The Making of a Socially Conscientious Engineer
(做一个有良心的工程师)

By
Chen-yu Yen (嚴震宇), PhD, PE

华府华人土木共济沙龙, August 2015

My Education

- Five elementary schools, many different cities in Taiwan
- National Oversea Chinese (Middle) High僑中1962-1965
- Chien-Kuo Senior High 建中 1965-1968
- National Taiwan University, 台大1968-1973, BS Chemistry
- UNC Chapel Hill, 1975-1977 MS Chemistry
- UNC Chapel Hill, 1977-1983 PhD Environmental Sciences and Engineering
- The Johns Hopkins University, 1983-1985 Post-doctoral research at Dept. of Geography and Environmental Engineering (DoGEE)

My Current Positions

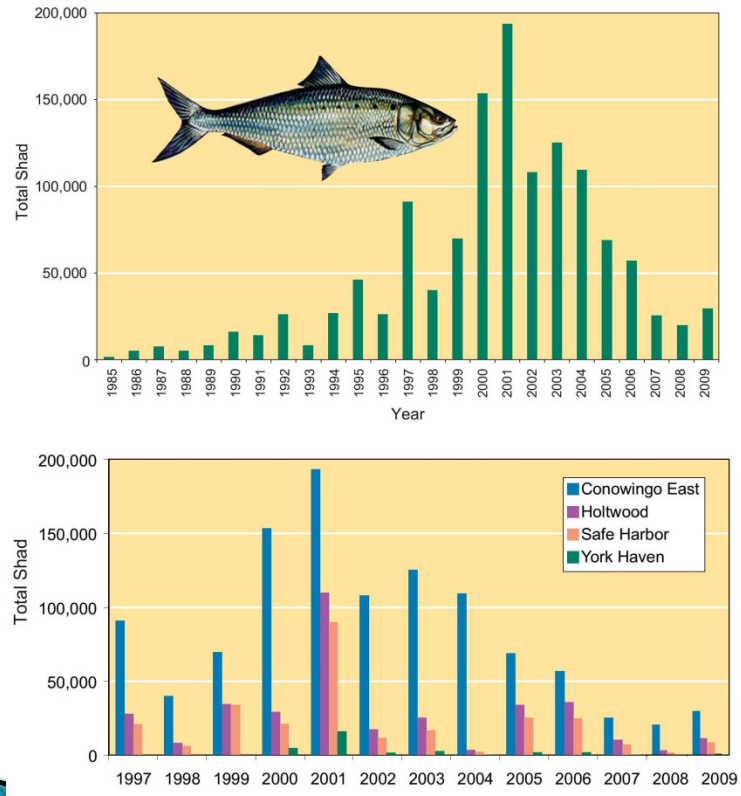
- Gannett Fleming Inc. - Vice President, Stockholder
- TerraSure Development LLC – President and CEO
- Gannett Fleming Sustainable Ventures Corporation – Senior Vice President
- Founder of **www.InvestWithYen.org** an online non-profit organization
- Chien-Kuo Senior High 建中 – CCAA-DC Activity Committee Chair
- UNC Chapel Hill – Board Director for School of Public Health Foundation
- The Johns Hopkins University – Advisory Board Member for DoGEE

My First Project: Oxygenation of Water Passing through Conowingo Dam, MD

Conowingo is the largest dam in MD and with 7 turbines and a capacity of 548 MW, the largest hydropower plant in MD

Anadromus fish was almost extinct in Susquehanna River in 1980s because of the Dams. GF was Hired by MD DNR to Recommend Solutions. Mission: to Increase Dissolved Oxygen

