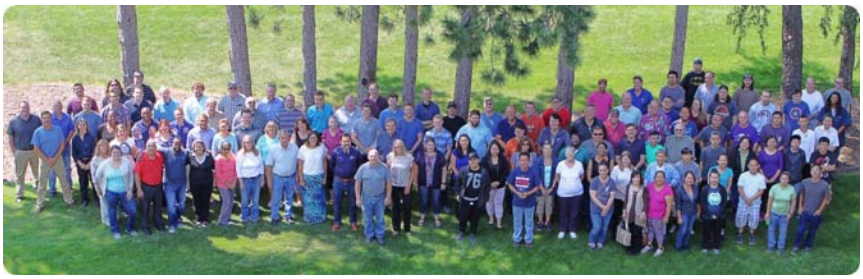
- Established 1993
- Sales, customer service, design, manufacturing & logistics
- Clutches, industrial products, consumer products

Singapore and China

- Established 2006
- Sales, application engineering, customer service
- Manufacturing through collaborative partnerships

ESOP – Employee Stock Ownership Plan

Reell is proud to be an ESOP Company.



Commercialization Process

	Standard Operating Procedure	EN2-35
REELL	Title: Project Deployment Process	REV: C
	Effectivity Date: 01-MAR-2016	Page 1 of 7

1.0 Purpose

Establish and define a consistent practice of managing projects through their life-cycle.

- Established from Kaizen event in 2007
- Relatively stable process for the past 8-10 years
- Multi disciplined team involvement
- Generally good buy in from the Organization
- Industry standard phase gate format
- Solid ISO Audit results and favorable comments
- It can drive a risk adverse behavior

Commercialization Process

Table 4: Project Phase Definition

Phase	Definition
Proposal (0)	• First customer contact and or concept of product/equipment. • Strategic fit and business opportunity are evaluated.
Concept (1)	• A Core Team is assigned and a project plan is developed. • Multiple concepts are developed and narrowed down to one.
Refinement (2)	• The design, manufacturing, quality and business plans are finalized such that capital expenditures can be justified.
Ramp (3)	• Tooling and equipment is purchased and/or fabricated. • Production equipment is readied and all operational supporting requirements are put in place.
Pre-Production (4)	• Production equipment and tooling is transferred to the floor. • Trial runs are completed on the production floor with production personnel. • Product qualification and training is completed. • Quality, cost and delivery is monitored.
Optimization (5)	• Initial period of mass production is launched. • Quality, cost and delivery is monitored. • A period of planned and focused improvement. • Design responsibility transferred to continuation team

Commercialization Process

Table 1: Project Type Definition

Class	Definition	Phase Approval
A	• New Technology or complex automation development • Inherent business risks with introduction of the new product to a small or nonexistent market • Significant supply chain development or operational development • Significant resource and capital requirements	RLT & Core Team: Through Optimization
B	• Technology or automation extension • Moderate business risks with aligning the product and with an established market • Moderate supply chain development or operational development • Significant resource and capital requirements	RLT & Core Team: Through Optimization
C	• Leverages existing core technology of the company • Minimal risks based on existing business relationships and markets. • Minimal supply chain or operational development • Moderate capital requirements aligned with the annual operating budget	Core Team: Through Optimization
D	• Minimal modifications to existing products • Primarily leverages existing component and assembly tooling but generally has some new tooling • Requires qualification testing • Springs that require new processes or materials • Retool projects	Core Team: See Table 2: Phase Progression: See Table 3
E	• Generally created to provide DHF access for documentation • May be created for account tracking (eg. Tooling replication) • Minor modifications or customizations to existing products • Requires no changes to existing component or assembly tooling • Springs that leverage existing processes and materials. • Generally minimal or no performance testing required • Quality Issues • Continuous improvement • Tooling replication	Core Team: See Table 2: Phase Progression: See Table 3
F	• Generally created for account tracking • Technology demonstrators • Sales tools, ie Paddle sets • No production intent	Core Team: See Table 2: Phase Progression: See Table 3

