Pipeline flow is Inefficient with High Energy Losses

Force Applied

Initial Parabolic Flow Develops

Laminar Parabolic Flow

Only ~50% Effective Flow Diameter

Increasing Force Causes Turbulent Flow

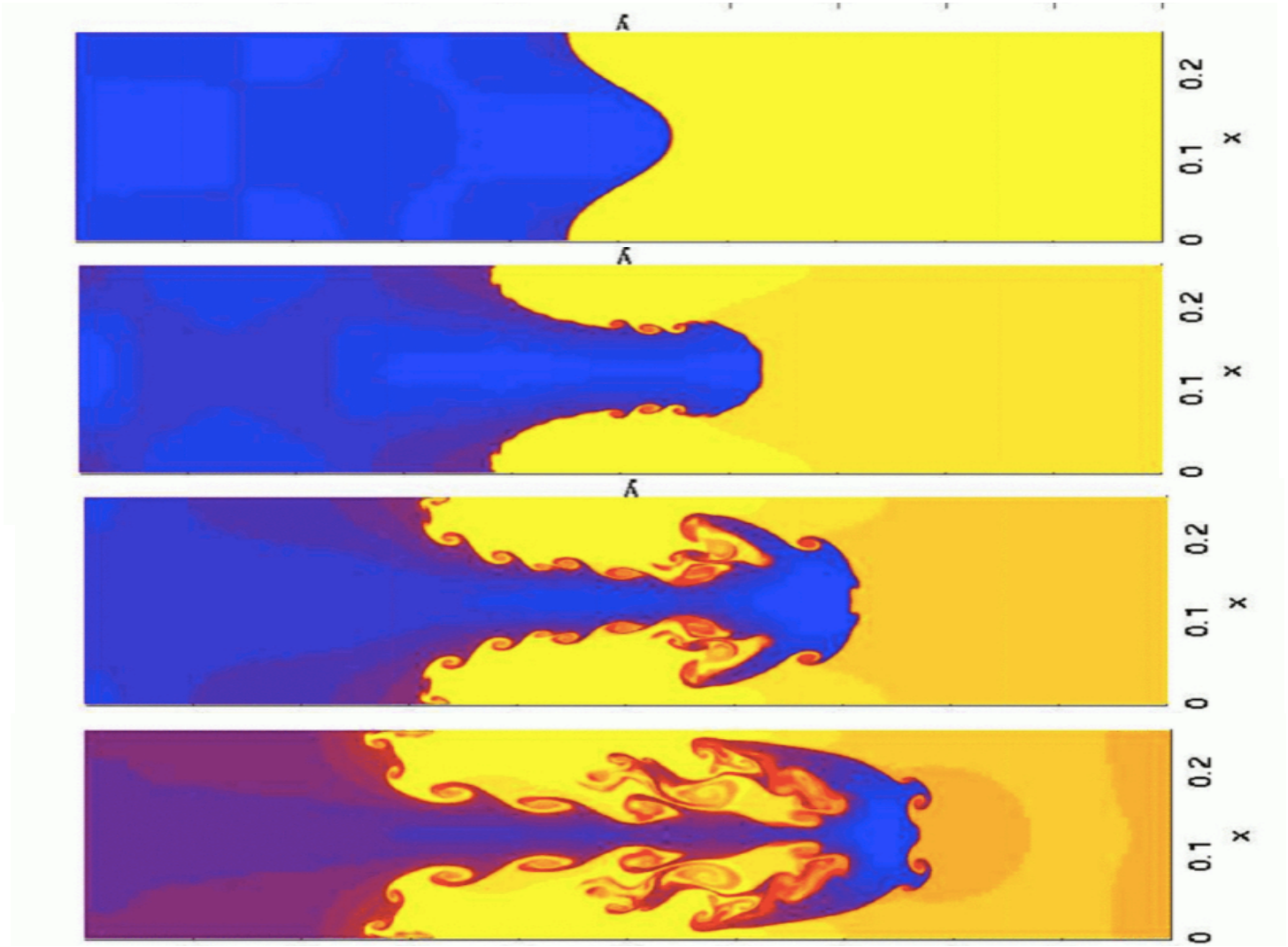
< 50% Effective Flow Diameter

Increasing Sidewall Drag

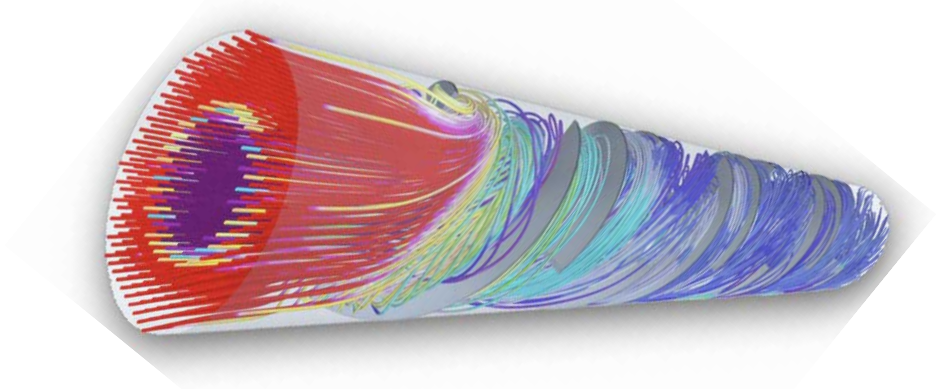
Inefficient Turbulent Flow

Low Effective Flow Diameter

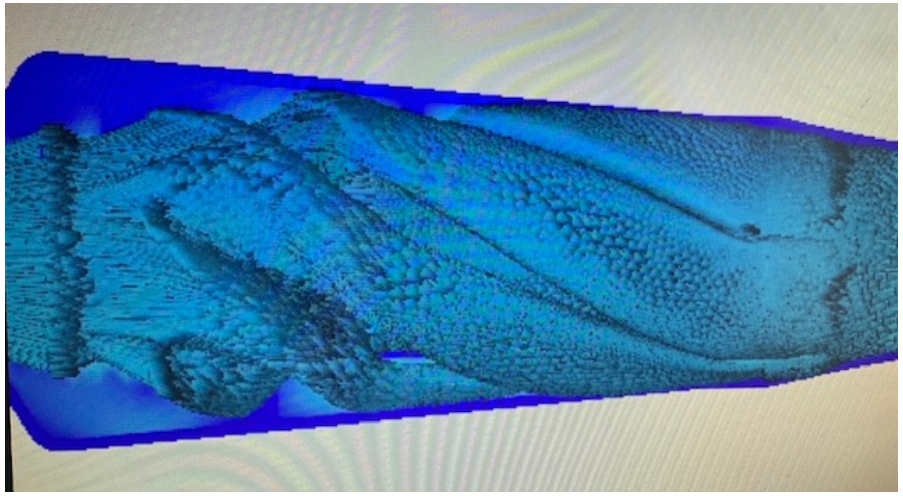
Dominant Sidewall Drag



Vortex Moves Water Much More Efficiently



Rotating flow output



- Vortex design creates a longitudinal rotational flow
- Vortex reduces drag on the pipe wall – increasing flow rates without extra energy
- Vortex saves energy and manpower costs by reducing pump loads and maintenance
- Vortex is simple to install, has no moving parts and requires no energy or maintenance

Vortex Working Principles and Benefits

- Higher flow volumes without extra energy
- Higher flow capacity in existing lines
- No line sedimentation – no backwashing needed

BENEFITS

Irrigation costs reduced ~30% by improved efficiency & reduced pumping loads
Permanently lower energy consumption
No sediment deposition in lines – backwashing manpower cost savings
Vortex action enhances flow over long distances and gradients
Reliable pumping, longer pump life & lower maintenance
Fixed profile rigid design eliminates slugging, hammering, line and pump vibration

Energy and water-saving projects attract Local, State and Federal support programs

Vortex Solves Expensive Line Cleaning

- SEDIMENT DEPOSITS BLOCK LINES
- STRESSED PUMP WASTES ENERGY, HAS INCREASED WEAR
- PUMPING DELIVERS SLUGGING FLOWS
- UNRELIABLE, UNEVEN FLOW DELIVERY
- RECURRING MANPOWER AND MAINTENANCE COSTS
- EXPENSIVE CYCLE OF BACKFLUSHING AND DOWNTIME