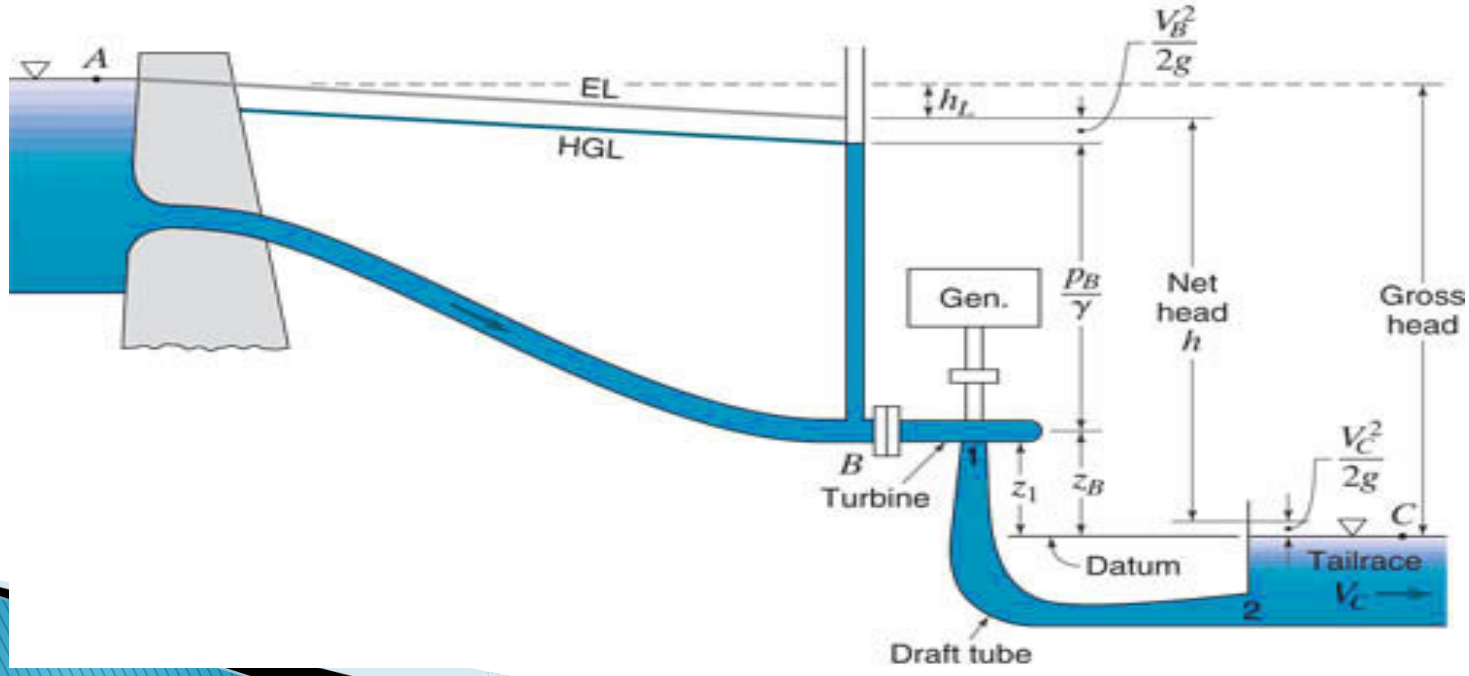
Figure 3-15 Number of American Shad Passed at Conowingo Dam (Susquehanna River), 1985-2009 and at Conowingo East, Holtwood, Safe Harbor, and York Haven Dams, 1997 - 2009



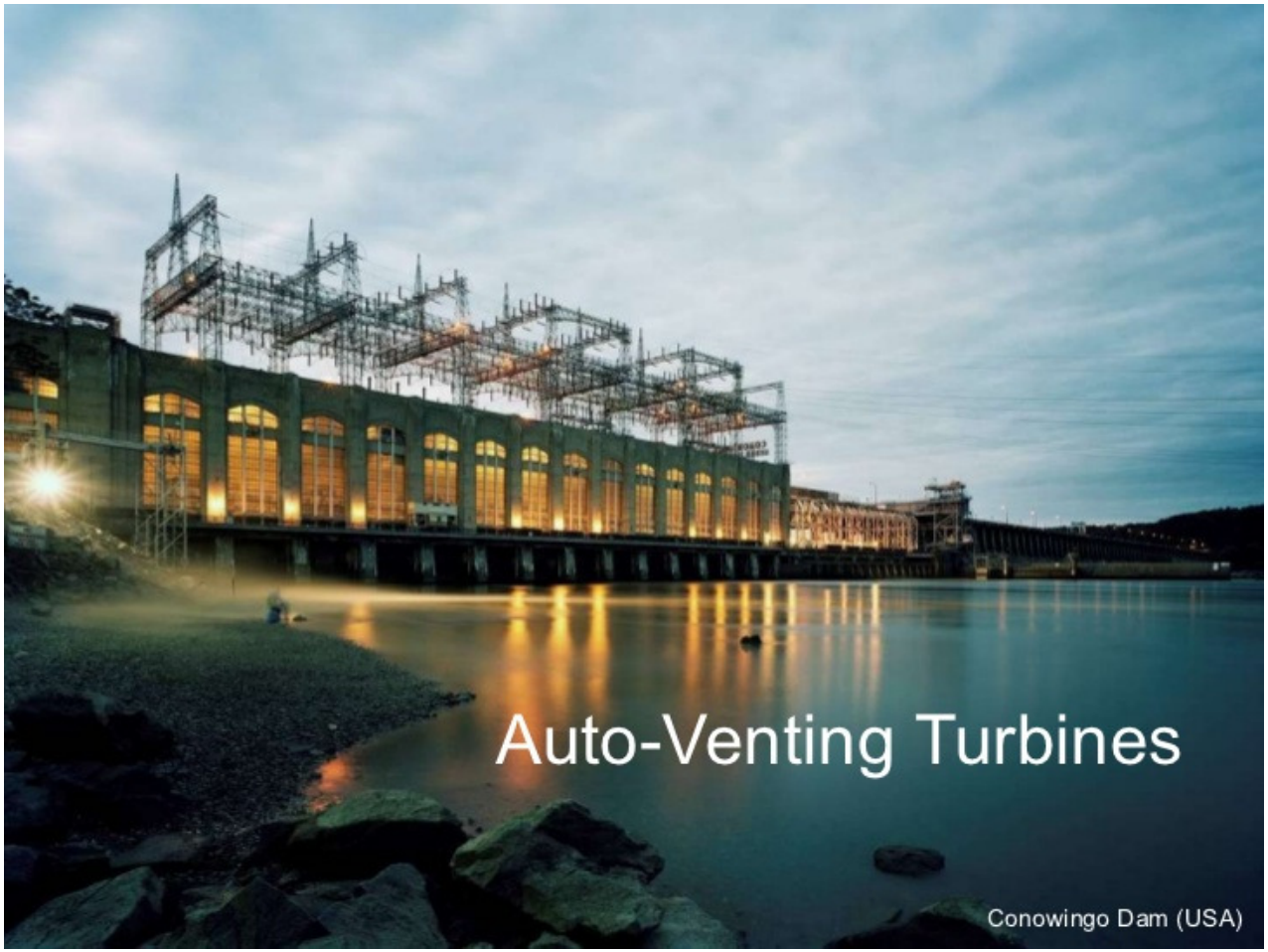
Alternatives Evaluated:

