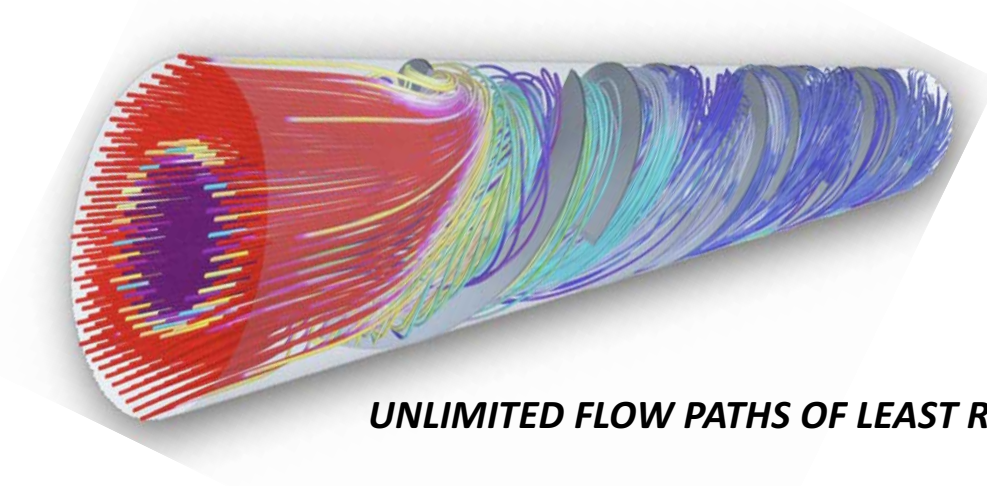
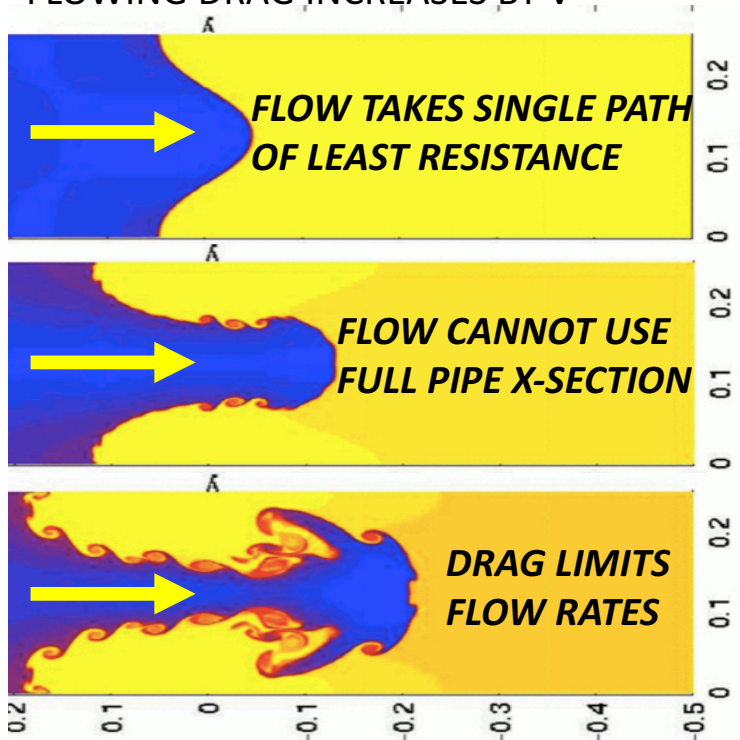


Restore Flow & Increase Yields  
Vortex Drag Reduction Technology

## VORTEX FLOW TECHNOLOGY

INEFFICIENCY OF STANDARD PARABOLIC FLOW :

