Velan Inc.
Torqseal Triple-Offset Butterfly Valves

Cost Reduction & Design Optimization

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Agenda

- Introduction
- VE Job Plan
  - Organization/Information
  - Function Analysis
  - Cost Analysis
  - Creativity
  - Evaluation
  - Development
  - Implementation
- Conclusion

Velan

- Leading Manufacturer of Industrial Steel Valves
  Gate • Globe • Check • Ball • Knife • Butterfly
- Sales over $400M
- Plants in Canada, U.S.A, Europe & Asia
- Nuclear Component Certification by ASME

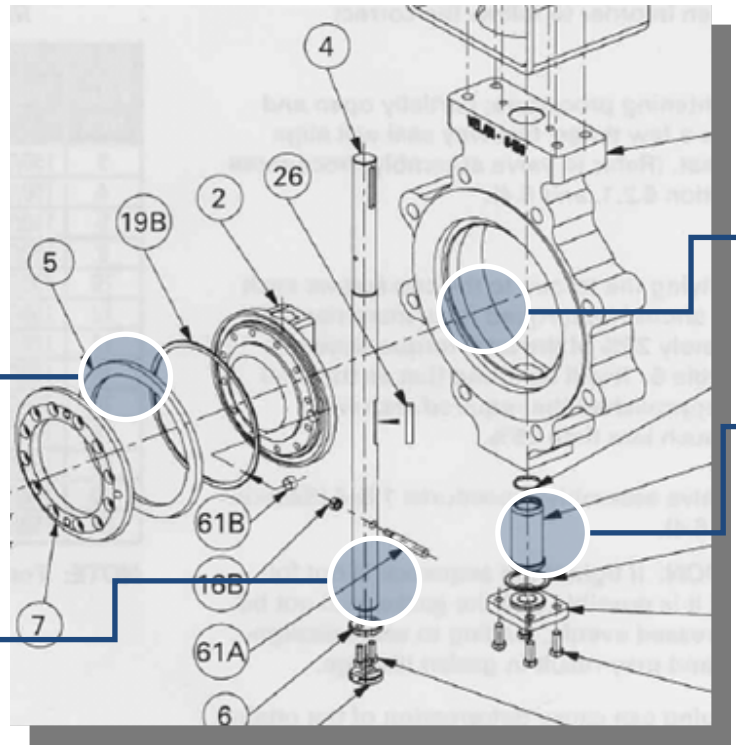
Torqseal Butterfly - Features

3-48 Inches

No Cavity

Resilient Laminated Graphite Disc Seal

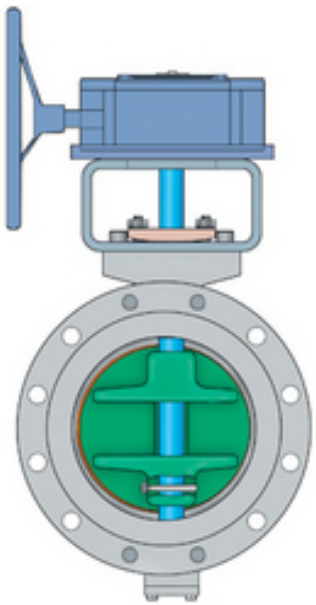
One-Piece Shaft



Stellite Hard-Faced Seat

Nitrided Shaft Bearings

Using the VE Framework

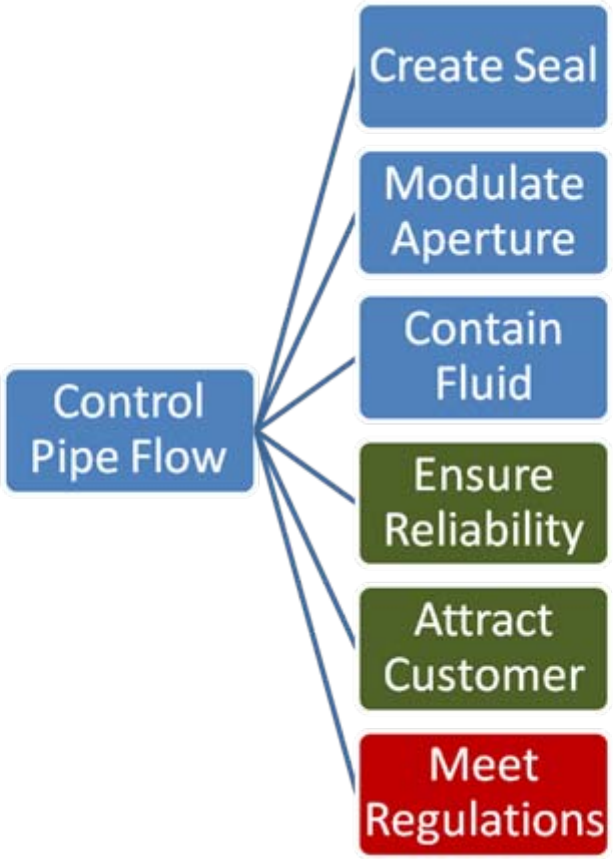


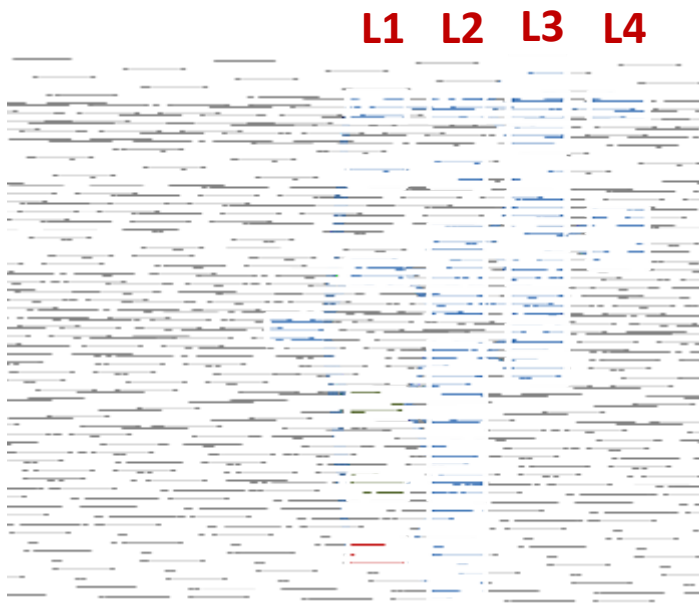
- 5 Fewer Components
- Eliminated Pre-Assembly Step
- Estimated % Cost Savings per Valve: 15%

Objectives

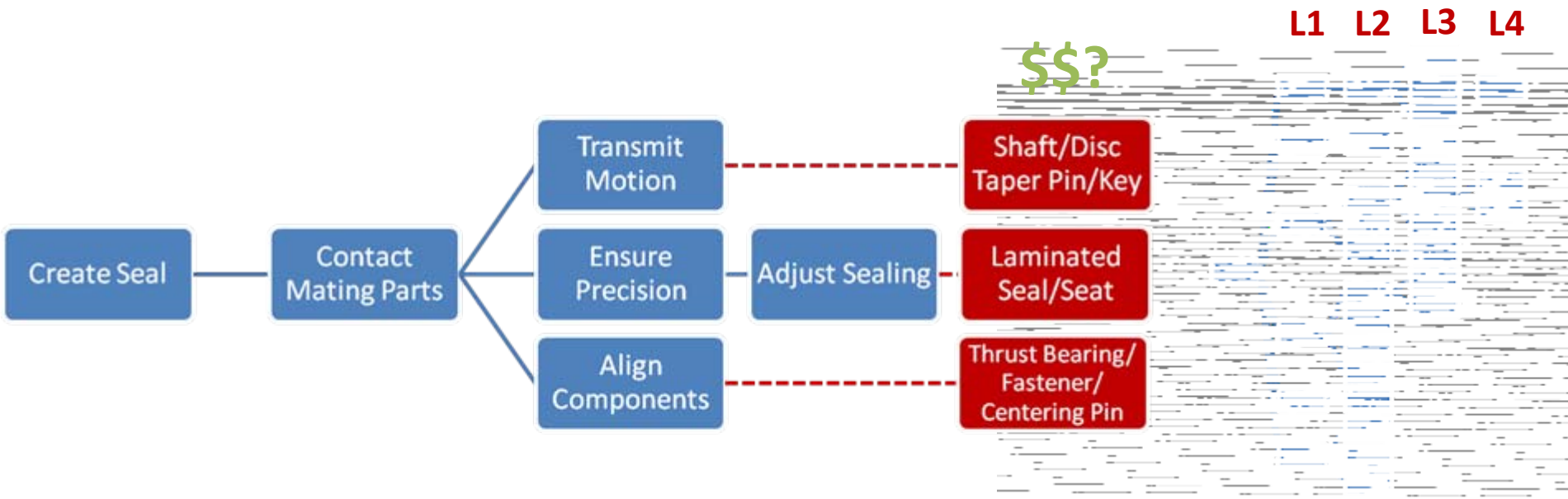
- Simplify Stem-Disc Connection
  Eliminate Stem-Disc Pre-Assembly
- Minimize Part Count & Assembly Time
- Explore Opportunities for Overall Cost/Design Optimization