- Diffused Air Injection in the Reservoir
- Oxygen Injection in the Reservoir
- Mechanical Aerators in the Reservoir
- Turbine Venting inside the Power Generation Units

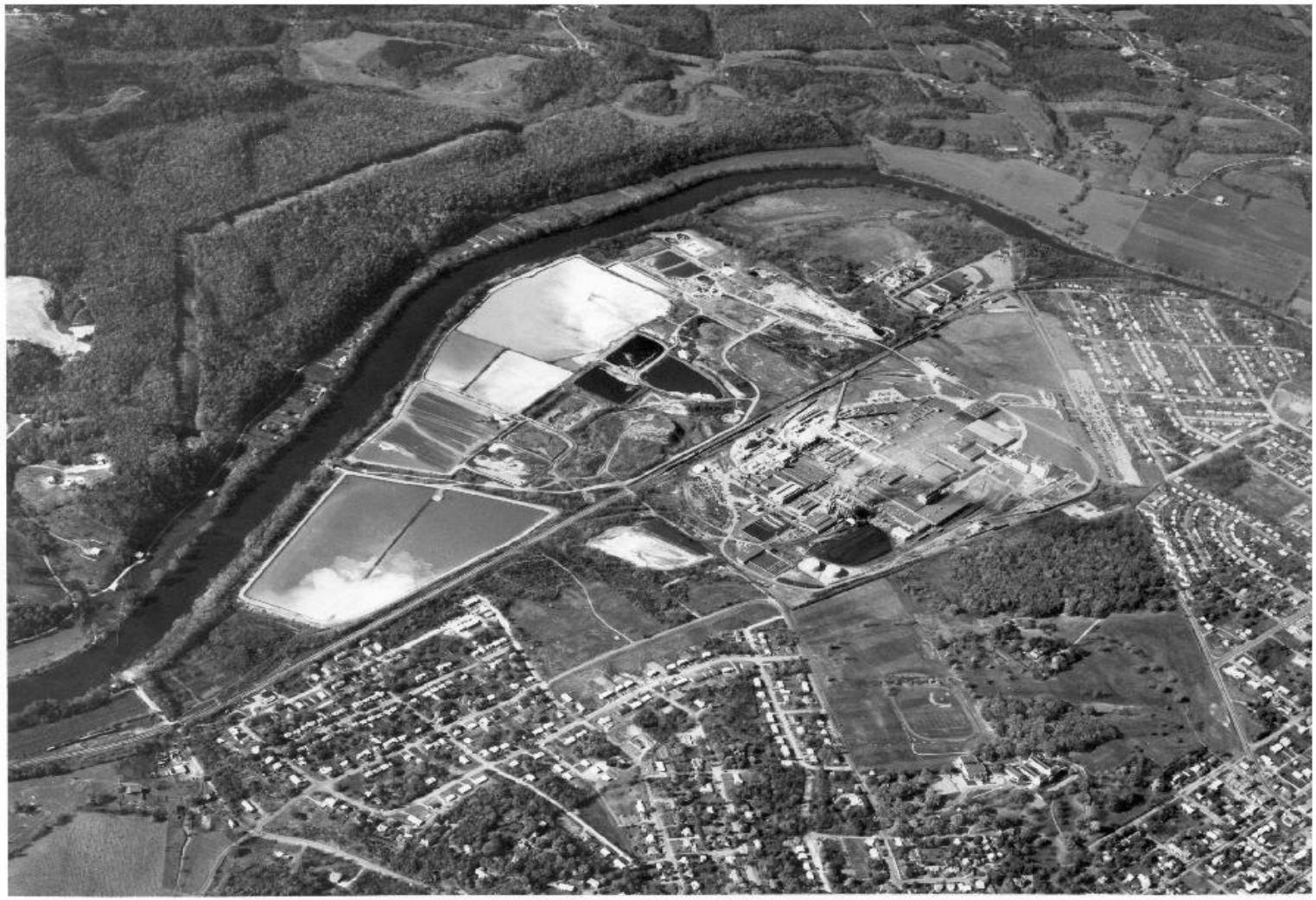
Air can be automatically sucked in through holes properly placed and balanced through the draft tube. This method using the Venturi effect is called TURBINE VENTING. In 1985, turbine venting was in its infancy. I collected data from Alabama Power and TVA to model the efficiency achievable at Conowingo Dam. Even with modest capital cost and very little O&M cost, it took us about 5 years to get them installed. American Shad came back to the Susquehanna River in huge numbers.



