Robert Ayers,
ITT Fluid Technologies

Center for Strategic and International Studies

Wednesday, March 9, 2005

Erik Peterson: I would like to move now to our next presentation. It gives me very special pleasure to introduce Bob Ayers, Senior Vice President ITT Industries and President of the Fluid Technology there. ITT Industries Fluid Technology is the world's largest pump producer, and services customers in the areas of water, waste water, industrial process, bio-pharmaceutical, and building trade sectors. And also, I hope Bob will mention this, they also sponsor the Stockholm World Water Conference Junior Water prize each year, quite significant effort by the company. Before joining ITT, Bob Ayers was President of Sulzer Industrial USA and CEO of Sulzer Bingham, a pump manufacturer situated in Portland, Oregon, and prior to that he was President and CEO of the U.S. subsidiaries of Lanzagorta International and Director of Marketing and New Business Development at FMC Corporation's Petroleum Equipment Group. He holds an MBA degree from Old Dominion University and a BSEE from the Virginia Military Institute. So it's with very special pleasure that I welcome to the podium Bob Ayers.

Bob Ayers: Thanks Erik, and good morning everyone. Before I get started, I also would like to congratulate Eric and Peter and the work that CSIS and Cindy has done to really get this initiative started, I think it's a terrific start and one that I hope truly gains momentum.

You know when I talk to you today, I really would rather you forget that I'm head of ITT's Fluid Technology, and I'd really like you to think of me more maybe as a father and a grandfather, especially of two precious little girls that the future means so much to me for.

And what I want to do is talk about work-arounds, alternatives. In all the panel discussions yesterday, one thing was clear. One size doesn't fit all. There's got to be a multitude of solutions, and some of the things that I'll be saying today, you may find surprising, coming from the world's largest pump manufacturer if you'll just put that in the back of your mind.

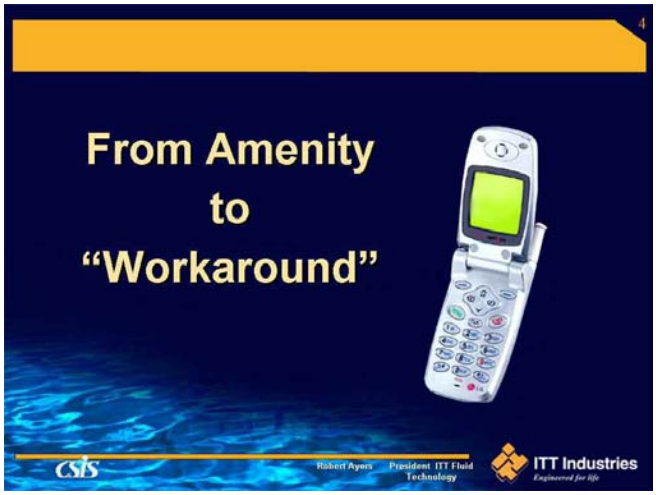
But when we talk about work-arounds, alternative solutions, you know not very long ago, in the youth of the internet if you wanted to find specific information, you were in trouble. Either you couldn't find what you wanted on the web because of the immensity of the listings and the primitive search functions, or you depended on a search operation, manned by groups of librarians or Siberians so to speak, trying to get you the data manually. Everyone looking for data was following the traditional library model, books on shelves, Dewey decimal system.

Then Larry Page and Sergey Brin came up with the concept of the Google search engine and the rest is history. They worked around a need for manpower and made the power of the internet design, the power of their engine. Their search format tapped into the very structure of the web. Google is now part of an international information infrastructure, an infrastructure very much like the power grid, the sewer lines, and the internet itself. Google now answers 200 million queries a day and deals with more content on the young internet than even Gutenberg and all the publishers after him could have imagined.

The presence of Google is such that when Google became unavailable to Chinese citizens, the outcry was so great that the service was back in full force in ten days. Quite a work-around in quite an international infrastructure. For its next work-around, Google was tackling the inefficiencies of many libraries in many places by housing all of those great libraries digitally.

There was trust 35 years ago when, if you needed a machine part, or a book delivered from one coast to the other, absolutely the next day, you had two choices: one was, you could buy an airplane seat for the item and its courier, or if you were a corporation and you had a plane, you could have it on stand-by to take the part from one location to the other. Then Fred Smith worked around this untenable inefficiency and created a hub and spoke system of planes to deliver critical goods overnight. Absolutely positively overnight. Like Google's Page and Brinn, Smith defined an

industry. His was a work-around for an untenable situation in a rapidly developing economy dependent on efficient, uninterrupted production. Knowledge for Google, goods for FedEx, and really two new verbs for the English language.



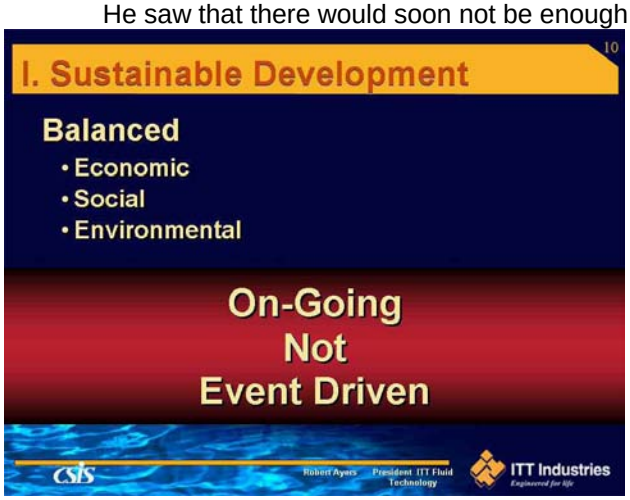
Then there is the cell phone - yes a simple amenity for those of us in a well-wired country like the U.S., but for the Chinese, Indians and Russians the cell phone is a work-around for the expense and inefficiencies of stringing telephone wire over huge countries trying to develop modern economies. And I can tell you I lived in Venezuela and Mexico during the 70s, for eight years down there, and in every town I went to rent a house, the very first thing you looked for was, was there a land line installed, was there a telephone. As a businessman you had to have that and they were few and far between. Just as recently as 1992, China just had ten million wired phones and was adding roughly 20 million annually, but by 1998 less then 7% of the Chinese had phone numbers of their own, compared with 50% for Singapore. With the government's active encouragement of cell phones, the Chinese today have 310 million users and I can tell you because we are in the electronic components business; that, by far, is the hottest market in the world.

So about 25% of its population now is connected. Developing countries now account for 56% of all mobile subscribers worldwide. Skip the wires, don't think of traditional infrastructure, and you have remarkably successful and cost-effective work-arounds.

I hope you could see where I'm going with this -- we equally need innovative and effective breakthroughs, work-arounds and technology assists, for water to meet the needs of the water century. So where are we and how we do it? How do we get farther in meeting the challenge of enough safe and healthful water?