Functional Diagram





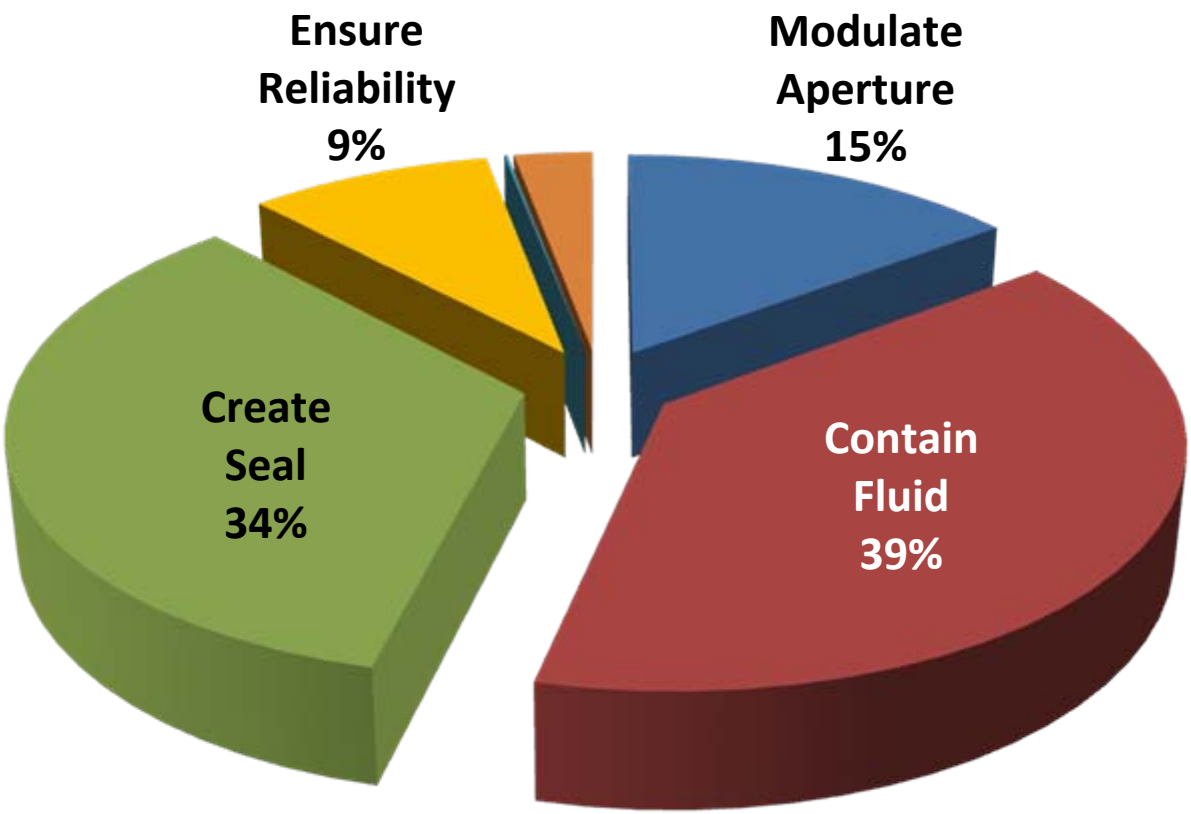
Functional Diagram



Associated Costs

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	Component	Cost
1. create seal	**1.1** contact mating parts	**1.1.1** Transmit Motion	-	Shaft	$$
				Disc	$$
				Taper pin	$$
				Taper pin nut	$$
				Stem/Disc Sub-assembly	$$
				Key (disc)	$$
		1.1.2 Ensure precision	**1.1.2.1** Adjust Sealing	Laminated seal	$$
				Seat	$$
		1.1.3 Align Component	-	Thrust Bearing	$$
				fastener thrust bearing	$$
				Centering Pin	$$

Cost Breakdown



Includes:

- Material
- Labour
- Machining
- Finishing
- Assembly

Brainstorming

Stainless Steel Disc	Pre-Assemble Disc Trim	Stem Shoulder	Guided Disc	Fastener
Tangent Pins	Splined Connection	Eliminate Centering Pin	Faster Machining of Stellite	Seal Retaining Ring Material
Combine Packing Flange	Snap Rings	Replace Stud and Nut	Mechanical Pressure Seal	Cotter pins
Alternative to Stellite	Tri-Lobe Stem	2-Part Disc	No Bottom Cover	2-Piece Stem
Packing Flange on Bottom	Weld Disc to Stem	Single Offset	Machine Disc to Tolerance	Threaded Stem Disc Connection
	Machine Stem In-House	Disc/Seat Sealing	Shrink Fit Stem	

- **What are the best ideas?**

Evaluation

- **Gut-Feel Index**
- **Feasibility**
- **Advantages**
- **Disadvantages**
- **Risks & Impact**