Conowingo became one of the most Successful Turbine Venting Site in US



My Longerst/largest Project: Avtex Fiber Superfund Site, Front Royal, VA (1991-Today)



Blue Ridge Aerial Surveys January 4, 1977

Site Features

- 440 acres (178 hectares)
- At one time 66 acres (27 hectares) under roof
- Waste disposal basins, lagoons and landfills – 150 acres (61 hectares)
- Peak manufacturing 6,000+ employees worked around clock
- Major contaminants of concern: PCBs, Carbon Disulfide, Arsenic, Asbestos, Zinc, etc.

EPA Announcing Superfund Redevelopment Initiative at Avtex (7/99)

Environmental Protection Agency Administrator Carol M. Browner, left, looks on as Sen. John W. Warner talks with Front Royal Vice Mayor Tony Carter during a news conference Friday at the Avtex Superfund site in Front Royal.

Daily staff photos by Rich Cooley

Photograph from The Northern Virginia Daily

Funding for Avtex Cleanup and Redevelopment

- FMC contribution ~$63M for cleanup
- EPA had spent >$30M before settlement with FMC
- DOD will pay ~$30M for cleanup
- EPA Superfund Redevelopment Fund for community: $100K
- HUD Redevelopment Fund: $5M
- Private funds ~$5M for redevelopment

Avtex Source of Asbestos

Avtex Source of PCBs

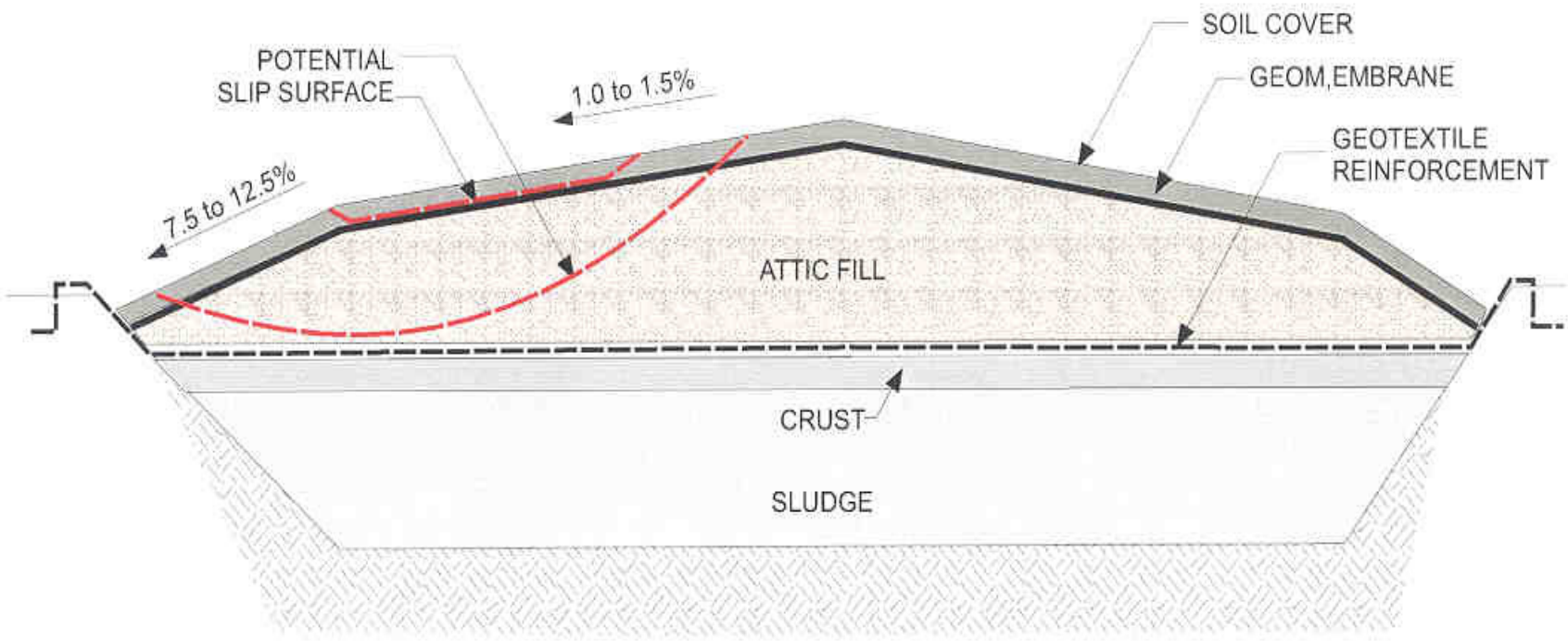
Avtex Demolition (1998)

Avtex Cleanup (1998)

Avtex Waste Removal (2000)

ERM samplers using a miniature tracked back-hoe to retrieve soil samples from the SIV-2 waste pile.
Photograph date: August 21, 2000