Today I would like to look at available needed technology and available needed work-arounds to meet the challenges of sustainable development which is an absolute, water scarcity, and water purity. I think we should begin with an agreement, an understanding of the sine qua non to succeed in meeting the challenges of our water century, and that is simply sustainable development. Medieval scientist Hans Karl _____ observed that the thriving business of mining copper and iron was taking a huge number of logs to support mining shafts.

He saw that there would soon not be enough trees for the mines and wrote a paper in 1713 where he coined the phrase ((is there someone here that speaks German and can help me out?))- thank you, thank you! Sustainable development, okay. He observed that the number of trees cut had to be less than those grown in any period of time. The assumption was, and has developed in our time to be, that a society lives in prosperity only if economic, social and environmental affairs are kept in balance and can be ongoing rather then event-driven in the present tense only.



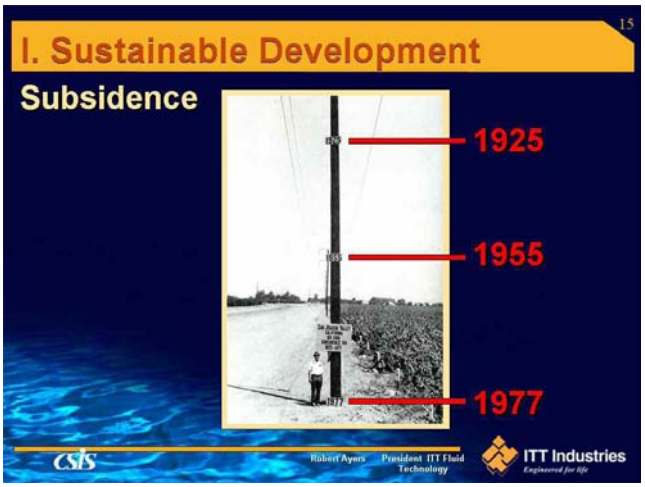
Water is a critical unit for sustainable development in every society and economy. Consider all the world's water - and I know everybody in this room knows this but consider if all of it were compressed in a one gallon jug. From that gallon jug the fresh water available to us would be equal to about one tablespoon. You know, this image I'm sure gives you as much pause as it does me in thinking about the future solutions, with all the discussions that took place yesterday and with the Senator this morning.

If you have any doubts about this, consider the following: 300 million people now live in areas of serious to severe water shortages. In 25 years that number will be 3 billion, but less than one percent is the amount of fresh water available for use, and that's the tablespoon from the gallon. Two million tons of human waste is released in the streams and rivers of the word everyday. Tell ya, I just recently was in ChengDu, which is the capital of the Szechuan province in China. And if you walk along the river there, it is absolutely, the stench is absolutely overwhelming, and by the way that's a small town of ten million people with rapidly new building and very progressive in trying to build up their economy but the infrastructure isn't there. Maintaining clean safe water and disposing of our waste is paramount for sustainable development. I think it was Hubert Humphrey that said, and was correct when he said it, our affluent society was also our effluent society and Victor Hugo was equally correct when he said that a city's sores are its conscience.

Great rivers of the world including the Nile of Egypt, the Ganges of India, the Yellow River of China, and here at home, the Colorado, do not reach their destinations for significant periods of time. The Yellow River has gone dry on an average of 70 days a year in each of the last 10 years. Again, bad decisions and over-use are the culprits. Now we can say, well back when we were making decisions about the Colorado River and water disposal for the west, we had no idea of the long-term implications. But let me quote John W. Powell, a geologist and explorer of the Grand Canyon and the Colorado river, from his speech he gave in 1893 and I quote: "I wish to make it clear to you there is not sufficient water to irrigate all the lands which could irrigated. And only a small portion can be irrigated. I tell you gentlemen, you are piling up a heritage of conflict".

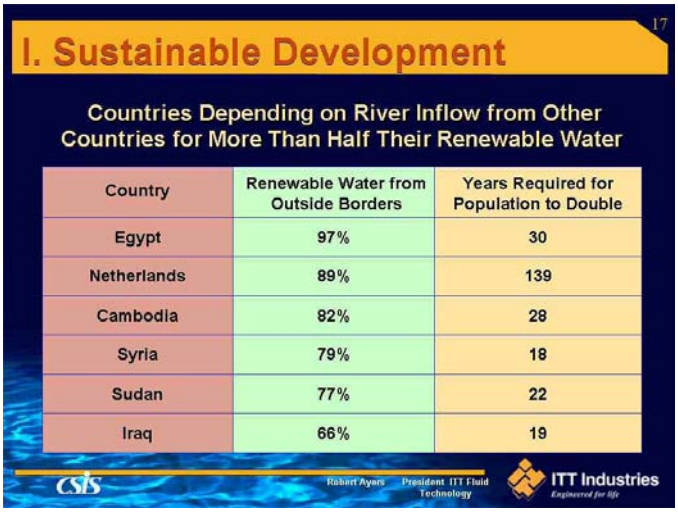
This is an appropriate place to suggest another problem of sustainable development. It has been

said that water runs uphill, to money in the American west. Short-sightedness and short-term gain have stood in the way of sustainable development in the past and of course our west is just an easy, close-to-home example of the problems. Take a look at this chart showing the proportionate use of water.



Yes, agriculture uses 70% of the world's available fresh water. Many governments, including our own, subsidize irrigation, thereby encouraging waste. What sense does it make that farmers in the imperial valley of California pay $15.50 an acre foot, while residential water in Southern California costs $431 an acre foot. To add insult to injury, irrigation often causes salination of the soil, while pumping of ground water causes the land to sink. If you doubt the reality of ? from heavy pumping of ground water, take a look at the picture from the San Joaquin valley, and I don't know if you can see that, but you can see at the top of the pole, 1925, and at the bottom, 1977. I'd like to put 2005 on there, I'm not so sure we had enough room on the slide, but that's just the seriousness of that nature.

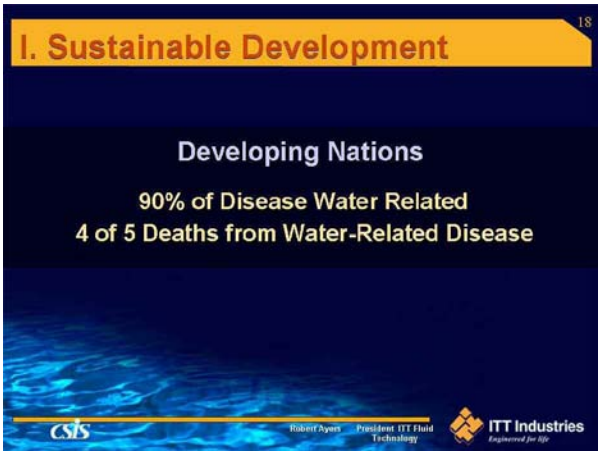
In Africa, 40 billion working hours are lost each year carrying water. Lest we think that doesn't apply here, where we have sophisticated water engineering, how many of now carry water around in plastic bottles because we don't trust local supplies. Remember, what the comedian George Carlin said about such bottled water? Evian is just Naive spelled backwards (laugh) and I love that statement because when you think of the cost of water in the United States, and what an affluent society we are because it literally costs us between seven thousand five hundred, to eight thousand dollars per thousand gallons for bottled water, versus thirty to forty cents per thousand gallons out of the municipal system, yet we go on. We can't be so naive as to think that water in other places doesn't affect us, either, and we all know that. It is truly a one water planet, and we must realize that as we enter the water century. Now I heard what John Hamre says and I respect John Hamre a lot, he happens to be on the board of ITT. But I will tell you, to me, and I was in this business before I got in the water business -- if oil was the black gold of the 20th century, then I think water is the white gold of the 21st century.