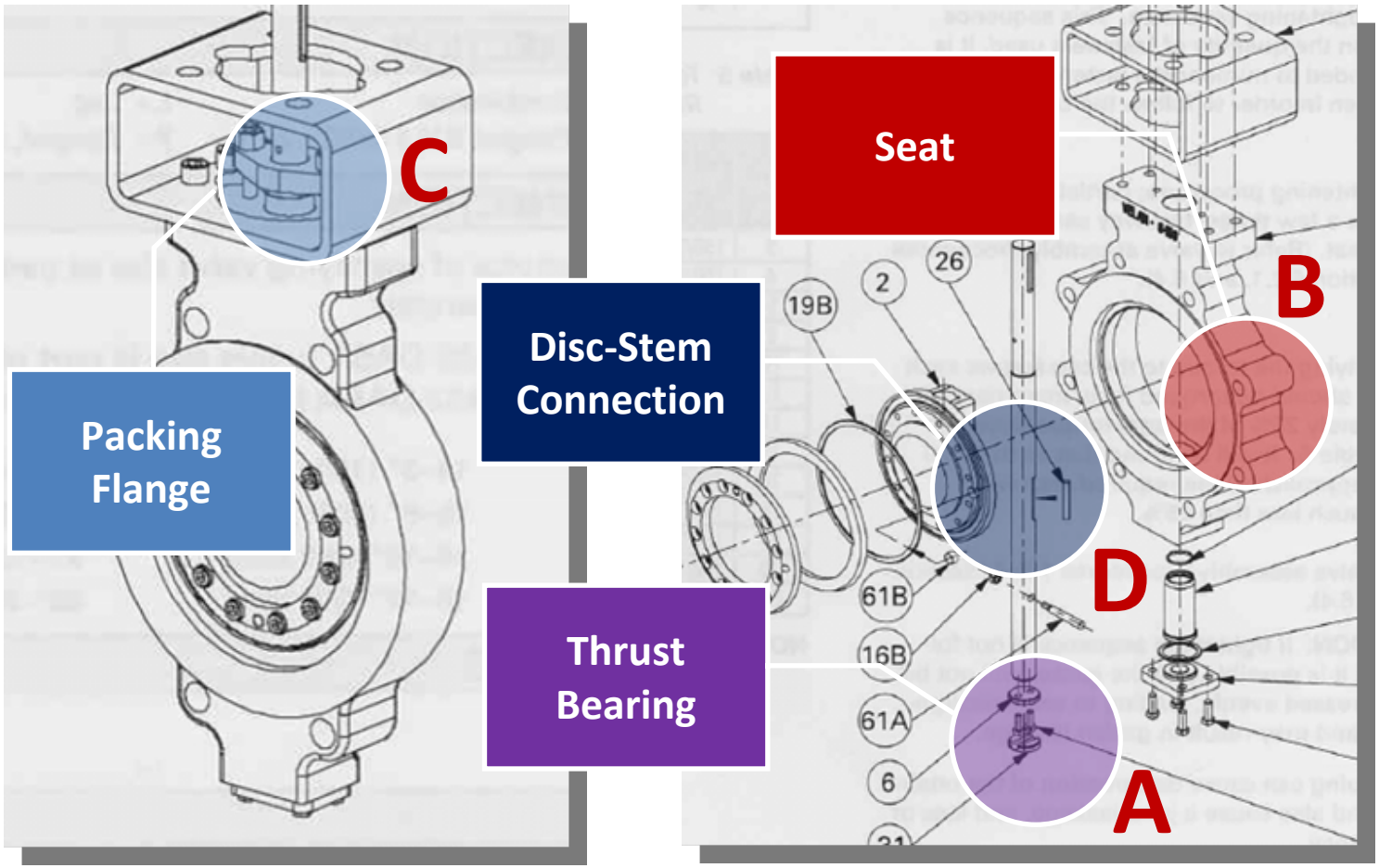
- **What are the cost savings?**

Cost Savings

- **Example: Plated Seat (Dollars Standardized to $1000)**

Template	Material	Cost	Labour	Assembly	Machine Time	Machining	Total
Actual	Valve Body	69.60		0.00		0.00	
	Seat	20.40		0.00		0.00	
	Pre-machine			0.00	30.37	50.00	
	Degrease			0.00	8.00	13.00	
	Hardface			0.00	41.00	68.00	
	Final machine			0.00	68.30	150.00	
	Conv machine			0.00	19.00	114.00	
	Cleaning			0.00	8.00	13.00	
	subtotal	90.00	0.00	0.00	174.00	289.80	380.00
Proposed	Valve Body	69.60		0.00	0.00	0.00	
	Shipping	8.00		0.00		0.00	
	Machining			0.00	68.00	114.00	
	Degrease			0.00	8.00	13.00	
	Seat plating (nickel)	37.90		0.00		0.00	
	Conv machine			0.00	19.00	31.00	
	Cleaning			0.00	8.00	13.00	
	Subtotal	115.13	0.00	0.00	103.00	170.84	286.00
						Savings	**93.90**

Solutions


C
Packing Flange
Disc-Stem Connection
Thrust Bearing
Seat
B
D
A
19B
2
26
61B
16B
61A
6

A
Thrust Bearing

Stem Shoulder

SAVINGS: STD $9.12

B
Seat

Nickel-Plated Seat

SAVINGS: STD $93.83

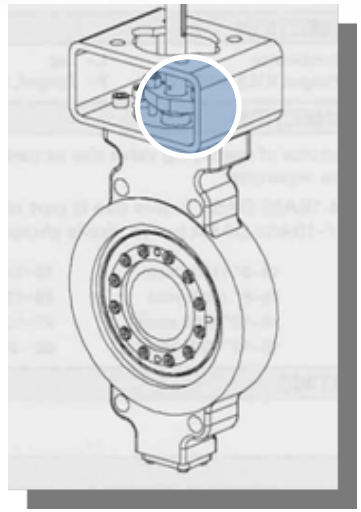
C
Packing Flange

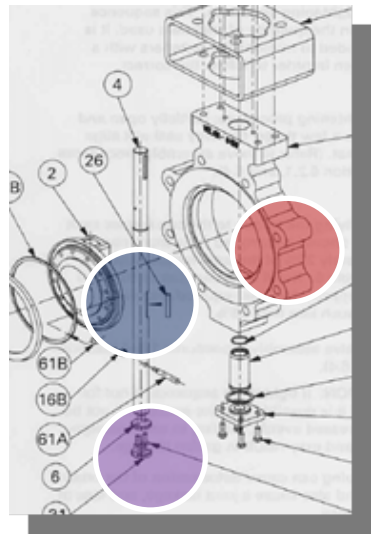
Single Part Packing Flange

SAVINGS: STD $4.39

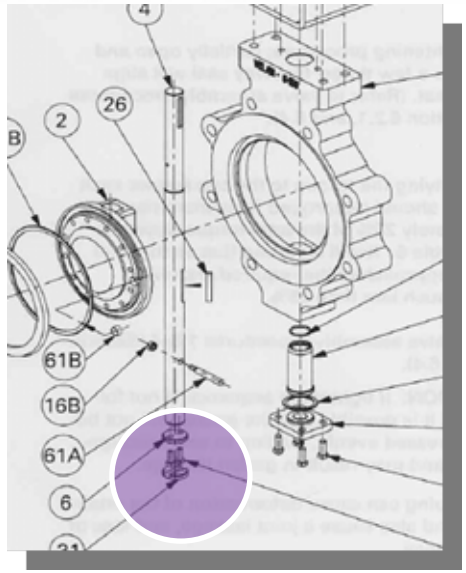
D
Disc-Stem

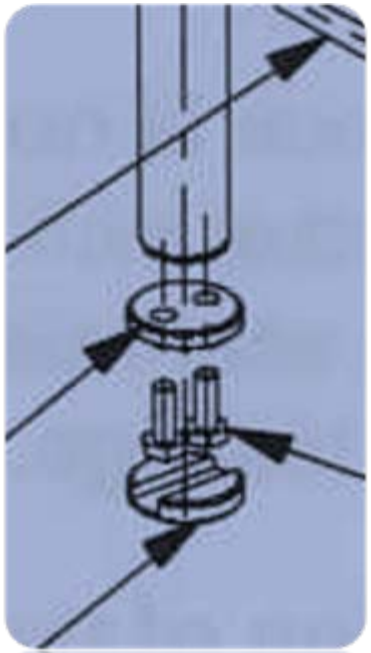
- Guided Disc STD $32.80
- Tangent Pins STD $24.57
- Snap-Rings STD $29.75
- Cotter-Pins STD $24.00
- 2-Part Disc STD $51.20
- Fastener STD $28.80