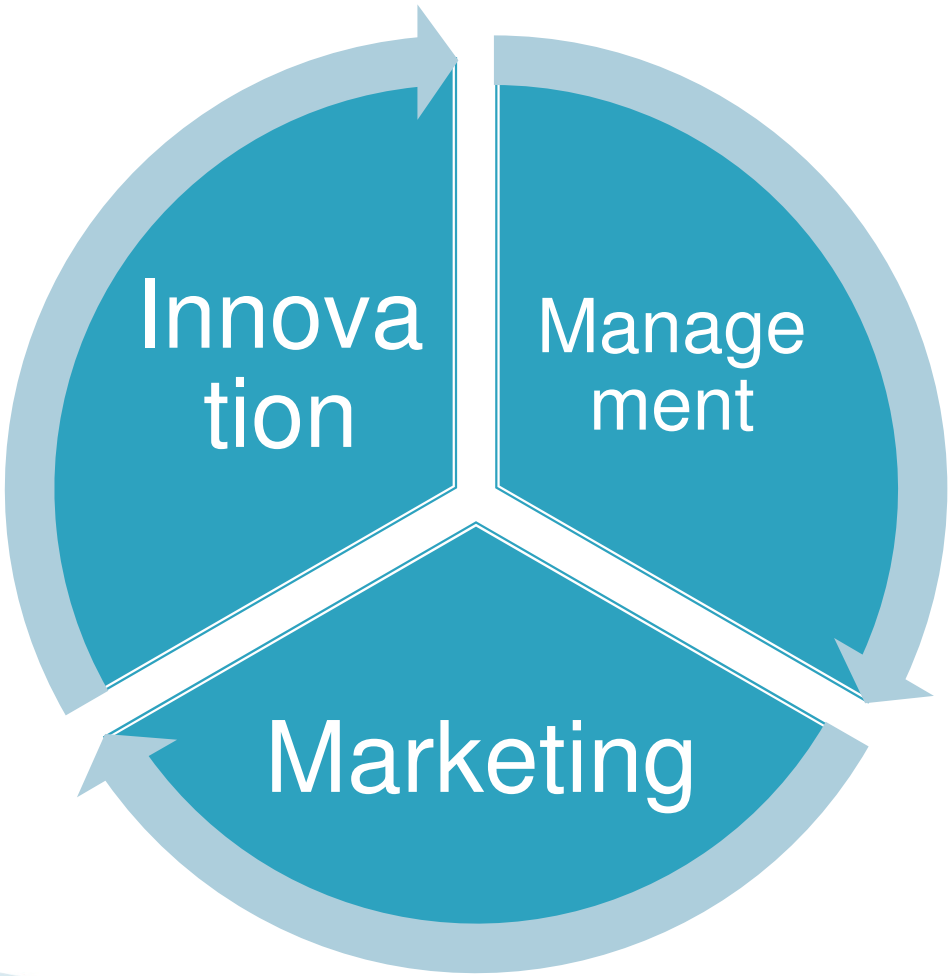
Cap Concept


POTENTIAL
SLIP SURFACE
1.0 to 1.5%
7.5 to 12.5%
SOIL COVER
GEOM,EMBRANE
GEOTEXTILE
REINFORCEMENT
ATTIC FILL
CRUST
SLUDGE

Basin Cap Construction (2003)

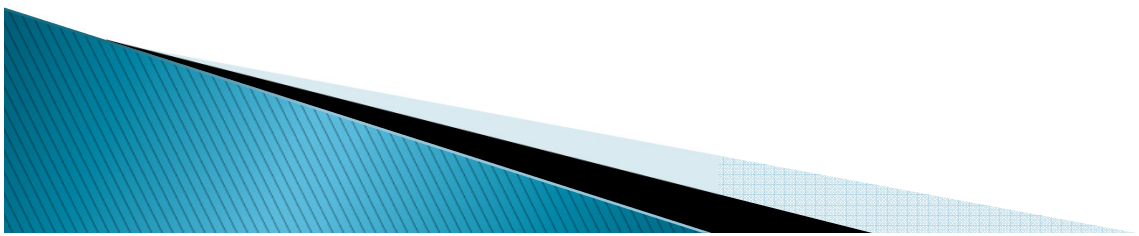
Concept of the Future Avtex

My Secret Sauce: Ingredients of a Successful Business



Management

- Consulting engineer is in a service business; our only true resource is human resource.
- Managing technical quality is just as important as managing financial health of projects and business units. A good engineer needs to know both.

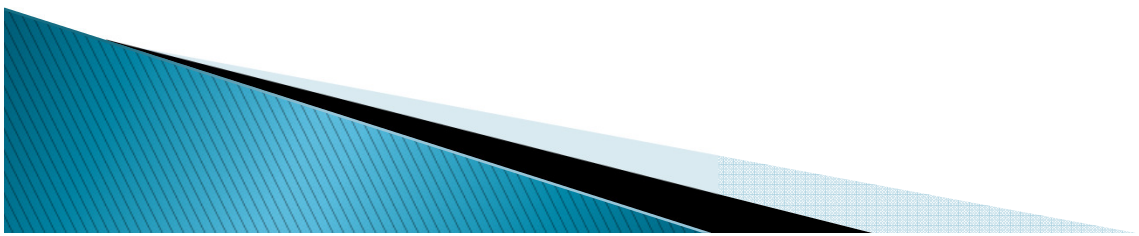


Tips/Examples of Good Management Practice

- The most important assets in any business is human resources.
- I go extra miles to treat my people well; e.g., company car, Education IRA, fund raising, free financial consulting.
- 良将手下无弱兵, Hiring/firing is very important
- People procrastinate. Compress project schedule and work gets done for less cost.
- Motivate and Improve: e.g., the 6 p.m. tour of the office.