And just as conflict arose over oil, so can it arise over water. Take a look at this chart showing the countries depending on their neighbors for water, then look at the rapid population growth. In many of these same countries, which are in the most unstable areas of the world, you can see the problem that just becomes exacerbated over time.

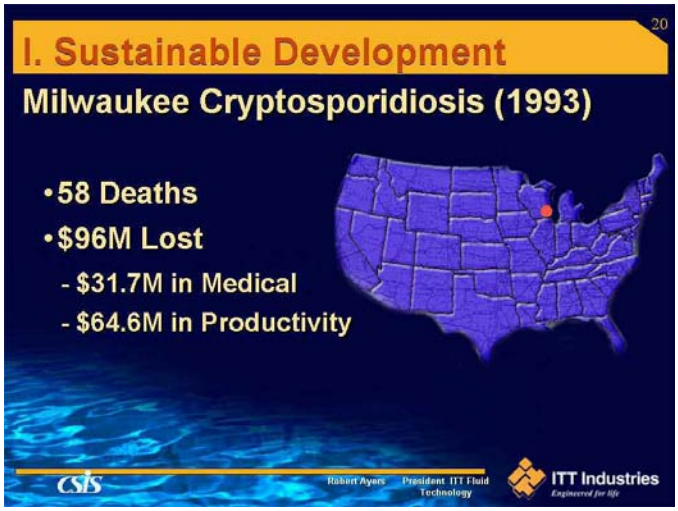
You know, I am sure there is going to be one take-away because I have it here also, and that's Mark Twain's statement that whiskey is for drinking and water is for fighting. It's been said so many times by Jim and by the Senator and now by me, it reminds me of the question about behaviors yesterday, and at the

end of one of the panels one of the questions came up and it reminds me about the old comment that Lady Astor made to Winston Churchill one time when she found him somewhat inebriated in the middle of the ballroom at a big dance and she said, Winston, my God you have drunk enough whiskey to fill up half of this room, to which he answered, So little accomplished, so much to do.(Laugh)



But really, when you think about this and you think about the critical nature of water and trans-boundaries, and the sharing of water in the geopolitical scale, the thought of the future, it's more than sobering, that water is for fighting.

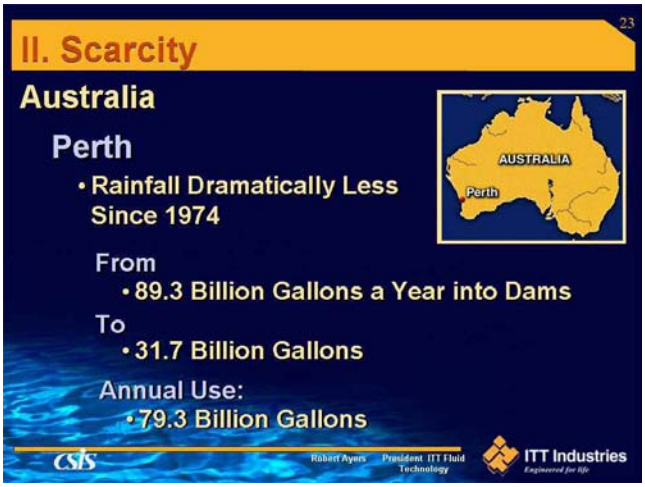
And finally, as we assess our sustainable development position, we need to look at the purity of water and its effect on health to be truly discouraged, only just one other thing - at least ninety percent of the diseases of the world are and have been water related. That means five to seven million people die every year because of contaminated water. This is a problem for both developing and developed countries. Consider, for example, the cholera epidemic in South America in the early 1990's. The result - eleven thousand dead, a million or more sick, and an economic impact beyond calculation, for the entire continent. And let's all remember it's not just the developing countries, it affects us at home, and that goes back to the crisis in Milwaukee, the cryptospuriosis contamination which had 58 deaths and $96 million of economic impact. This is not an issue of just developing countries, it is also the issue right here in our backyard.



It clearly, clearly, clearly is a global problem. India, for example, lost seventy-three million working days because of water illnesses costing the economy over $600 million. Internationally in human cost, one child dies every eight seconds from water-borne disease. Whether India or Milwaukee, the human and economic costs are simply not acceptable. I think we can all agree that sustainable development should be our guide. Indeed, I think we can and must do better. We need to reach higher with our technology and knowledge and we can hand our planet over to our offspring in a better condition then it was given to us.

Now let's take a look at the other second issue, which is the scarcity issue. The amount of fresh water available to us is not going to change. Huge engineering projects are no longer the answer to get that water to more people. The days of enormous dams are over because of the few remaining appropriate locations, environmental issues, and cost. Building extensive infrastructures of pipes, wastewater treatment plants and

pumping stations is not possible for the mega-cities across this world. These cities already have serious and expensive problems of housing, food, and jobs, as well as major problems of adequate safe water for their citizens. We need work-arounds in technology to help succeed in this challenging water century. We can't rely on pipes and pumps any more than Google can rely on the library and books. Now I'm saying that, standing up here representing the largest pump company in the world. So, it's not easy to role off of my tongue. But I truly believe that.



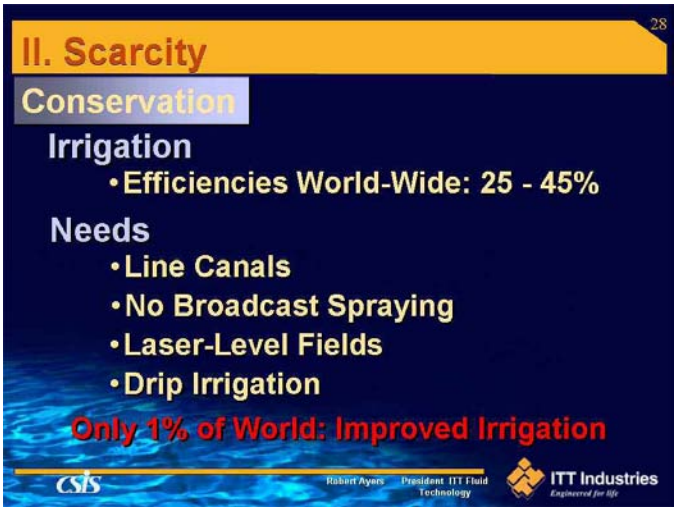
The city of Perth, Australia shows how difficult scarcity can be even for a developed country with an existing infrastructure. Perth's rainfall had dramatically lessened since 1974, when the city once had inflow into its dams of roughly eighty billion gallons a year. That flow has dropped to about 32 billion gallons, while annual usage has risen to 79 billion gallons. The situation is critical and has become a major political issue.