A: Stem Shoulder

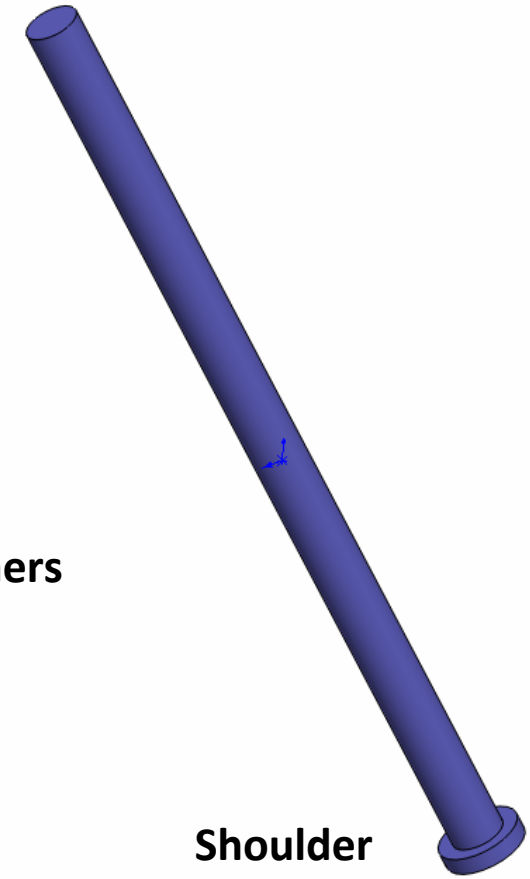




Thrust Bearing

Fasteners

Locking Plate

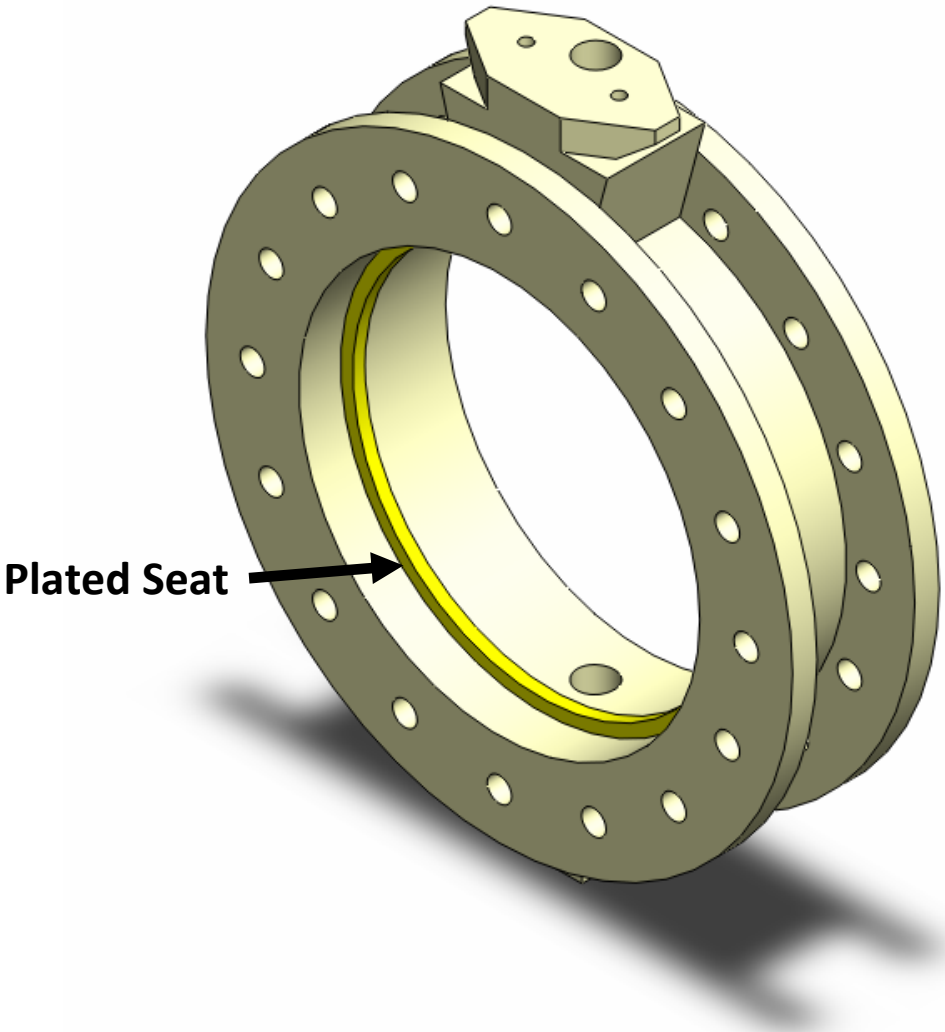


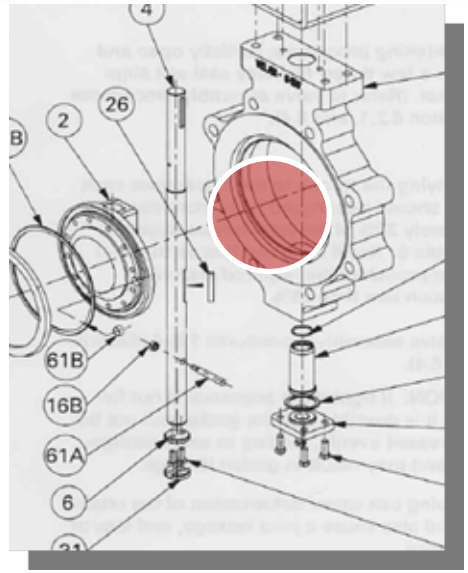
Shoulder

A
Thrust Bearing

Stem Shoulder

B: Plated Seat

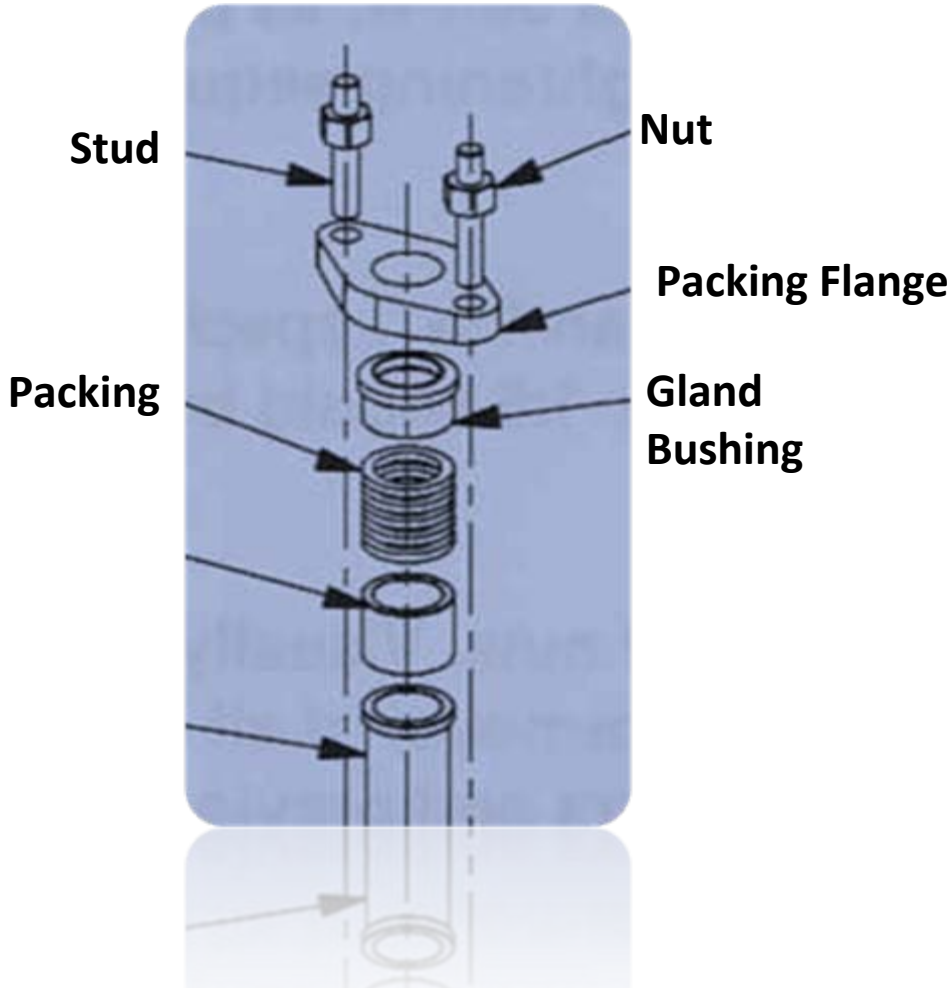


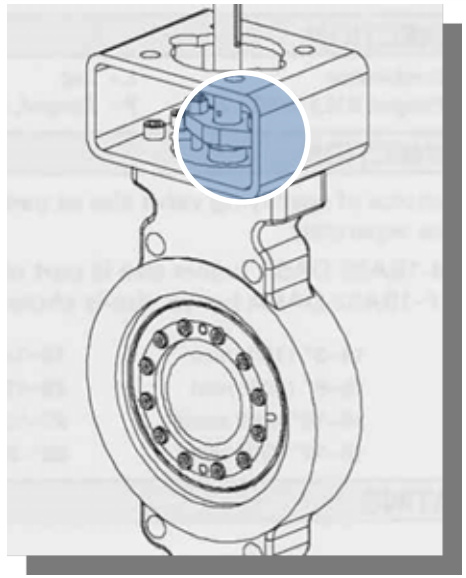


B
Seat

Plated Seat

C: Single Part Packing Flange