Marketing

- Marketing is a continuous job.
- Internal marketing is as important as external marketing.
- Networking is extremely important: “It is not what you know, but who you know”
- “It takes 20 years to build a reputation and five minutes to ruin it “ – Warren Buffett



Tips/Examples of Good Marketing Practice

- Learn to communicate (both speaking and writing) with English: practice, practice, and practice.
- Writing marketing material: Claim, Illustrate, and Validate.
- Pre-positioning is very important: EPA Regional Oversight Contracts, a good 17-year run.
- Nothing beats having the client to ask specifically for your service: I was asked by EPA to manage Avtex and asked by our prime partner to be GF's program manager for the EPA Superfund contracts.

Innovation

- Continued innovation is the only way to get ahead in the consulting engineering business
- When you spend (extra) time to innovate at work, the knowledge stay with YOU!
  <u>You are not being exploited for your surplus value (剩余价值).</u>

- During my early career, I developed or used project-specific computer models/programs for more than 50% of my project; resulting in either <u>better quality products</u> or having project <u>more efficiently done.</u>

Examples of Good Innovation Practice: List of Computer Models Developed/Used on my Projects

	Self-Developed Models/ Programs								Using Commercial Programs						
Project Description and Location	Treatment Process Modeling	Groundwater Fate & Transport	Data Processing	Human Risk Assessment	Water Quality in Streams	Sewer Flow Projection	Project Cost Estimation	Remediation Cost Estimate	Groundwater Fate & Transport	Water Quality in Streams	Air Pollution Dispersion	Remediation Cost Estimate	WWTP Pretreatment	Biostatistics	Landfill Hydrogeological
Conowingo Dam Turbine Venting, Conowingo, MD	x														
Tollgate Landfill Superfund Site, Harford County, MD		x													
PACT Process at Back River WWTP, Baltimore, MD	x														
Avtex Fiber Superfund Site, Warren County, VA			x	x			x	x			x				
Tybouts Landfill Superfund Site, Newcastle County, DE			x	x			x		x		x				
Army Creek Landfill Superfund Site, Newcastle County, DE			x	x			x								x
Middletown Airfield Superfund Site, Middletown, PA			x	x			x								
Heleva Landfill Superfund Site, Lehigh County, PA		x	x	x			x								
Jacks Creek Superfund Site, Mifflin County, PA			x	x			x								
Greenwood Chemical Superfund Site, Albemarle County, VA			x	x			x								
Delaware Sand & Gravel Superfund Site, Newcastle County, DE			x				x								
Berks Sand Pit Superfund Site, Berks County, PA			x				x								
Berkeley Products Landfill Superfund Site, Denver, PA			x				x					x			
Oversight of Remediation at 35 Federal Facilities in EPA R3			x	x			x								
Seneca WWTP Facility Plan, WSSC, MD						x				x					
Gwynns Falls Sewershed Planning, Baltimore County, MD						x									
Cherry Island Landfill Design, Newcastle County, DE															x
Allied Chemical Chromium +6 Site, Baltimore MD		x													
Drake Chemical Superfund Site, Clinton County, PA	x						x	x							
SARA Title III Cancer Risk for EPA Region 3							x							x	
Biological Nutrient Removal, Greenwich WWTP, Greenwich, CT	x						x								
UAJA WWTP Upgrade for Nutrient Removal, State College, PA	x				x		x								
Industrial wastewater pretreatment Program, Carroll County, MD							x						X		
Industrial wastewater pretreatment Program, Washington Co. MD							x						X		
Industrial wastewater pretreatment Program, Hagerstown, MD							x						x		

Financial Management

- Why financial management is important? The story of my grandfather.
- I strive to manage every project to be profitable.
- Most important formula:
  Revenue Factor = Utilization X Net Multiplier
- I took over GF Baltimore office in 2000 and went on national business in 2005. In between, I turned a 35 people money losing office to a 75 people office generating more than $1 million.
- The engineering consulting business tends to be a price driven commodity type of business. So I turned to stock market for better return on investment (ROI)

The Accidental GF Stockholder

- Due to my computer program skills (tool making) in the EPA Superfund Remediation Contract (known as ARCS), I became the Program Manager around 1995.
- There were some personnel changes in the GF-Baltimore Office. I was a little restless. So I started to explore other possibilities, including working for other firms and forming my own consulting business.
- After getting an offer letter, GF counter-offered with promotion and possibility of becoming a stockholder if I stay. I decided to stay.

The Accidental GF Baltimore Office Manager (天生我材必有用)

- In 2000, while on vacation in NC, I got a phone call from our Proposal Manager. She wants to turn in her resignation because our Office Manager was abusing the female admin staff.
- I told her to hold off. I called up an emergency meeting with the senior managers in the offices; drove back; and led the coup to evict the Office Manager (or we would all quit our jobs with GF).
- I followed my conscience; in a fool-hearted way.
- I was one of the very few "革命" office managers in American business; ever.