Vortex Solves Expensive Line Cleaning

- VORTEX FLOW CLEARS PIPE OF SEDIMENT BUILD-UP
- VORTEX ACTION KEEPS IT CLEAR - FULL PIPE DIAMETER USED
- PUMPING SYSTEM HAS MUCH LOWER ENERGY USE
- PUMP WEAR AND MAINTENANCE IS REDUCED
- RELIABLE, ASSURED, HIGH SYSTEM FLOWS
- SYSTEM HAS OPTIMAL FLOW EFFICIENCY AND RELIABILITY
- VORTEX SAVES COSTS - ENERGY, MANPOWER AND WATER
- VORTEX PERMANENTLY REDUCES OPERATING COSTS

Operational Fuel Consumption Test

CLOSED PIPE SYSTEM : 12” PIPE – 750’ LINE
FLOWING WATER, POWERED BY DIESEL MOTOR
LIFT 75 FT
55 PSI
FLOW RATE 750 GPM
175 HRS OPERATION

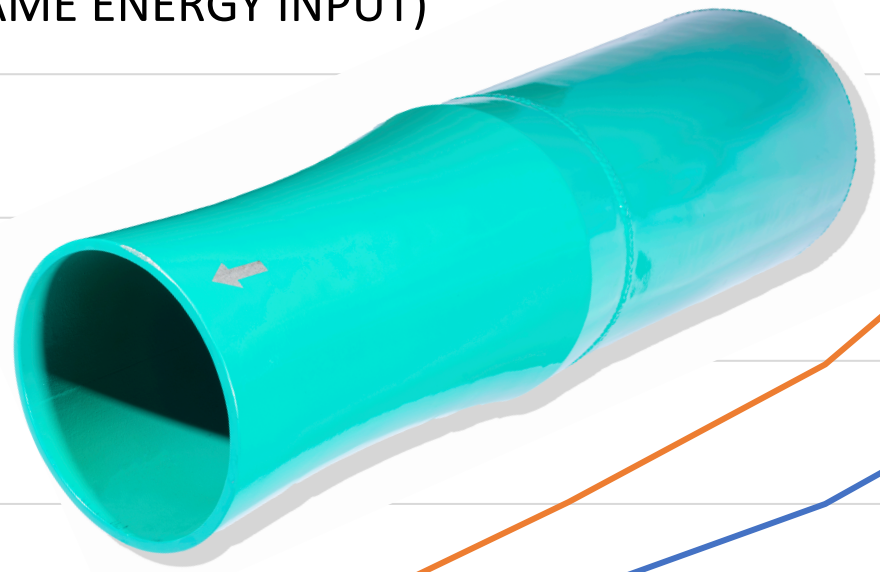
STANDARD FUEL CONSUMED : 10,240 GAL
VORTEX SYSTEM FUEL CONSUMED : 6,960 GAL

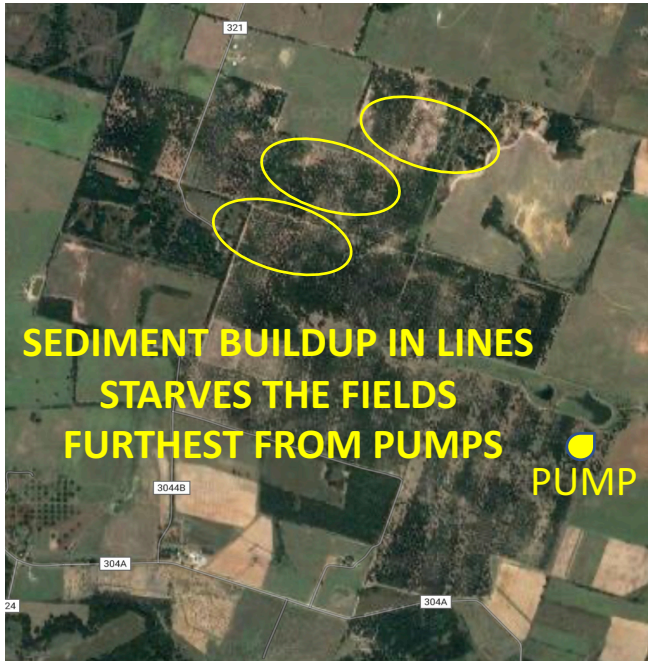
32% FUEL SAVINGS USING THE VORTEX SYSTEM