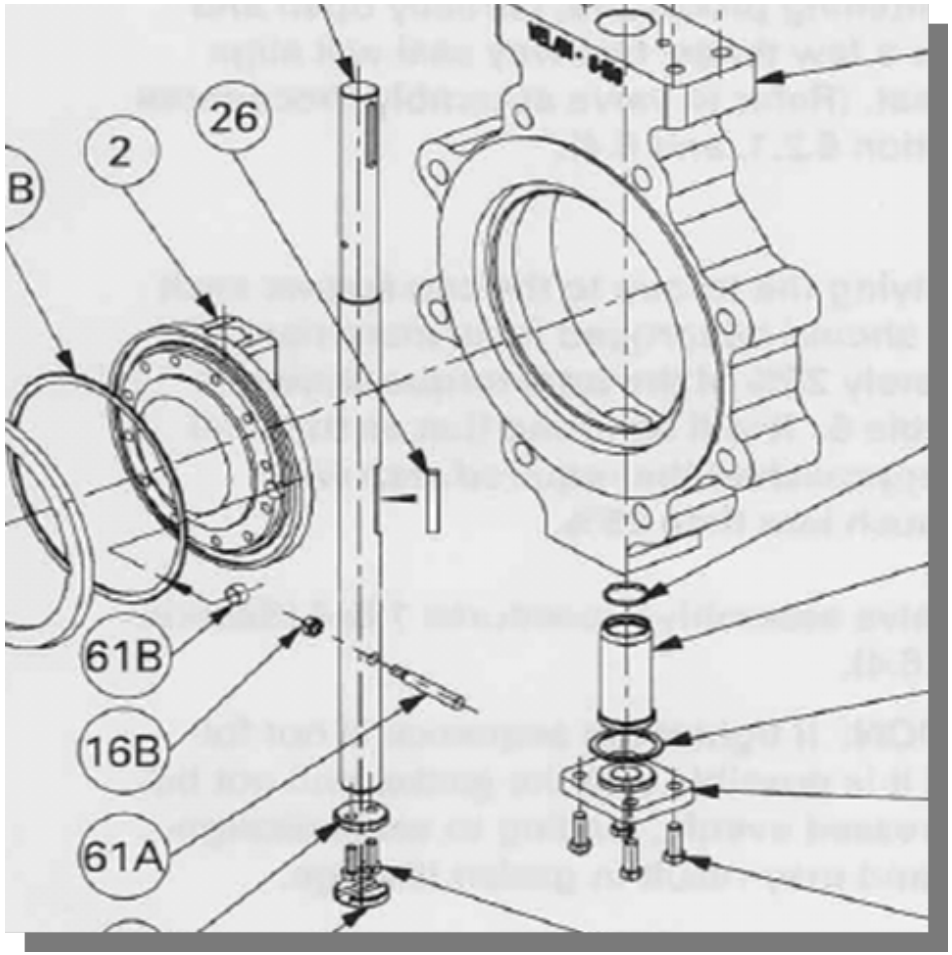




C
Packing Flange

Single Part Packing Flange

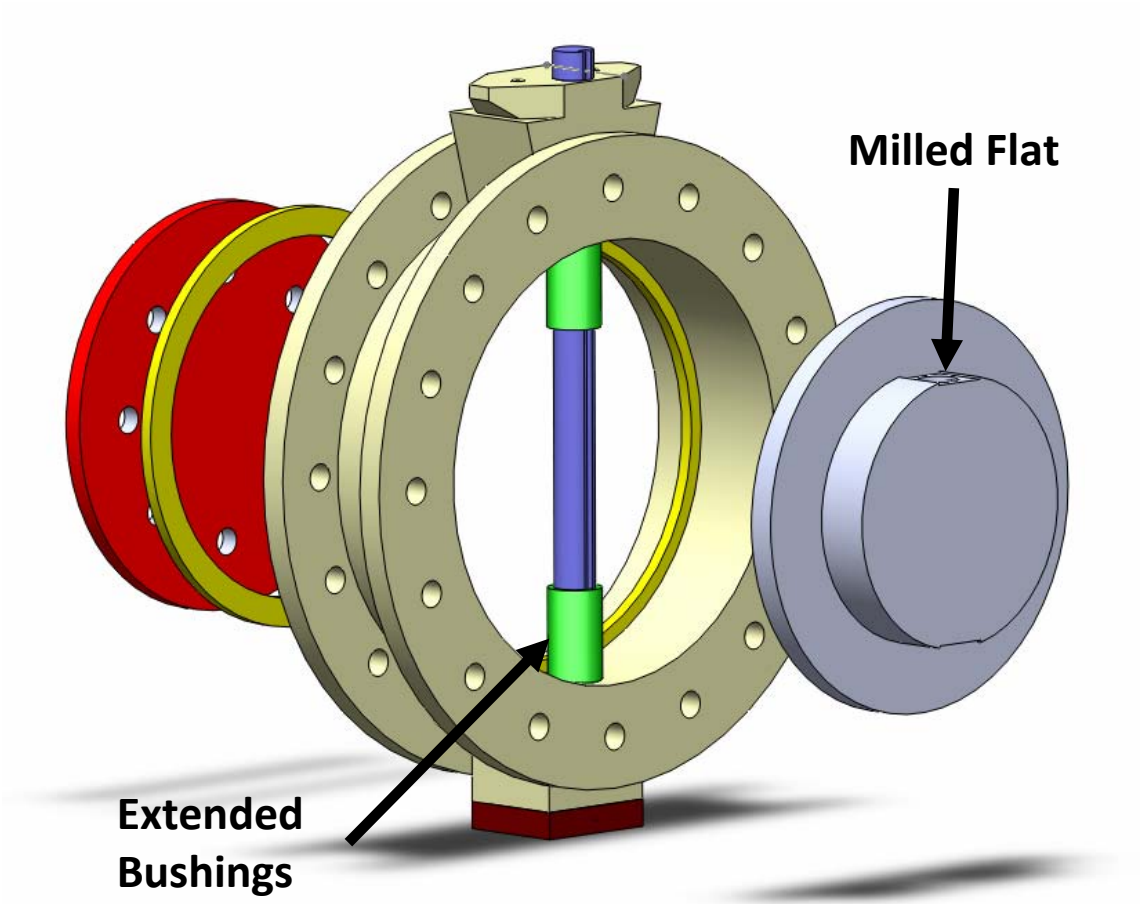
D: Disc-Stem Assembly

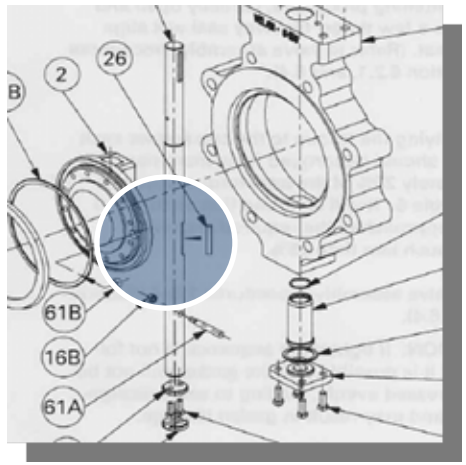


D
Disc-Stem Connection

- Guided Disc
- 2-Part Disc
- Fasteners

D: Guided Disc

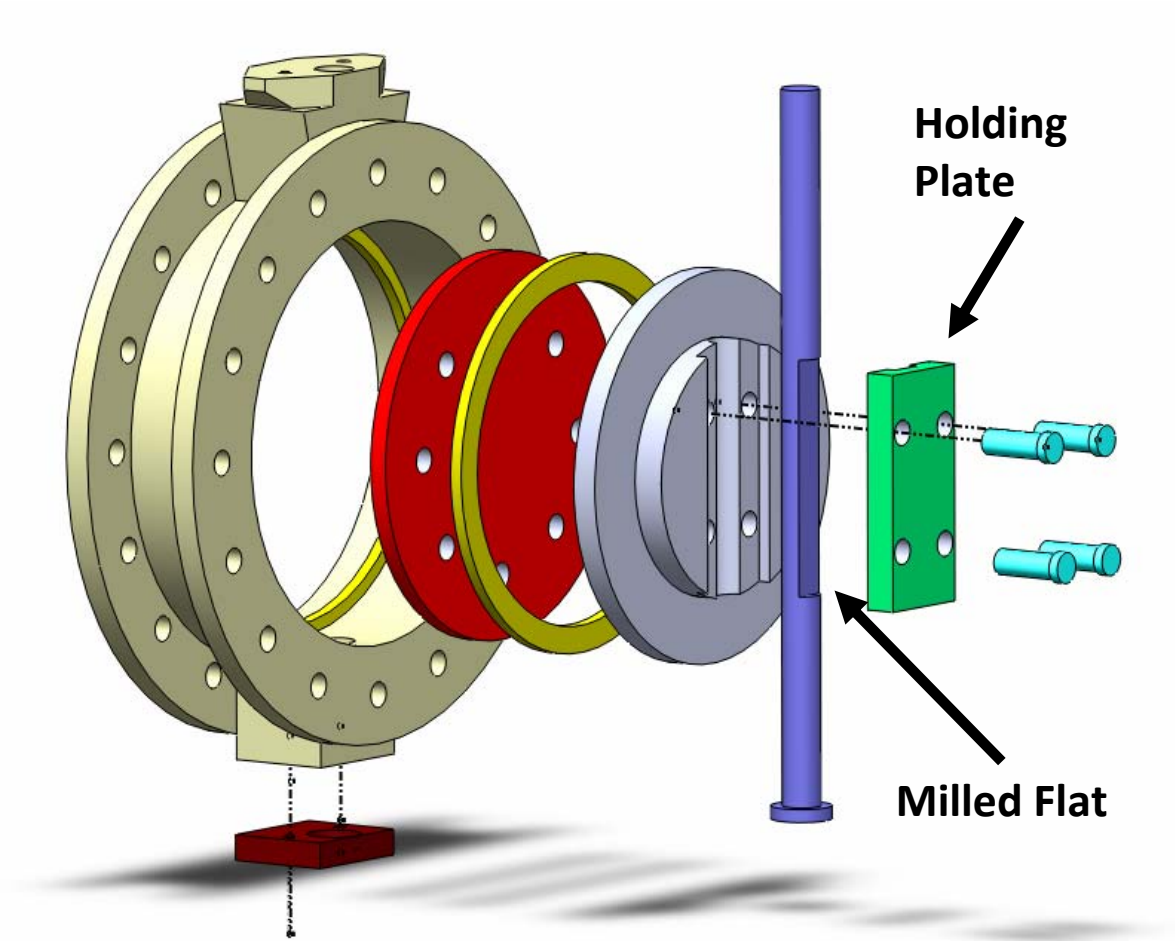


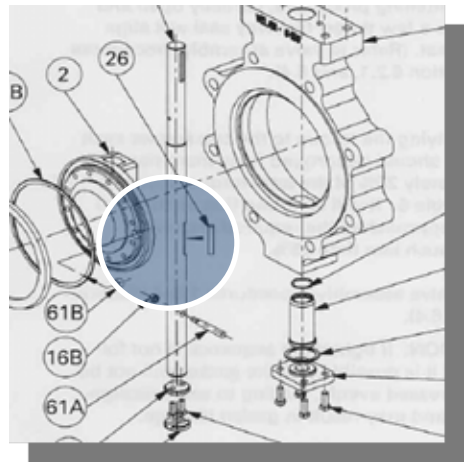


D
Disc-Stem Connection

- Guided Disc