The Accidental GF Baltimore Office Manager, Continued

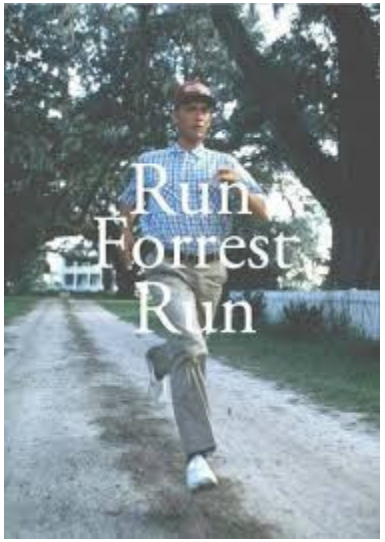
- We promised Corporate that we would be turning the losing office around – In 2000 GF-Baltimore had 35 staff and was losing money. By 2005, when I turned the office over, we had 75 staff and was making more than $1 million profit, the best in the company.
- I put my “secret sauce” to work.
- We promised Corporate that in 20 years, we would have about 200 staff and making about $2 million profit – We have about 140 staff and making about $1.5 million profit now.

The Accidental TerraSure President and CEO

- In 2005, Earth Technology under Tyco International offered cash and stocks to lure away a key senior manager in GF-Baltimore.
- To save the future growth of GF-Baltimore, I made the counter-offer of Office Manager and GF stockholder package to retain this senior manager
- I looked around for national duties to do instead and decided to take on the largest losing business unit of TerraSure, the guaranteed fixed price remediation program and the national site remediation program at federal facilities.

The Accidental Start of Invest With Yen (IWY) Newsletters

- In 1996, my English writing skill needs improving. I took an evening course at JHU on technical writing.
- I felt so dumb when my classmates could write 5 pages in an hour while I barely got two pages.
- My instructor told me to find a topic that was dear to my heart and to find a reason to write repeatedly on the subject.
- I had been doing research on investing in stocks and thought I was very good at it. IWY Newsletter was born. This year, we celebrate Volume 20 (Like a good Chinese, IWY was 1 year old at birth). Currently it is a quarterly.

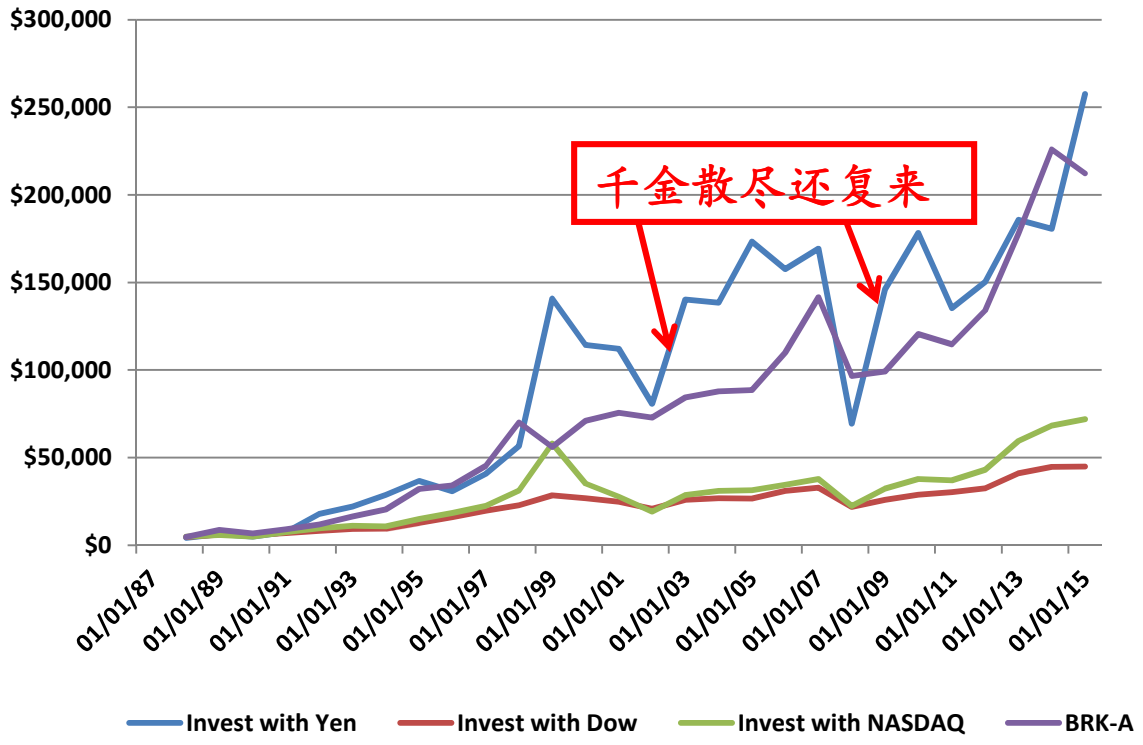


Transition from IWY Newsletters to www.InvestWithYen.org

- Provide good information on how to invest for the long term
- Strive to beat the professional investment advisors over the long term
- Ask whomever benefits from IWY to pay forward by helping others
- 助人为快乐之本