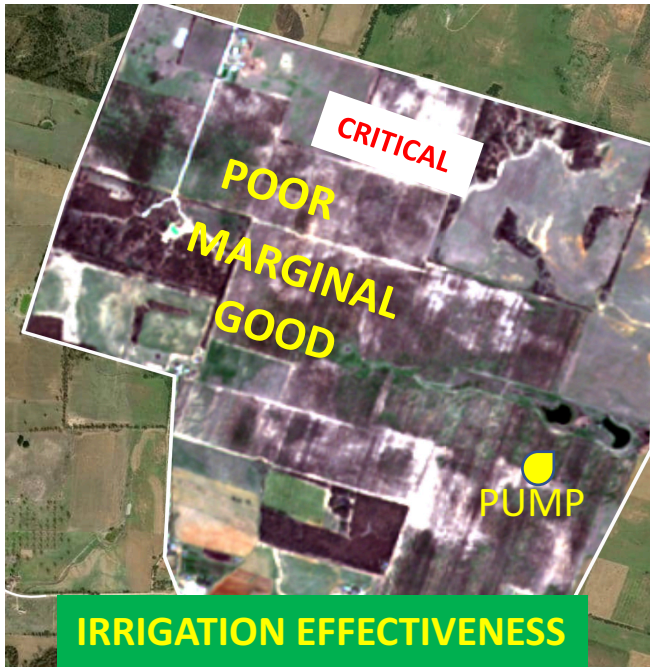
Vortex Flow Rate Comparison

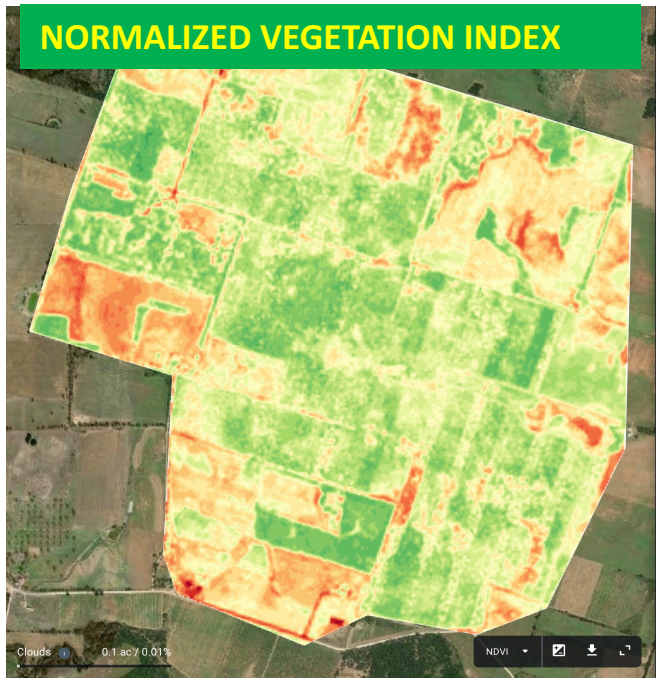
GPM FLOWRATE vs LINE SIZE
(AT SAME ENERGY INPUT)