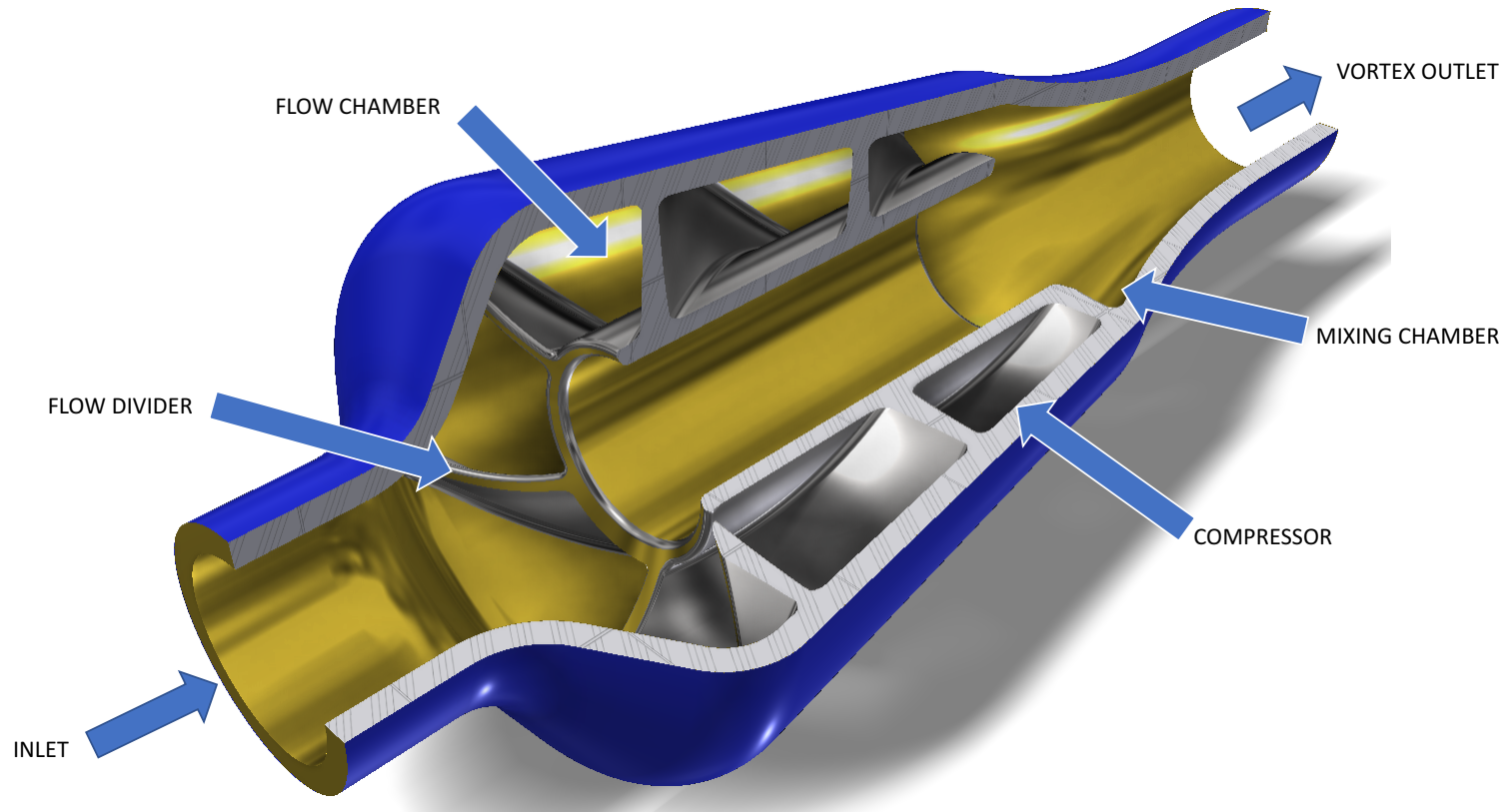
- **SINGLE PATH OF LEAST RESISTANCE**
- THIS LIMITS FLOW VOLUMES
- FLOWING DRAG INCREASES BY  $V^2$