- 2-Part Disc
- Fasteners

D: 2-Part Disc

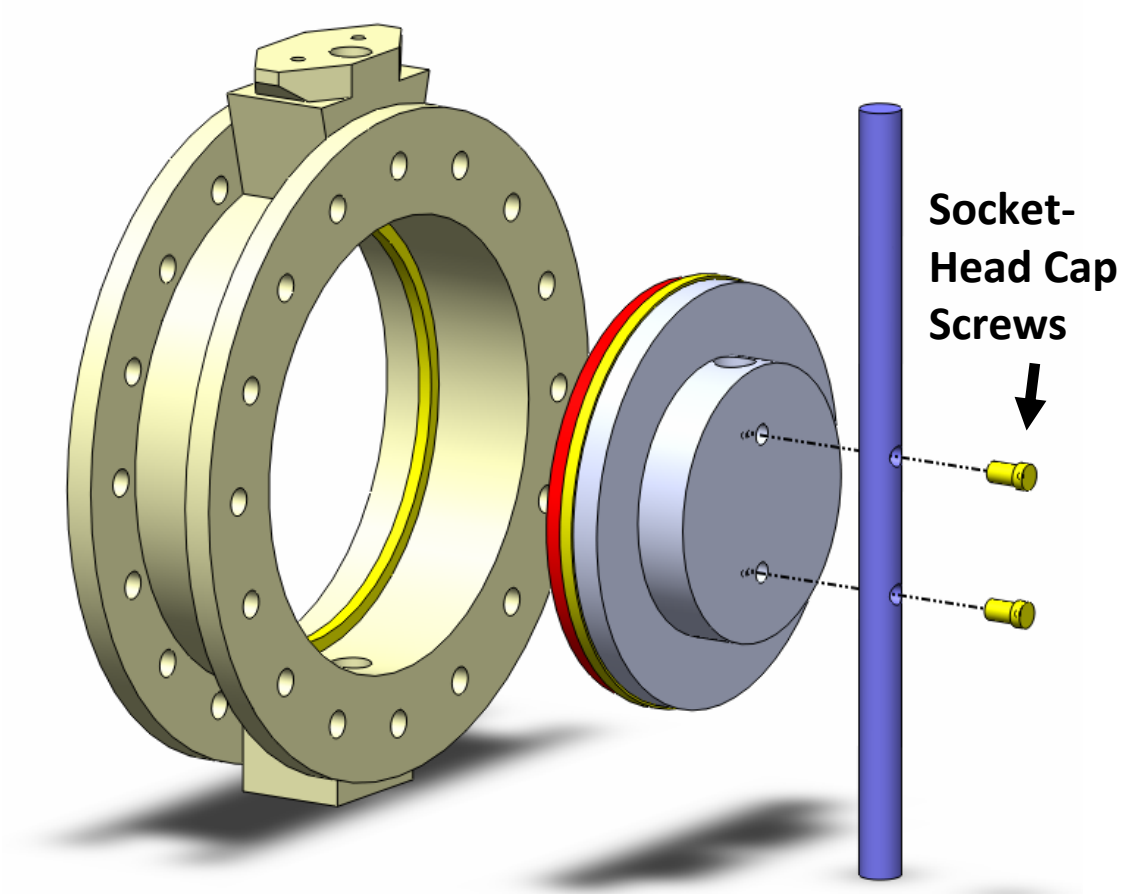


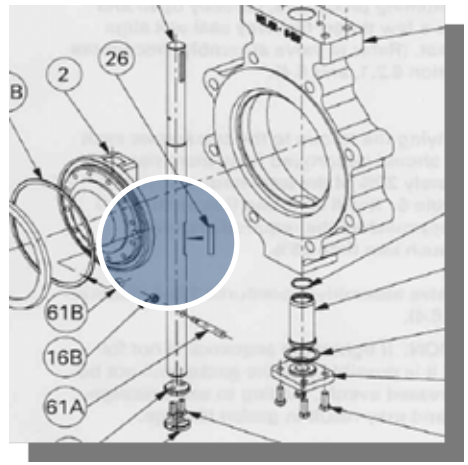


D
Disc-Stem Connection

- Guided Disc
- 2-Part Disc
- Fasteners

D: Fasteners



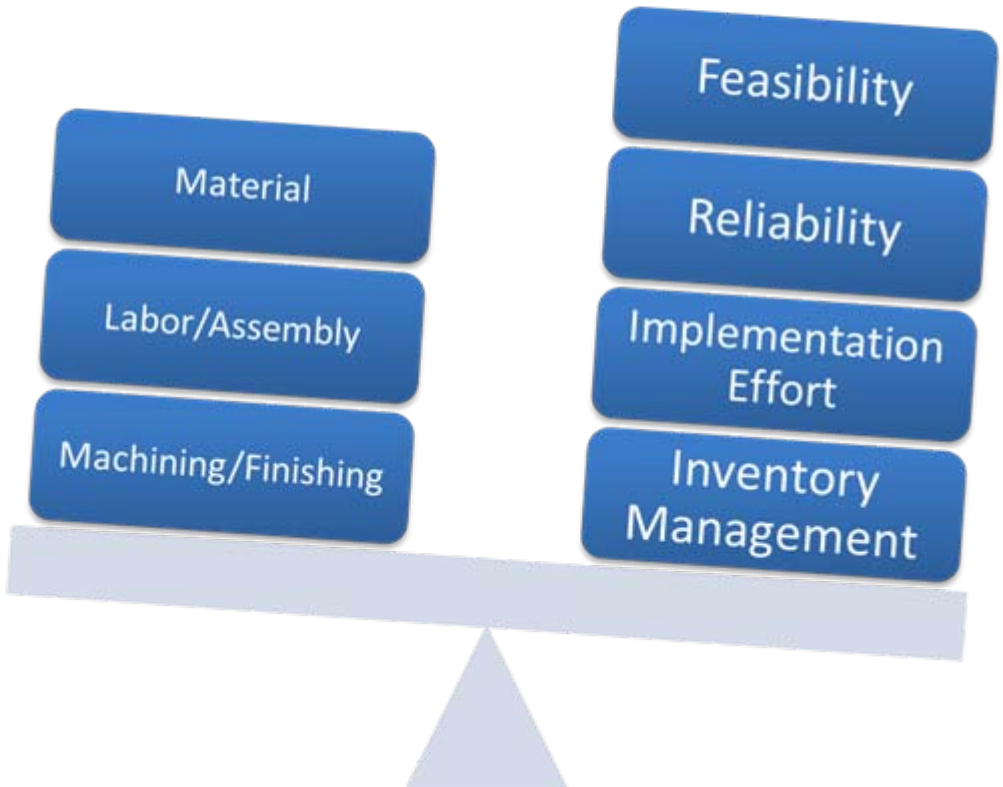


D
Disc-Stem Connection

- Guided Disc
- 2-Part Disc
- Fasteners

Cost Savings

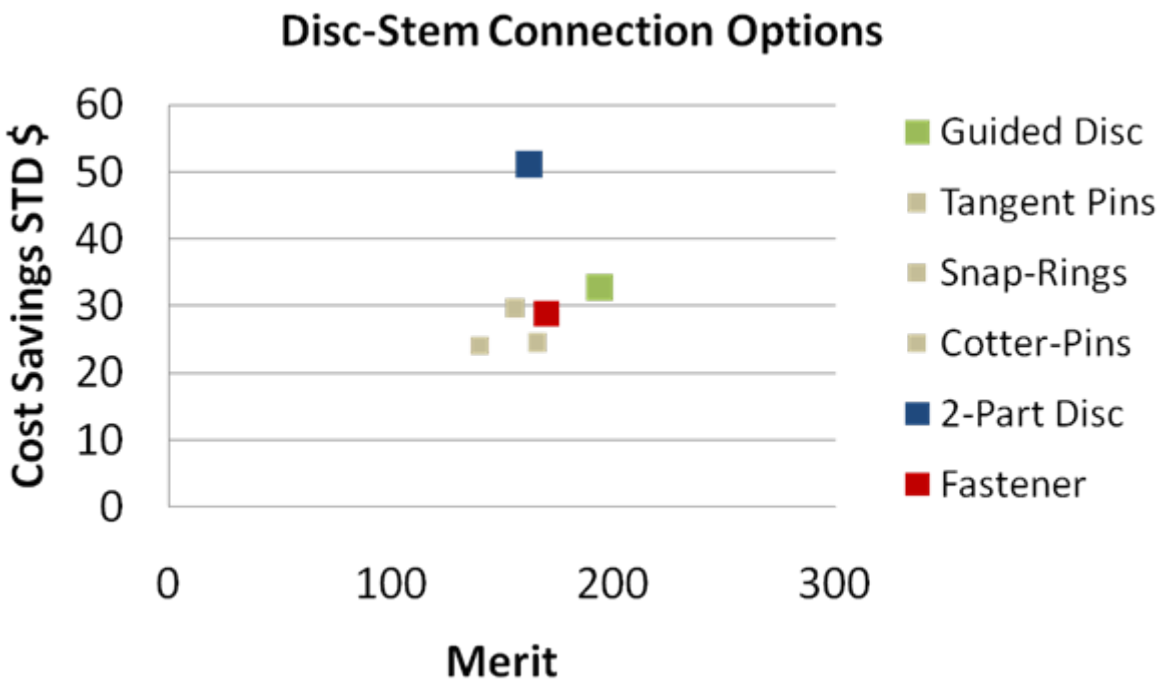
Merit



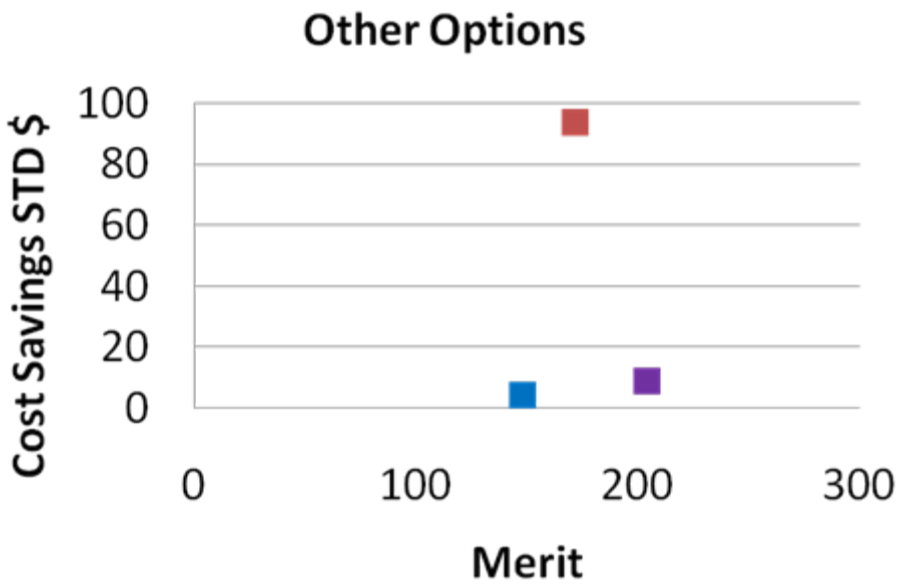