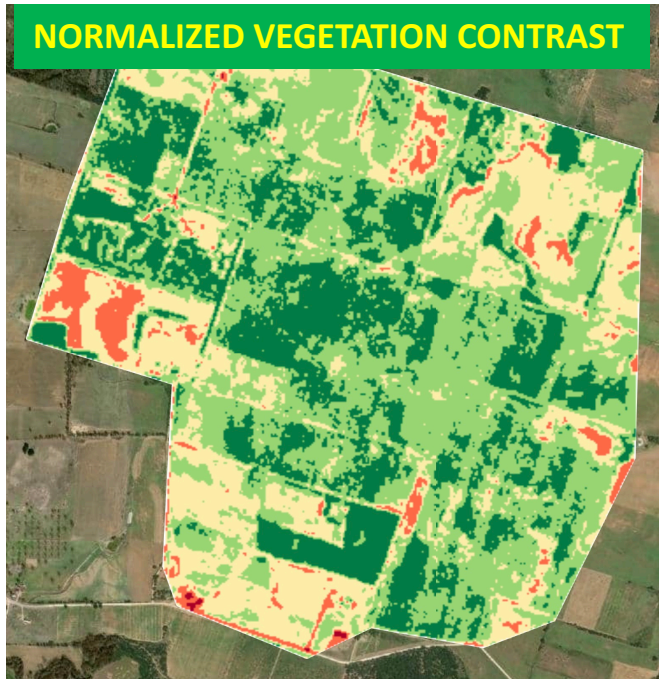
PIPE SIZE	GPM STANDARD	GPM VORTEX
2"	45	60
4"	260	360
6"	800	1,100
8"	1600	2,200
10"	3000	4,300
12"	4,700	6,020
14"	6,000	7,950
16"	8,000	11,000











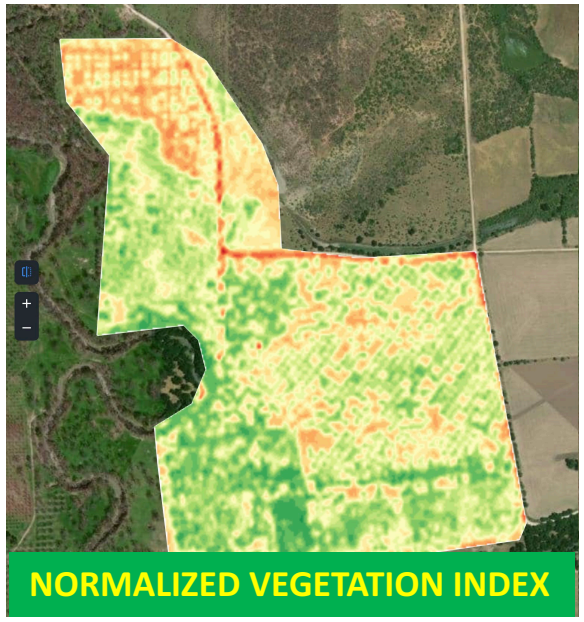
Vortex Irrigation Solutions

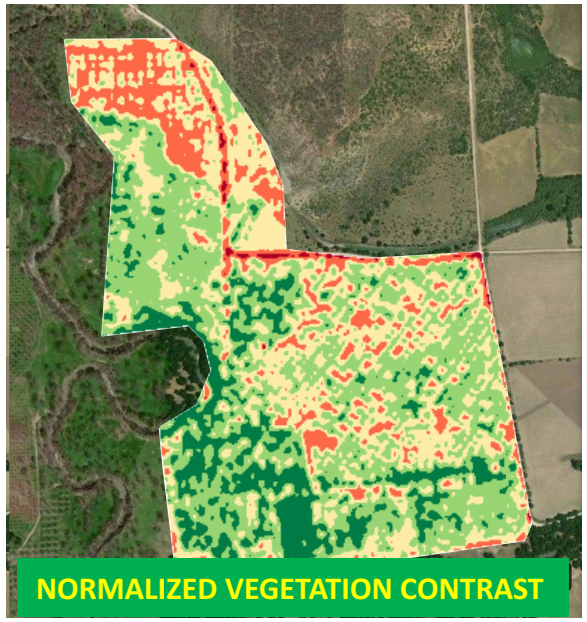
Satellite mapping
- Quickly identifies weakest orchard areas
- Shows highest priority sections for flow analysis
- Improves long term orchard management