**UNLIMITED FLOW PATHS OF LEAST RESISTANCE**

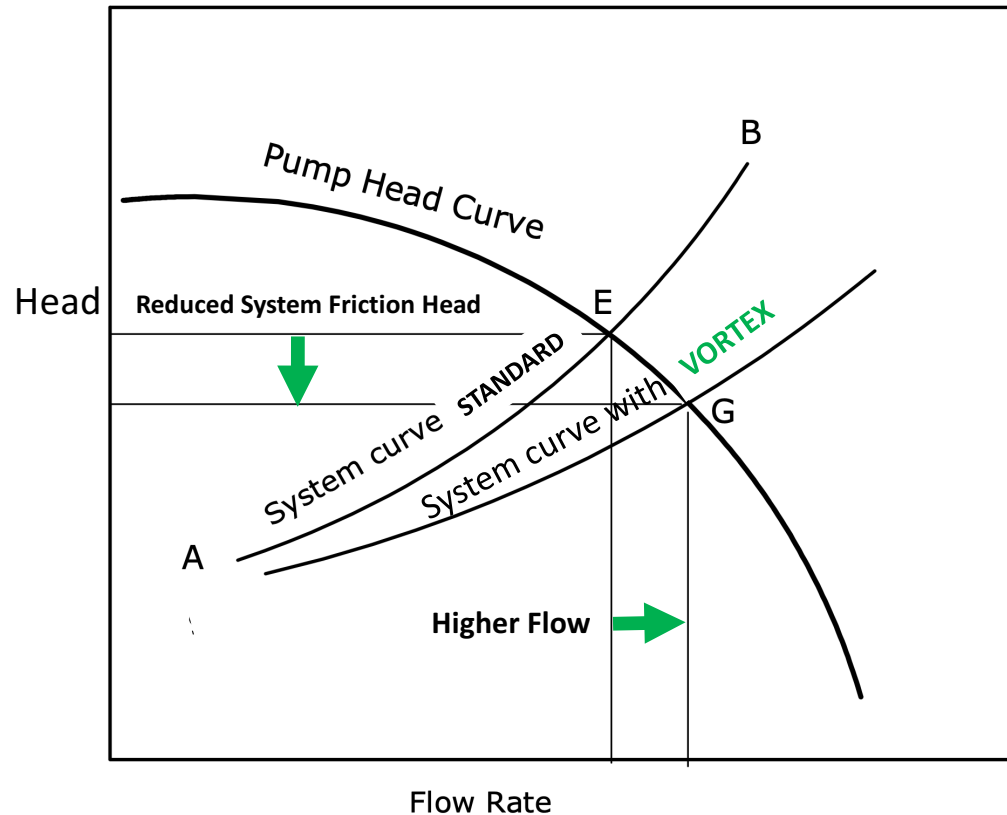
- USES FULL PIPE X-SECTION
- UTILISES FULL PIPE VOLUMETRIC CAPACITY
- FLOW ROTATION REDUCES FRICTIONAL DRAG
- LESS ENERGY CONSUMED AT ANY FLOW RATE
- HIGHER FLOW RATES POSSIBLE IN EXISTING LINES

## VORTEX AMPLIFIER CROSS-SECTION



- Multiple material and size options
- Simple to install in line
- ***No moving parts***
- ***No energy required***
- ***No maintenance***