One side wants to commit to de-salination at $350 million, that's the capital cost, producing roughly 12 billion gallons a year, somewhere in the neighborhood of about $1.11 per 1000 liters or 264 gallons. The opposition wants a canal and pipeline from Kimberly to Perth, a distance of 2300 miles. The canal would deliver roughly 53 billion gallons at an estimated cost of $2 billion, and that's kind of like yesterday, I think there was some debate about small solutions or large infrastructure, which amortized over time, which would be the most cost-effective. And it kind-of gets, you know, the engineer in all of us or certainly in me, it gets me very interested in looking at this problem.

But I don't live in Perth, and know only what I read of the city and its water issues. So, before I become too engaged in deciding about the engineering solution that I would recommend, and offering my advice, I and you should note one other set of facts. The water used in Perth: 50% for gardens, 8% in the kitchen, and 11% for flushing toilets. Now I recently read an article where it talked about people moving to the sun belt, especially those out of New England. And I guess the people in New England, they were saying, used which is much less than the national average but typically somewhere in the neighborhood of thirty, an individual used somewhere in the neighborhood of about 30 gallons a day, which increases when they move to New Mexico or Arizona to 300 gallons a day, and why is that? Their gardens are just like they had back home.

So apparently water flows, in the case getting back to the Australian example, uphill in Western Australia just as it does in the western USA. Indeed the Australian example Association Chief, Australian Water Association Chief Chris Davis says the politicians prefer what he calls the King Hit solution. The King Hit solution is nothing but spending money to postpone the ultimate problem, instead of considering where we actually use water and waste water. What sense does it make for us to flush toilets filled with drinking quality water? What sense to spend more per gallon on

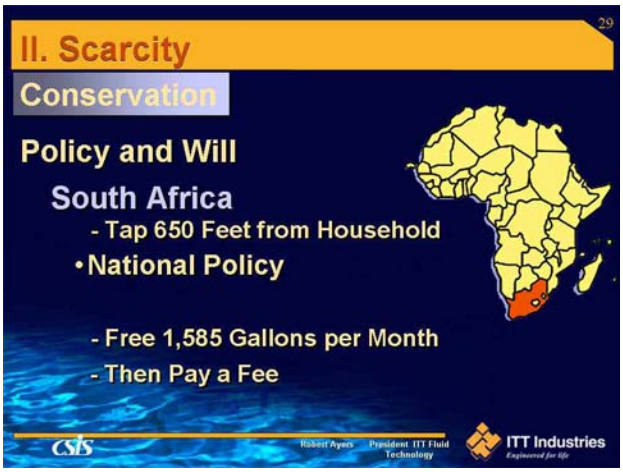
drinking water we carry around in our bottles than we do for gasoline? Couple things, I think, that help to look at solving this are conservation and reuse and desalination, coupled with many of the small-scale solutions that we talked about yesterday are the three areas I would like to propose that we focus on, or I focus on, to help resolve the issues that I mentioned.



Conservation, of course, can come in many ways and I look briefly at the greatest water waste and that is irrigation, and I'm certainly not an expert like Jim and some of the other people here, and remember that about 90% of water consumption is related in some way to food production. Typically in developing countries the efficiencies of irrigation range from 25% to 45% and even the highest success rates of efficiencies internationally are only in the 50% to 60% rate. If we line canals, stop broadcast spraying, laser level the fields, and use drip irrigations, the savings would be enormous.

Only 1% of the world's irrigated land now has any kind of improved precision irrigation. This has to change. It has to change in the American west as we look at the boom cities like Las Vegas and Phoenix where farmers still grow water-intensive crops with subsidized water, it has to change in countries where there may only be 79,000 gallons of water per capita. Areas where the shortage is so severe, the agriculture inefficiencies or efficiencies can mean the difference between life and death.

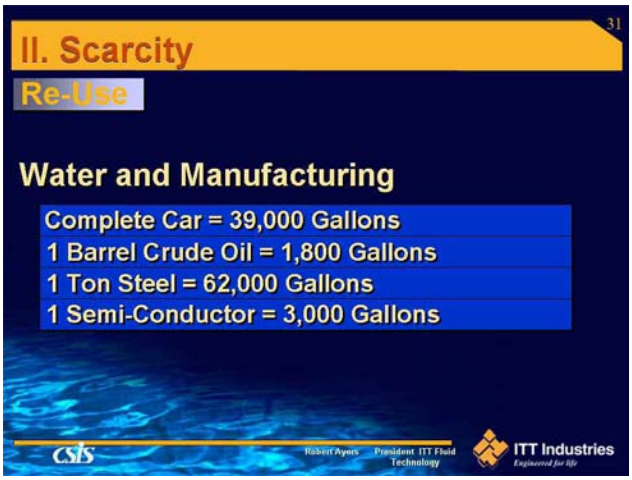
Policy and will, however, are as important as practice in addressing need and that's where the Senator addressed this morning. A major effort has been made in South Africa, for example, to address both availability and conservation via national policy. And a few years ago I sat next to Kara Azmal (?), who won the Stockholm water prize for leading this effort into South Africa. And they had made a commitment to have a tap within 650 feet of every household and to providing the first 1600 gallons per month, per family for free. After that amount is used there is a charge. An important point to observe here is that there is political will and national policy for water problems to be fully addressed. The U.S., without any national water policy, must certainly consider its priorities in this most serious times of shortages and need worldwide.



Now let me go back to the scarcity issue, and another way it's being addressed, and that is with dual piping. One piping system carries potable water at a higher price, while another carries non-potable water with clear price advantage. The non-potable water can be used for landscaping, agriculture, manufacturing, etc. In places as diverse as Bangladore, India, Singapore, Florida, California, Texas are using this dual piping now to conserve water in new residential construction.

Reuse is a major opportunity for water to be part of sustainable development in addressing scarcity. One of the fathers of this is Professor Takasia Sano, who also won the Stockholm Water Prize, from the University of California and is

considered really I guess the father of water reuse and he has shown us the way in which more and more in our future, this can become practical.



But it's sad, because if we look at manufacturing, the current picture is not encouraging. The world manufacturing systems are largely still open, meaning water is drawn in for production and then discarded at the end of the process. More often than not, we are discarding a valuable recyclable. The manufacture of a car and its four tires requires 39,000 gallons of water for production. One barrel of crude oil takes 1800 gallons, a ton of steel 62,000 gallons, and just one semiconductor 3000 gallons. Industrial recycling of water dramatically alters the intake of water and the quality of discharge. A decade ago, it was a standard procedure for water to run through a manufacturing process just once and discharge. This was a major cause of pollution and shortage. Now, more and more companies, far still too few, are looking at self-contained systems where the same water is used, cleaned, and then used again.