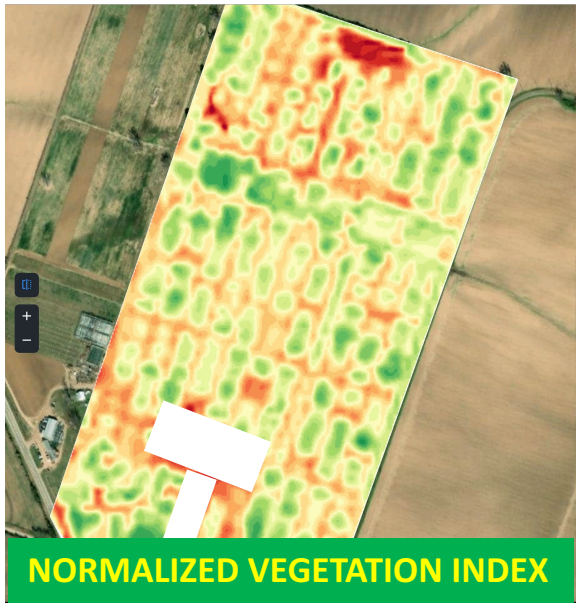
Pump and Pipe System Analysis
- Identifies stressed line sections and causes
- Review extent of line sedimentation
- Review of pump and current operations
- Assess optimal Vortex unit insertion points
- Assess Vortex energy and manpower savings

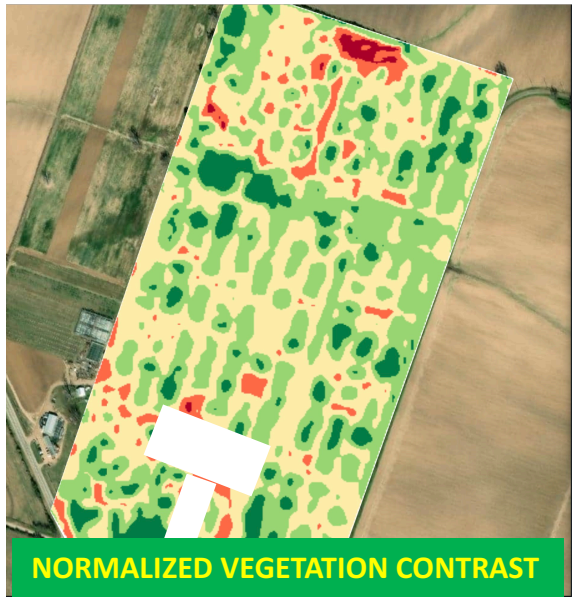
Vortex solutions
- Vortex prevents line sedimentation
- Vortex increases flow with less energy
- Lines stay clear, higher flow assured to all areas
- Major manpower savings achieved
- Energy and water savings achieved
- Energy and water conservation grants may apply

Irrigation Case Studies









- Satellite data confirms almost 70% of these orchard areas are inefficiently watered
- Distance from pump and line sediment deposits are compounding the irrigation problem
- Expensive, regular backwashing is not solving low orchard productivity
- Low yields and high costs are holding back cashflow

- Vortex prevents line sedimentation
- Vortex efficiency increases flow with less energy
- Lines stay clear, higher flow is assured to all areas

- Major manpower savings achieved
- Energy and water savings achieved
- Energy and water conservation grants may apply

- Satellite images confirm Vortex effectiveness
- Fast payback and support from energy and water savings grant programs

System Analysis & Vortex Cost Savings

- Vortex solves the most pressing irrigation problems quickly, at low cost

- Vortex technology identifies and delivers the most cost-effective irrigation system efficiency savings for pumping, maintenance and manpower costs

- Main lines (8-15”) connecting wells and rivers with central storage
- Trunk lines(4-8”) from storage centers
- Field Irrigation lines (2.25 – 4”) distribution lines to end point irrigation

- Cost-saving improvements are achievable in each part of the system with fast payback and permanent future cost-reductions

- Energy and water-saving investments qualify for multiple grants and incentives

Vortex
PIPE SYSTEMS

Thank you	–	Please Contact
Jay Sonntag Sales Manager Jay.Sonntag@Vortexpipe.com		936-212-5675
Paul Schmidt Head of Engineering Paul.Schmidt@Vortexpipe.com		832-623-3087
Avi Ghosh President Avi.Ghosh@Vortexpipe.com		713-623-3085