Example Performance of InvestWithYen

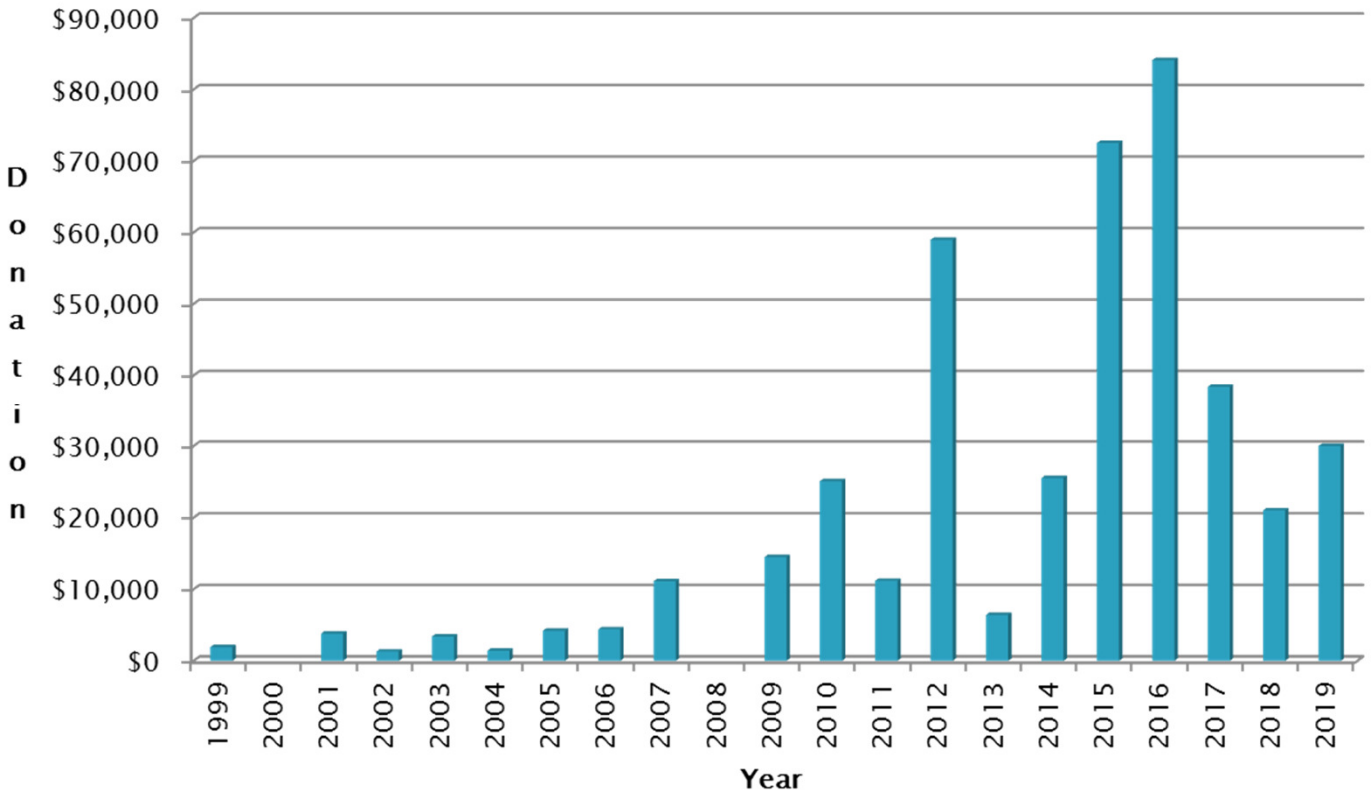
Total $ in My Roth IRA (Total Contribution = $7,000)



My Secret Sauce to Build Wealth

- There are at least three ways to make money. The lowest level uses labor; the middle level uses brain; the highest level uses MONEY.
- Buy low and sell high.
- Concentrate to become rich; diversify to stay rich.
- Most important elements to build wealth, in order: Discipline > Time > Capital

To Pay Forward: My Donations from Appreciated Stocks to 2019



Total to date: $214,000 Total to 2019 = $421,000

The Pension and 401(k) Committee Services at GF

- In 2002, after reading my IWY newsletters, the CEO of GF invited me to serve on the Pension and 401(k) committees.
- After reviewing our pension investment and liability status, I recommended we consider (1) selling to insurance company or (2) termination.
- Although the legally calculated asset value was greater than the liability in 2004, the quotes came in costing at least 10% more than we have.
- We voted to freeze our pension plan and to convert all to the 401(k) program, starting 2006.

The Purposeful Reconnection to the Academic World

- After leaving JHU as a post doc in 1985, I moon-lighted as a guest lecturer on water/wastewater treatment process/design class.
- In 2004, EPA established a Center for Hazardous Substances in Urban Environments at JHU. I was invited to be an advisor. I served five years.
- In 2007, UNC Chapel Hill received a large ($50M) endowment grant, I was asked to be an advisor.
- My investments have started to generate gains large enough to donate.

The Purposeful Reconnection to the Academic World, Continued

- In 2007, Ray-Whay and I decided to create the O'Melia Distinguished Lectureship at JHU. In 2014 we decided to endow it.
- In 2010, I joined several classmates to fund the endowed Distinguished Professorship at UNC Chapel Hill in honor of Phil Singer, my PhD advisor.
- In 2015, Ray-Whay and I decided to create the endowed Yen Fellowship at UNC Chapel Hill. This Fellowship will support international graduate students for Environmental Sciences & Engineering.

Take Away

- 十年树木，百年树人
- Successful business should have balance of Management, Marketing, and Innovation
- Successful life should have balance of family, career, and finance
- Through it all, we need conscience
- Let's all strive to be socially conscientious engineers