I would like to take a note and talk about the savings at one of the ITT plants, and that's the ITT Defense Avionics plant, which is a totally self-contained system. It reuses the water it has, rather then regularly taking in new water and discarding it, and this has saved us about 160,000 gallons of water per day in that facility.

From 1962 to 1975, Israel moved from using 5,300 galloons of water to manufacture $100 worth of goods, to using only 2000 gallons per $100 of goods. This conservation is a three-fold increase in water efficiency. This efficiency of course cuts cost while creating a better environment. This total waste water reuse has been so successful that it has become national policy in Israel.

Intel, going back to the manufacturing sector, reports the strict water management and reuse policies has enabled it to lessen its global water requirements by a third, from over 9 billion to just over 6 billion gallons annually.

I think another very interesting example and creative example, and does have a little bit in behavioral change as wel, is in Singapore, which has embraced what they call the new water technology. This technology reclaims waste water and that is, it takes sewage into the drinking water, industrial-use water by taking it through two different membrane filtration processes and then exposing it to, not natural sunlight but 254 nanometers UV, in disinfection process and Singapore's first two new water factories supply, they supply about 10 million gallons of recycled waste water each day.

Now what they are doing, one of the things they are doing in Singapore, I think is interesting because initially there was not a great social acceptance for drinking recycled waste water and so they began to take the school kids through the plant on tours, and at the end of the tour the guide would take a glass of this new water and offer it to the children and over time they are building up this cultural acceptance of

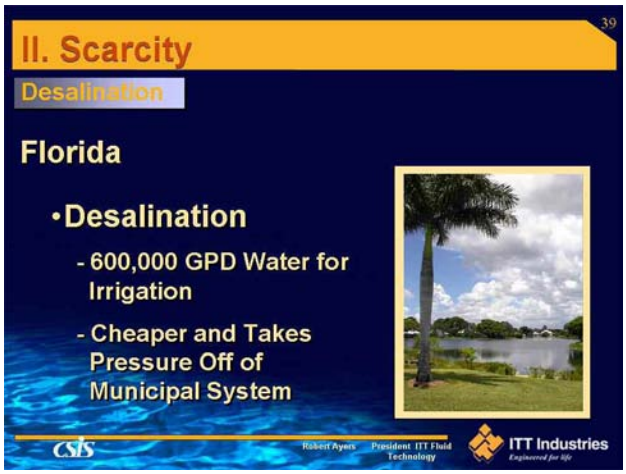
this new water which is really cleaner than the water they are recharging it with back in the aquifer.

You know, another simple promising reuse solution of water shortage clearly is water harvesting. Certainly in South and Southeast Asia, I was in Bermuda not too long ago, it's certainly prevalent there, living in South America in certain regions - and that is really catching the rainfall that may come during any particular time. And it's twenty days in monsoon season in Southeast Asia, but I also like to think of Los Angeles with its recent storms and how often have we heard in the past, if only L.A. had that water when it needed it. You know there is now interest in harvesting out there and this kind of water. Water collection and aquifer recharging are in their infancies, but it takes just a little imagination to understand the potential.

And I say this to all of you, you know, certainly, and anybody that has appreciated the wetland (?) and this appearance of wetland would concur with this, but certainly if we can pave over land, like we have, and remove the wetlands, which we have, which has resulted in increased run-off by huge amounts of our water supply, then certainly we can devise an effective means of collection and renewing our aquifers in reuse. Despite such creative approaches and success stories of reuse and recycling, it is still very much the exception rather than the rule for water. Recycling of paper and plastic are now part of our economy and culture. Can water be far behind,should it be far behind?

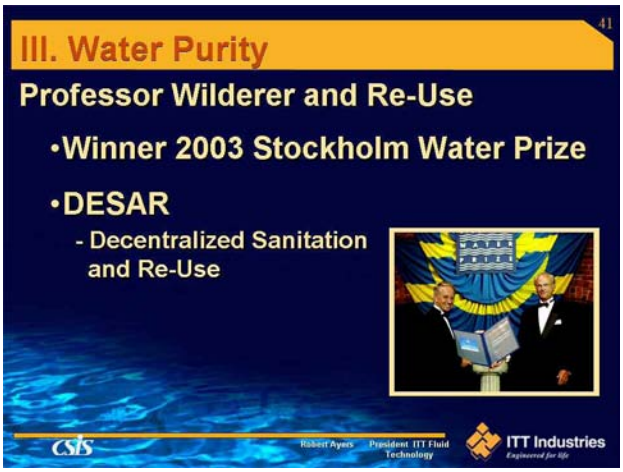
Now let's go to another area that I guess we've talked about in the past and I think is one that's quite interesting as a solution, and that's desalination, because irrigation of the land today with sea water desalinated by fusion... fusion power is ancient, it's called rain. But desalination quite frankly is an old technology with a very, very big future. Its future is big because the costs are steadily dropping due to advances. As we know, however, there is not enough rain in the right places, so we must desalinate by technology. Reverse osmosis and less energy intensive new technologies have resulted in steadily decreasing cost for desalinated water. Whether it be in California, Texas, Florida, China, The Middle East, The Caribbean, they're all participants in this desalination movement. If you look at the cost from 1991 to 2003, the savings are dramatic, from $6 per thousand gallons in Santa Barbara, to a dollar fifty in Singapore. And once again, when I hear that desalinated water, which is $3 to $4 per thousand gallons, which is tenfold municipal water out of an aquifer, what I still go back to the price of the bottled water we carry around. It is really a cheap source and a very inexpensive solution.

Now these new technologies have offset, many new technologies have offset the cost of energy and the goal here is to continue making desalination as energy-efficient as possible by continuing improvements, and I can tell you, as both the manufacturer of filtration and UV disinfection as well as pumps, we are focused heavily on making our pumps much more efficient to run these desalinated facilities. Unlike dams and larger engineering projects, desalination is responsive to issues of scale. It can effectively serve small communities as well as large cities at proportional investment rates. It is sort of pay as you go or pay as you grow. For example an ITT unit was put in place at a resort in Egypt that relied on trucked-in water. Desalination at this intensely saline Red Sea location provided 134,000 gallons of water per day of high purity drinking water, at about one-third of the alternative cost.



Another example is a golf course in Florida that treated brackish water for 600,000 gallons per day for irrigation. The system was significantly less expensive than using municipal water while at the same time taking pressure off the municipal supply. Whether resort or municipality, desalination is becoming an ever more effective work-around to meet water needs. Add to it conservation techniques in reuse recycling and we are moving in the right direction towards sustainable development.

And one more footnote here, when you think of today and I've heard all kind of statistics, but let's just take as a given that more than fifty, probably somewhat less than sixty percent of the world's population lives within 150 kilometers, a 150 miles of a coast. And you think of the population growth that we expect over the next 20 to 30 years, and by all futurist predictions that I have looked at, the amount of migration towards the coastal areas will increase that number from -- if it's fifty, to sixty, or if it's fifty-five to sixty-five, but somewhere in that neighborhood, you are looking at today's, in not too long of a time, today's population living within a hundred miles of the coastal region. And you think of the tremendous infrastructural changes that must take place in these regions and the resultant technology changes that must follow, or must lead that change, really, the infrastructure change and that's why we in our company are so bullish on desalination as being one of the technology leaders to make that happen.