Innovative Motion Control Reell Confidential www.reell.com

Commercialization Process

Scale effort to the level of the project

Table 2: Core Team by Project Class

	A	B	C	D	E	F
Product Line Manager	■	■	■	■	■	■
Project Manager	■	■	■	■	■	■
Product Development Engineer	■	■	■	■	■	■
Process Development Engineer	■	■	■	■		
Quality Representative	■	■	■	■	■	
Global Sourcing Representative	■	■	■	■		
Manufacturing Representative	■	■	■	■	■	
Financial Services Representative	■	■	■			

■ Required
NA

Table 3: Phase Progression by Project Class

	A	B	C	D	E	F
Proposal	■	■	■	■	■	■
Concept	■	■	■			■
Refinement	■	■	■	■		
Ramp	■	■	■	■		
Pre-Production	■	■	■	■	■	
Optimization	■	■	■			

■ Required
NA

Standardized Tools

Project Management
- Enterprise Planning Tool
- Templates for project types
- Lessons Learned (Prior Projects)
- Budget Analysis Reporting/Tools

Product Management
- Customer Requirements Document
- Net Present Value (ROI)

Product Development Engineering
- PLM Integration (Drawings, Models & ERP)
- Design Review/FMEA
- Standardized Analysis Tools
- Rapid Proto-typing Methods

Process Development Engineering
- PLM Integration (Drawings, Models & ERP)
- Design Review
- Analysis Tools

Standardized Tools

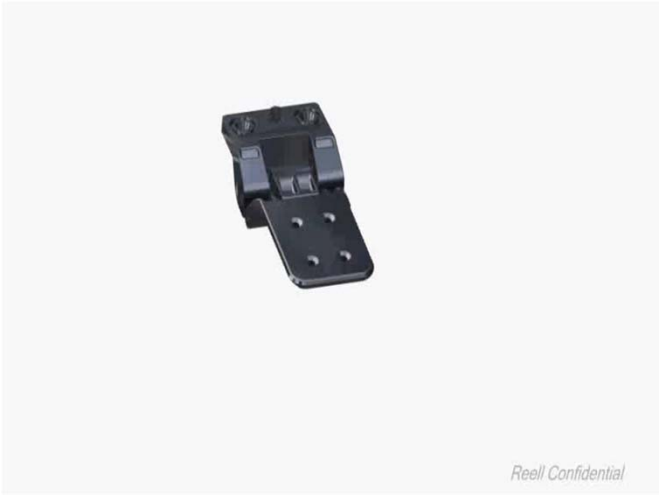
Quality
- Process FMEA
- Part Warrants
- Supplier Qual.

Sourcing
- RFQ Tools
- Analysis Tools

Manufacturing
- Manufacturing Plan
- DV/PV Build Checklists

Finance
- Cost Models

Product Example



Lessons Learned

Project Management

- Standardized Phase Gate Approvals drove appropriate action.
- Drive collaboration between Product and Process Development.
- Test process assumptions early.
- Develop appropriate mitigation plans.
- Track product improvements that can be added later.

Engineering

- Multiple concepts considered.
- Concept selection balanced fit and capability relative to Customer need.
- Drive subject matter expertise throughout the organization.
- Standardized Design Aids from prior project proved accurate.
- Early Supplier Engagement.
- Rapid iteration of components provided value.

Process Example

Lessons Learned

Project Management
- Daily check-in meetings were extremely helpful.
- Short meeting notes with clear actions.
- Plan/staff for concurrent activities.
- Plan for learning curve of new staff.
- Develop appropriate mitigation plans.
- Conservative estimates for resource and time.
- Buffer for Supplier delivery.

Engineering
- Cross functional design reviews at sub system level.
- Modular design very helpful.
- Sub-system builds and qualification.
- Standardized components.
- Bench-top studies for “new to Reell” processes.
- More time allocation for “new to Reell” processes.

Take-Aways

Standardize
- Consistent procedures and methods to complete tasks drives effectiveness and efficiency.

Minimize
- Not all processes and procedures drive value towards the Customer on every project.

Communicate
- Consistent and frequent communication clarifies priorities and expectations.

Iterate
- Fail fast and achieve Customer buy-in.

Celebrate
- Don’t underestimate the power of Thank You!

Thank You

Manufacturers Alliance
Sharing Education & Resources Peer to Peer

Thank you for joining us!