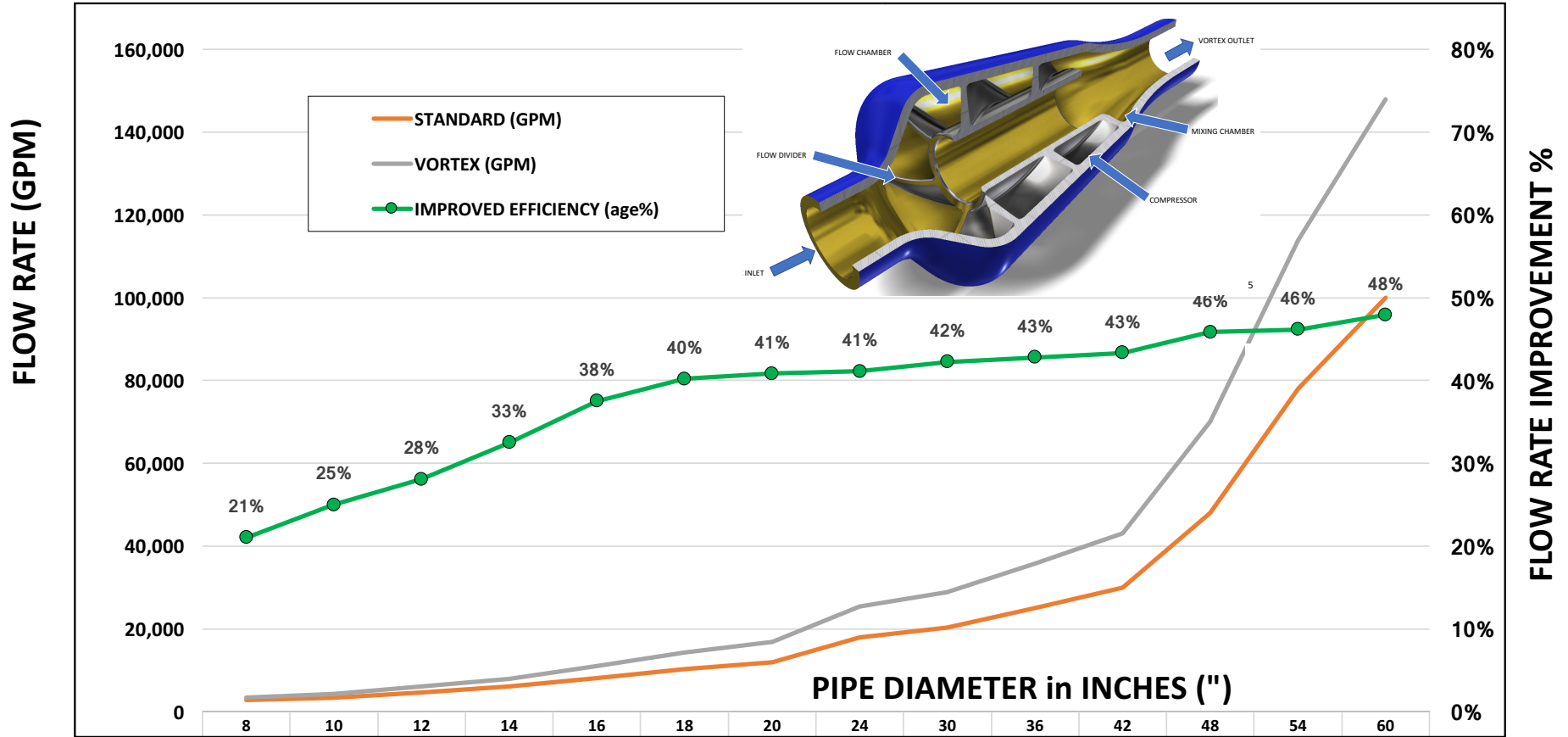
## VORTEX DELIVERS PERMANENT SYSTEMS CURVE IMPROVEMENT



Pipeline Hydraulics, Dr. S. Menon

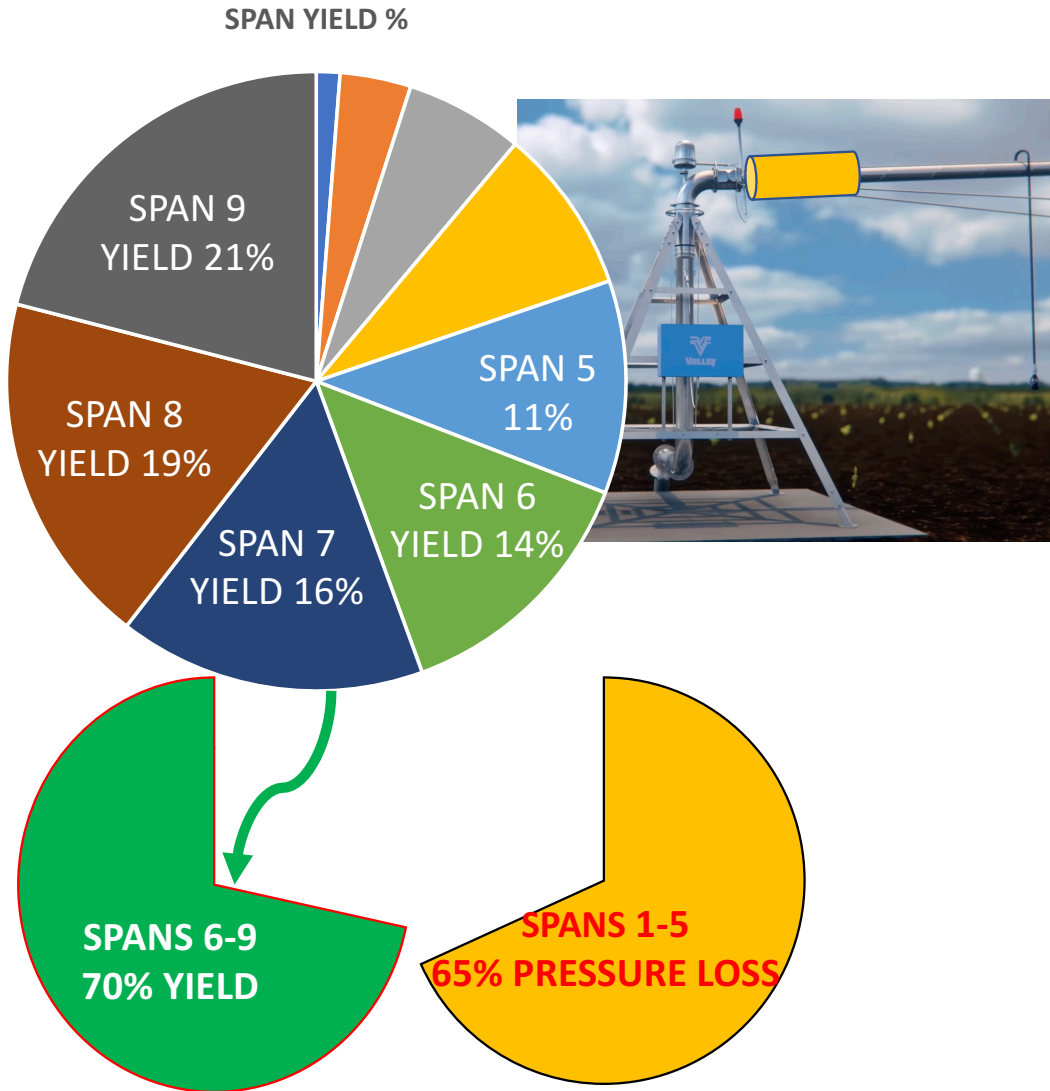
- **VORTEX REDUCES FRICTION HEAD IN THE SYSTEM CURVE**
- BEST EFFICIENCY POINT (BEP) AT HIGHER FLOWRATE
- REDUCED PUMPING ENERGY AND OPEX
- OR HIGHER FLOW RATES AS DESIRED
- FLUID ROTATION INCREASES SEDIMENT LOAD CAPACITY
- HIGHER SYSTEM UPTIME
- IMPROVED FLOW ASSURANCE

# VORTEX FLOW EFFICIENCY COMPARISON



STANDARD (GPM)	2,800	3,400	4,700	6,000	8,000	10,200	12,000	18,000	20,250	25,000	30,000	48,000	78,000	100,000
VORTEX (GPM)	3,388	4,250	6,020	7,950	11,000	14,300	16,900	25,400	28,800	35,700	43,000	70,000	114,000	147,939
IMPROVED EFFICIENCY (age%)	21%	25%	28%	33%	38%	40%	41%	41%	42%	43%	43%	46%	46%	48%