Now I would like to turn to water sanitation and really water purity, it's clearly a matter of life and death, you know we've all talked about this, one child dies every eight seconds worldwide and that certainly is more than enough motivation to break current patterns and find new work-arounds. It is hard for us to realize that money is not the answer, that traditional engineering is not the answer, which was so eloquently stated yesterday, but that, however, is the truth. If new pipelines and mega-delivery and processing plants are not the answer, what to do, where to start?

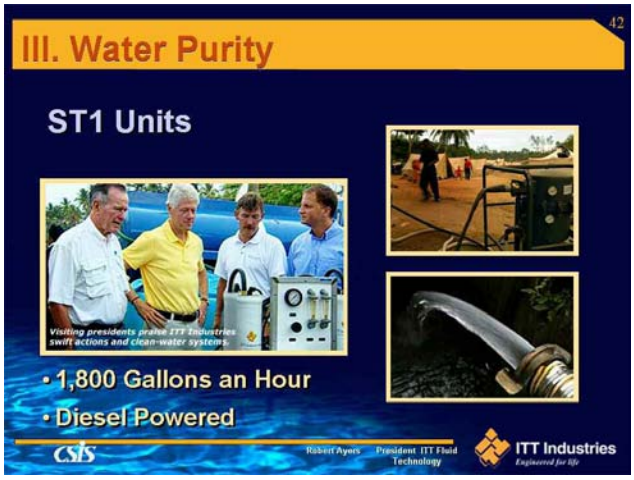
One way to look at that is the point-of-use for water rather than looking at central locations to process and pump water. Point-of-use is an important concept in finding solutions to our current untenable positions, and I'd like to - another example of a Stockholm Water Prize winner who's given a really, I think an important perspective on sanitation and reuse is Professor Peter Willower (?) who won several years ago from the University of Munich. He has really been a strong proponent of reuse of water and finding the work-arounds for pipe pump and treatment systems, and he's been very influential on me because I think some of his ideas are extremely creative and quite frankly would obsolete some of my products. But I believe he's in the right direction and we want to be working with him as the solution to the future.

He has really emphasized the importance of decentralized small-scale treatment in reuse of water. He developed the important concept in reality of decentralized sanitation in reuse. He emphasizes that the traditional approaches of the West, the water availability and purity, cannot be applied globally, and he has led us in many directions to look at alternative solutions.

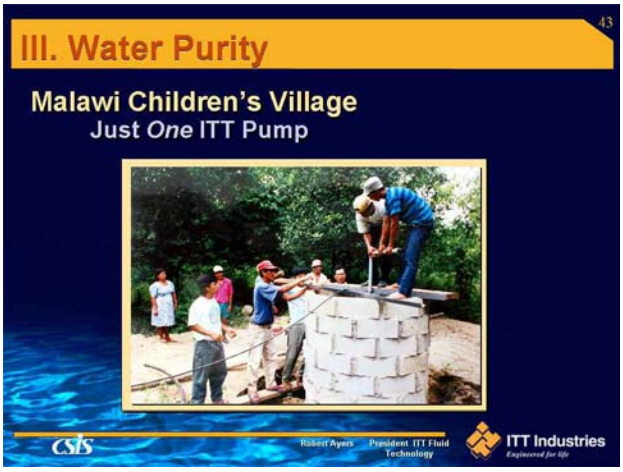
Now this is somewhat of a frivolous example, but it is one that he worked on that shows what can be done and that's -- Airbus asked Peter some time ago if he could design a purification system that would allow passengers to take a shower while flying between continents. I don't know who would want to do that, but maybe somebody has an important meeting when they arrive. Airbus said they could only use three gallons per passenger; he designed it for two and a half gallons, and you can shower as long as you like. But he did say there is a flush system so that the next passenger that comes in will feel better even

though the water is quite clean, there is a flush system to the unit. But the idea is, you know, these new technologies in household situations, applying them to household situations, you know really leads us to believe there will definitely be dramatic changes in opportunities and what we consider normal and standard procedures of living.

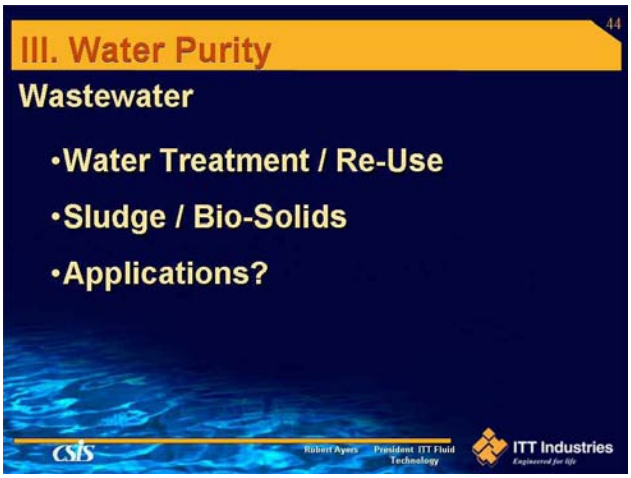
At ITT we're particularly excited, for example, by our POU system, one that is originally created for the British Army, it's called the ST1. Portable ST1 water treatment units are capable of treating more than 1800 gallons of water every hour, the units are diesel-powered enabling them to operate in many areas of the world without electricity and they are simple to operate and maintain.



Now these units were developed for the British Military, you know I think you can throw them out of a helicopter from 100 feet and they'll be fine, so there's got to be a lot of design changes, but I will tell you when the Tsunami hit over the holidays, our team went into action, and we contributed roughly two million dollars' worth of equipment that brought 300,000 people water in less than three weeks, and over 500,000 by the end of January through this equipment, and it wasn't equipment that we had on hand. This was equipment that we had to manufacture, but our people worked round the clock and we are very proud of that success. But we also have found out of this, and learned from that, a real economic possibility of applying this technology maybe in a less robust scale as a solution to the problems. These pumps are portable, they are really not inexpensive today, but we believe we can approach that by manufacturing them in different locations. But the most important thing is they really mean the difference between life and death and certainly did in the Tsunami region. The issue here is that there is no pipes, there is no infrastructure, just water where and when you need it.