D

Disc-Stem Connection

- Guided Disc
- Tangent Pins
- Snap-Rings
- Cotter-Pins
- 2-Part Disc
- Fastener

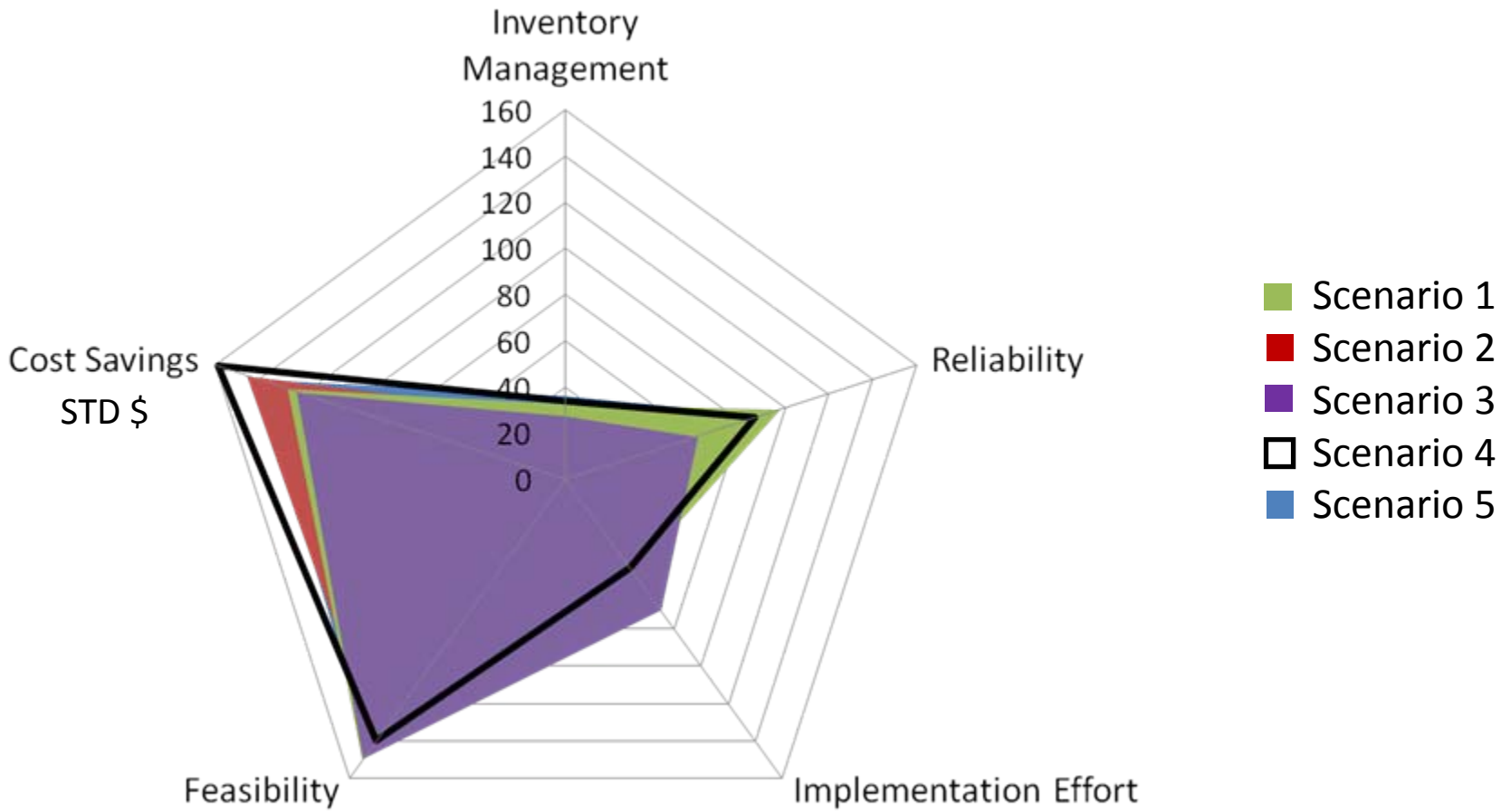


A Thrust Bearing	B Seat	C Packing Flange
Stem Shoulder	Plated Seat	Single Part Packing Flange

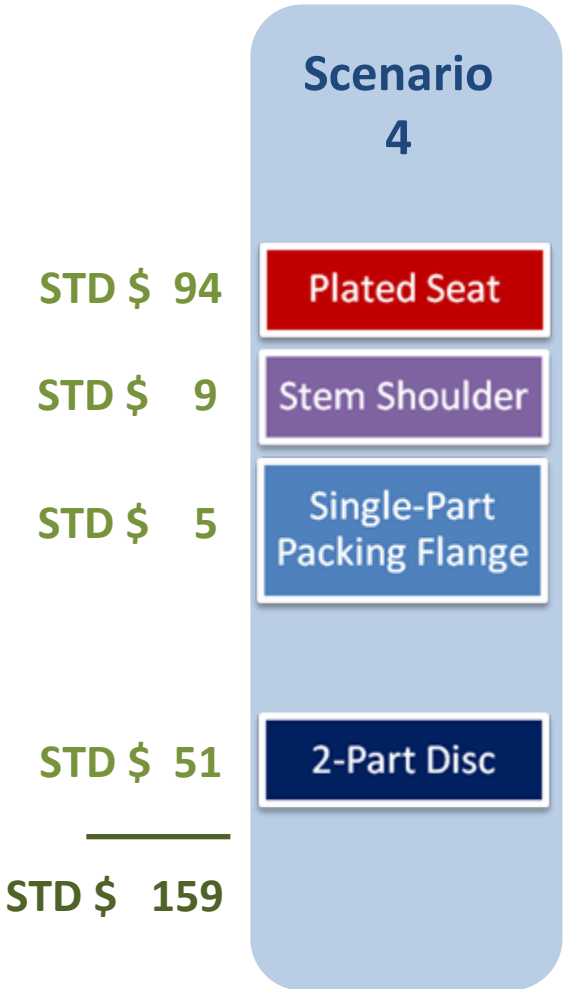


Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Plated Seat	Plated Seat	Plated Seat	Plated Seat	Plated Seat