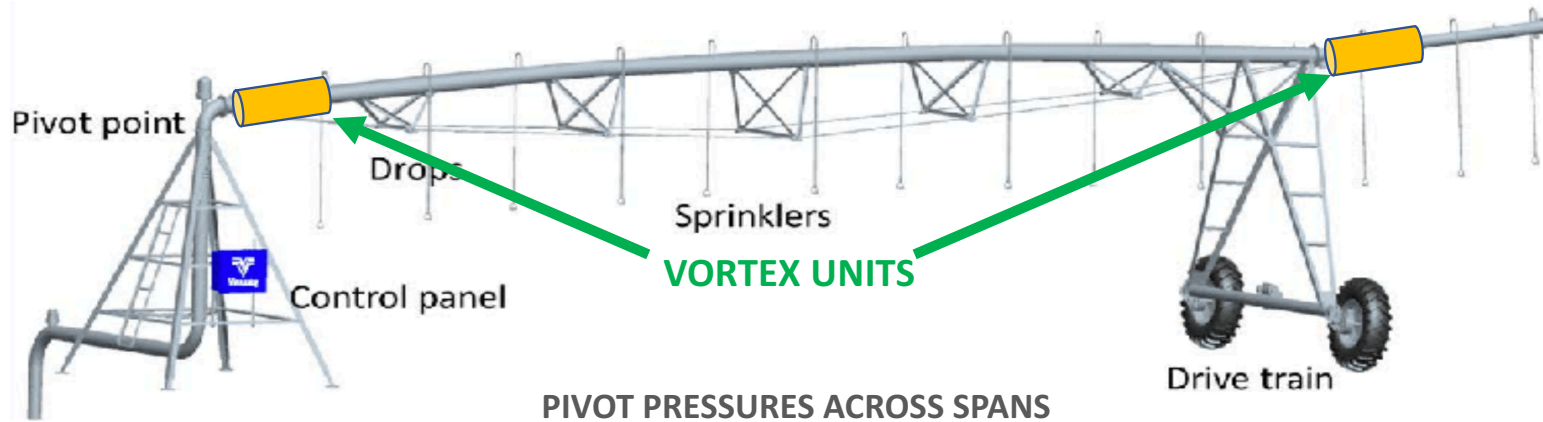
## PIVOT SYSTEMS PAIN



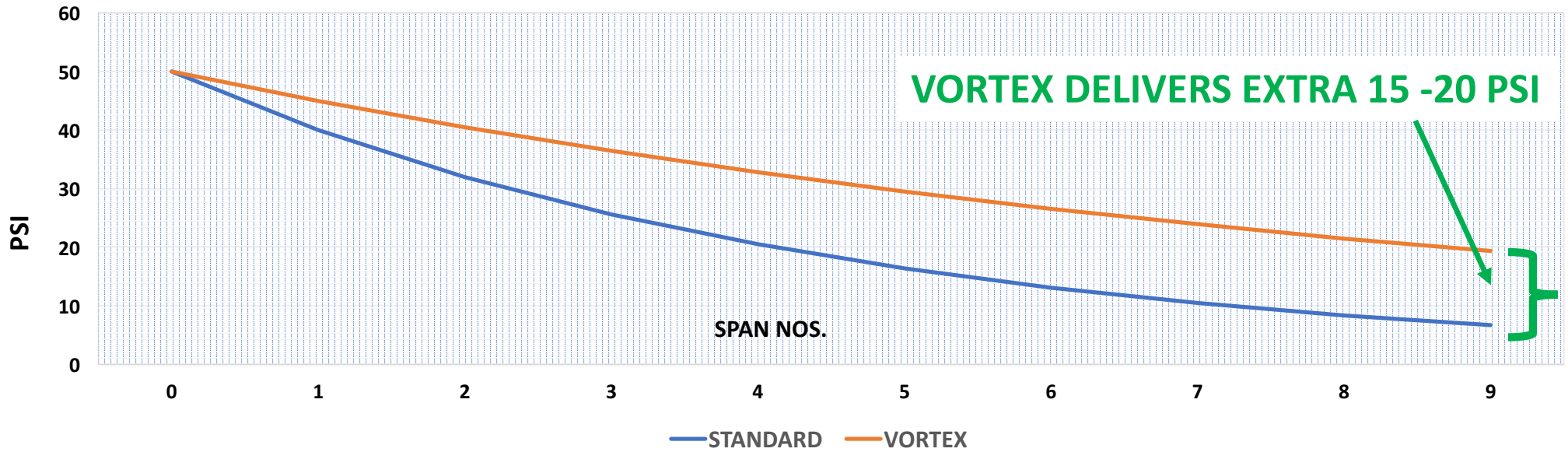
9 SPANS x 160' EXAMPLE :

- 70% OF YIELD COMES FROM 4 SPANS, 6-9
- **BUT SPANS 1 THROUGH 5 HAVE ALREADY REDUCED THE INITIAL PRESSURE BY ~65%**
- **1/3 OF YIELD USES 2/3 LINE PRESSURE**
- **VORTEX SOLUTIONS :**
  - **REDUCE EACH SPAN'S FLOWING FRICTION LOSS**
  - **COMPOUND FLOW GAINS, RAISE YIELD**
  - **SAVE PUMPING ENERGY**

### VORTEX PIVOT FLOW AMPLIFIER



PIVOT PRESSURES ACROSS SPANS



Change  
this



To  
this



## Contact

Avi Ghosh 713-623-3085  
President [Avi.Ghosh@VortexPipe.com](mailto:Avi.Ghosh@VortexPipe.com)

Paul Schmidt 713-623-3087  
Engineering Director  
[Paul.Schmidt@VortexPipe.com](mailto:Paul.Schmidt@VortexPipe.com)

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