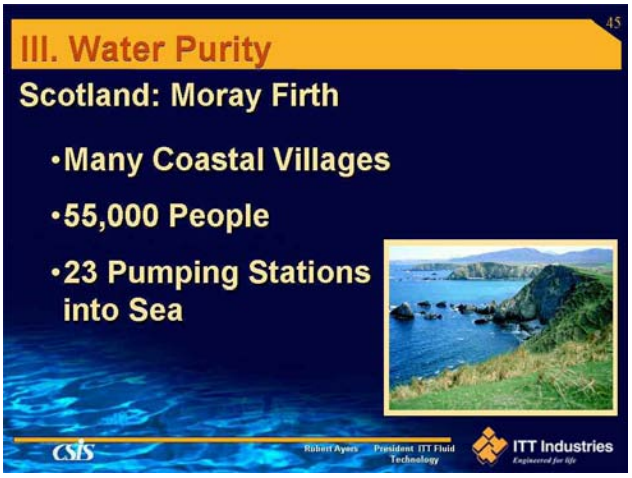
Another POU example, and this involves pumps, that we are particularly proud of, is one, is when we gave one pump to the Malawi (?) children's village in Eastern Africa. This village for orphans had no dependable source of clean water; one pump made that possible. It became the difference between life and death for several hundred orphans. But probably more importantly, it also became a behavioral changer. It was a model for nearby villages and an economic incentive. Freedom from the labor of finding water and from the sickness from dirty water is the means to a whole new quality of life both for individuals and the prosperity of their communities.



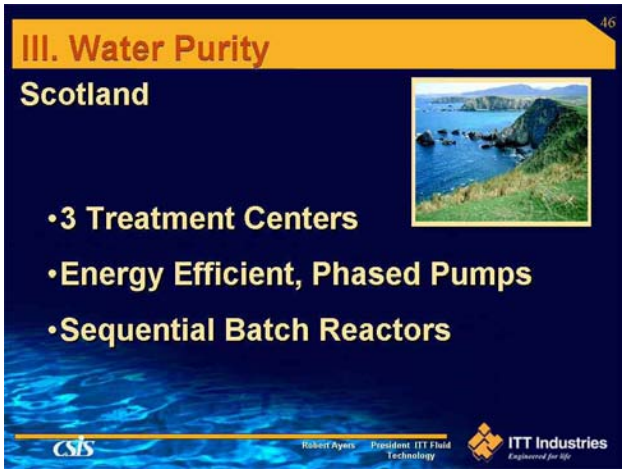
Now, unfortunately no discussion of clean, safe water can ignore the problems of human waste. There are problems of scale, processing options, and public understanding of treating waste water and in dealing with the sludge or the bio-solids that remained after the treatment. Remember water in the sewage treatment process, water is the product, but the byproduct is sludge. Enlarged processing plants, quite frankly as we have said

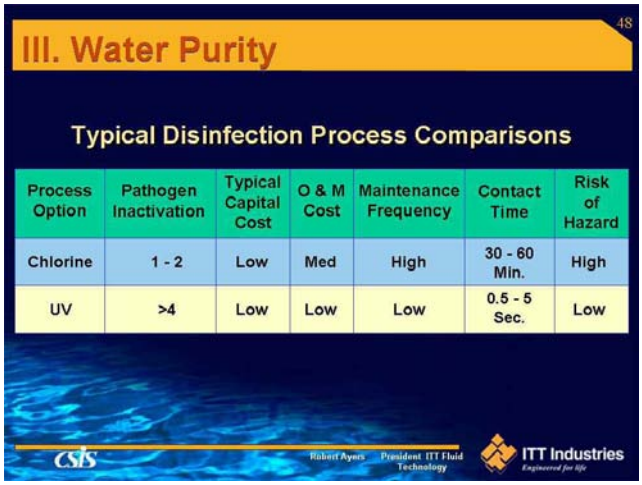
several times, are not possible for the rural villages. They are not feasible for the many cities which have to have every street dug up and repaved to install prohibitively expensive systems. When you put in a sewerage treatment plant the initial cost of that plant, the capital cost, eighty percent is the sewerage pipes. So when you go into cities like Sao Paulo, Brazil or Caracas, Venezuela and dig up the cities, they do become prohibitively expensive, extremely expensive for those developing countries anyhow.

What's the result? The result's what I told you about Shangdu. Way too much sewerage goes into rivers and seas around the world. You know Shanghai today only has 20% of their waste water with secondary treatment. It just has primary treatment and is flushed to the sea, only 20% - which is their model city. Now they realize that, they are working on that, but that's where they stood as of last year. So we have to refine, I think redefine our view of waste treatment, you know it must be smaller, it must be more local, and it must be manageable in technology and execution. In other words, what you are talking about here, not only a point of use or point of entry for water, but point of use or point of entry for waste water treatment plants, small compact treatment plants.



The European Union, along with the United States, are really providing leadership in this area. There is a requirement in the European Union, I think they have all populations over two thousand people, that have a waste treatment, waste water treatment process in effect. Good example here, some Scottish villages in the coastal area of towns of roughly, together about 55,000 people, have added three new waste water treatment works to treat sewerage from twenty-three pump stations serving these costal communities. Now, these communities had been dumping directly into the sea, this is as recent as two years ago, but by using the energy efficient phase pumps and sequential batch reactors, the water is treated and the sludge is dried to kill all bacteria. This resolved material is sold as fertilizer and one processing plant turns about seventeen thousand gallons of sludge cake into about five tons of agricultural fertilizer everyday. It is entirely compliant with the UK agricultural code of practice, although I know there is still a lot of debate, and it will continue to go on, about the heavy metals or minerals in sludge and it's used for agriculture areas' fertilization, but that's one that we will continue to look at in ITT in helping to find a solution for.





Process Option	Pathogen Inactivation	Typical Capital Cost	O & M Cost	Maintenance Frequency	Contact Time	Risk of Hazard
Chlorine	1 - 2	Low	Med	High	30 - 60 Min.	High
UV	>4	Low	Low	Low	0.5 - 5 Sec.	Low

So what we're saying is that the cities of the world, especially those in the developing part of the world that lack waste water treatment will have to consider a series of localized treatment areas within the cities rather than one enormous facility for the entire municipality, and clearly big is definitely not better in waste water treatment.

I would like to step to another part of treatment, and that's whether you're treating waste water or water -- a very promising means of disinfecting it is UV and it has worked, it's a good work-around from the tradition of chlorine. You recall, I mentioned the new water purification of water by membrane filters in UV disinfection?

Chlorine is relatively expensive, it is certainly dangerous to transport and to handle, and is vulnerable to accidents and terrorists. Ultraviolet irradiation is low in cost, much lower in operation and maintenance, and most importantly in hazard.

UV and other disinfecting alternatives are growing at greater than ten percent per annum. If we look at this chart comparing chlorine to UV treatment, we quickly realize that UV is a viable option across the board, whether considering cost, or pathogen inactivation. There are, you see, many options to safe clean water, that are not the king hits that the Australians spoke of, but many implementations of new technologies and improvements of old practices.

Indeed, whether we talk of sustainable development and ensuring the availability of adequate amounts of water, or providing clean water and managing sludge, there are no king hits. There are many small technology advances, many new understandings, understandings of the challenge and needs of our water century. But there is no amazing equation like that which makes Google work. There is no Fred Smith of water to turn an industry on its head.