			Stem Shoulder	Stem Shoulder
			Single-Part Packing Flange	Single-Part Packing Flange
Guided Disc				Guided Disc
	2-Part Disc		2-Part Disc	
		Cap-Screw Fastened Disc		

Scenario Comparison

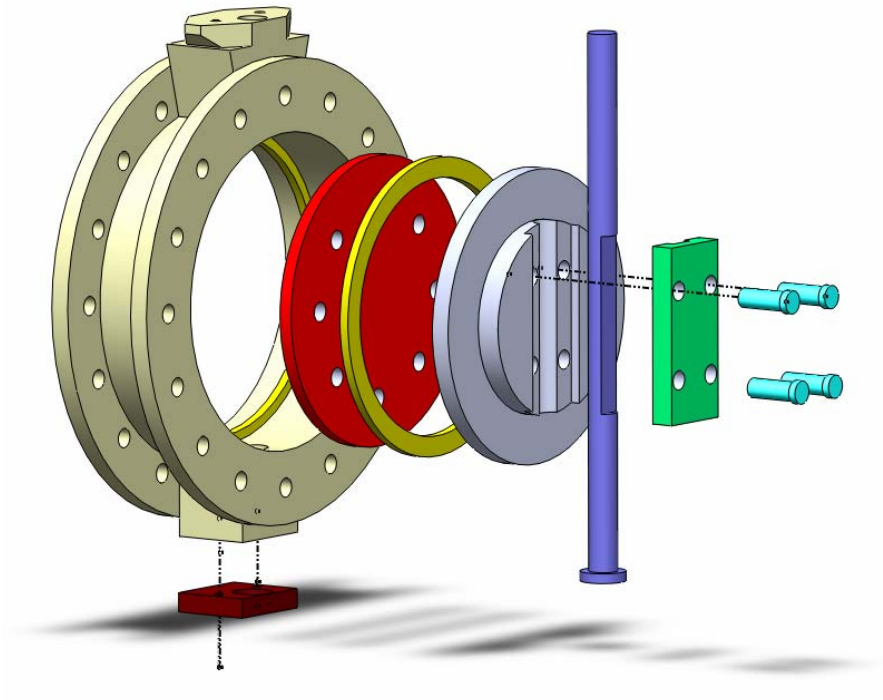


Recommendation



- Eliminated Pre-Assembly
- Reduced Part Count
- Estimated Cost Savings per Valve (8”): **15%**

Thank You



Questions?