But there are many options, many options like the cell phone transforming China, Russia and Japan. By that I mean there are many small technologies, often created for other reasons, which can transform water availability and quality. I have suggested how some of these work-arounds may help us move beyond the capital intensive traditional infrastructure approaches, approaches which demand a work-around just like Google jumping past the library model or again the cell phone -- past the stringing of lines across the country. We certainly need more work-arounds, more innovations to get where we are going to be in this century of water. That will happen only when water is fully understood by the public as a critical issue of our time. This will not happen when the U.S., for example, has no national water policy. When our own water usage and technology are a hodgepodge of problems, applications, waste and sometime solutions. Our government must move water to a top priority, and I certainly believe no less important than energy. The Congress must examine current practices and critical needs at home, and then look for ways to help our neighbors around the globe. There must be, there must be public and private cooporation to continue to investigate these challenges of water.

The people in this room reflect this opportunity, but this is far from enough in the face of such a severe challenge. More industries and more NGOs must work together on these critical issues. And there must be ways for government to spur water research into these new technologies. The Russian launching of the Sputnik satellite resulted in an education initiative that created a generation of scientists and engineers. That generation of scientists did everything from getting us to the moon to creating the internet. We cannot wait for a water disaster, similar to the Sputnik (?), to cause our government to move to action sponsoring research via government grants and tax incentives. The disaster is occurring now, as a child dies every eight seconds. Now is the time to act. Remember the old saying, you don't drown by falling in water, you drown by staying there.

We cannot afford to stay where we are; you may think, as you look around this room, there are just not enough people involved, enough people who understand, to make a difference. When I feel that kind of frustration personally, about the small number of people concerned about this issue -- and I speak a great deal on this issue for our company -- I often think of Margaret Mead who said, never doubt that a handful of committed people can change the world. Indeed! It is the only thing that ever has. Thank you very much.

Erik Peterson: Thank you very much Bob, you covered so many important points here, I know that this will bring a number of interesting perspectives to the surface. Bob has kindly agreed to take questions and comments. Let's open up to the floor please. Gordon, will you begin?

<Question> Thank you, very interesting presentation. My name is Gordon Binger with Aqua International Partners. One comment and then a question. I think it's absolutely critical that senior

executives from U.S. companies make their voices heard directly here in Washington. It is not sufficient to rely on your Washington offices, so I would encourage you to keep talking and talk to members of Congress, the administration and so forth. The question I have is with respect to reuse in manufacturing. How do you spread the word? What's the way to get the word out that more the close-loop systems in recycling, reuse has to occur, particularly regarding the cost of retrofitting existing plants and so forth, I'm sure that's a big hurdle that you've got to overcome, so any thoughts about that?

<Bob Ayers> Well, within ITT, I mean our best example, especially to the manufacturing industry, is simply taking case studies of actual savings and actual proof as to what has been accomplished. And I think from an economic perspective, there is nothing better than being able to call up a supporter of the water recycling benefits, someone who has stepped forward and done it for another factory or another manufacturing facility to really get on board. So for us more than anything else it's trying to get people involved and acting as referrals.

Erik Peterson: Other questions, please. Tom.

Question: Tom Hinkebein, from Sandia Labs. I wanted to, I was reflecting, as you were talking, about the difference between oil and water, and the fact that there is a global market for oil and a well-established value that, you know, comes out of every barrel of oil that we look at. Water, on the other hand, is very local in its use, you know we don't have the kind of national value, but how far would we go if we develop some kind of value proposition for water? You know, that would include all of the various aspects of quantity, quality, recycling, the quality of the recycled, and so forth. How far would that go towards addressing the policy needs of the country?

Bob Ayers:I'm not sure that I can answer that, at this time. What I would say is, and you heard some of the panelists speak to this yesterday, first of all, I spent the first twenty years of my career in the oil business, and the last eighteen or so in the water business. It's kind of interesting, at least it's nice to be in two exciting areas. I think that there are a lot of issues. First of all, people around the world, you and I, see water as a basic human need and consequently it becomes a basic human right. What we don't understand is that the infrastructure to get that clean and pure water to you, costs money.

And I think that what you'll find is, you know I have long been a supporter of what you would call fair water pricing, and fair water pricing would result directly in the most -- if it was truly fair water pricing -- it should result in the outcome of the most economical means of using water, whether it be reuse and recycling or de-sal or whatever method available. It is ironic in the world, especially the developing parts of the world, that truly the poor pay the highest price for water versus many industries or many of the wealthy, and I remember the way the origin of Carrer Ismal (?), who won the Stockholm Water Prize, and I sat next to him at dinner, was telling me that back in the early nineties I guess, or late, in the eighties, in the eighties, don't hold me to the time frame, but many of the blacks including Nelson Mandela used to have to walk approximately 2 kilometers, every day to pick up water and as they did, they would pass the gardens that had water flowing of the 'effluent' society. And that is one of the issues that really spurred this will and policy in South Africa. So I go back to, I think, a very basic thing is, number one - you have to have fair water pricing. I think in a lot of areas, I'm often asked about your investment, will ITT move into these areas, I mean there is two other givens as far as developing regions and that has to be some kind of governance, some kind of rule of law, would have to apply, but really fair water pricing I think more or less answers the question, from my perspective.

Question: Joe Cotruvo, from Washington here. First of all, I thought it was an excellent presentation, really covered a tremendous amount of territory and raised a number of real important issues. A couple of comments on value of water which is a very important issue, there actually is a pretty strong advocate of that, the National Water Research Institute is very aggressive in trying to raise consciousness as to what water is really worth. It's worth more than two dollars a thousand gallons, you know so there is a bigger picture there. But a comment also, and that is something that speaks very strongly for your thinking about decentralized processing and point-of-use water treatment and so forth, and that is the distribution process itself. The water that goes into the pipe doesn't come out the same two miles later or ten miles later. And there's biological growth, there's extraction of metals, there's leakage, there's all kinds of problems. And so I think, which really hasn't been discussed very much in the last two days, and that is the concept of distribution, of the quality of water, its maintaining that quality during distribution and/or reprocessing that water after it's been distributed, to upgrade it to where you want it to be, so just a thought.

Bob Ayers: No, you are absolutely correct. In fact, even if you go through our processes of filtration and UV disinfection, when you have absolutely clean pure water at that point, once it goes

through the pipes, you still have to dose it with some chlorine to kill whatever bacteria is there, and it still have the leaching of other contaminants into that. You are absolutely right, Joe, but one other thing I would ask everybody to think about, and I think we use it, the two congruously, there's a little bit of difference in solutions and that is, instead of just point-of-use, think of point-of-entry for other type of things, for instead of one household for a village with much less piping because it can become much more economical in a sense, in the way the technology is being driven today. So you would still have some piping rather than just your household piping. But it wouldn't be miles from your municipal plant.

Erik Peterson: Jim.

Question: Yes, I applaud your presentation and I found it quite interesting and basically right-on in terms of the water situation throughout the world. Three quick points, I don't count very well but I'll make them quick. The first is, I think for everybody here there is a very good FAO document, I can't remember the number right now but it's in the 20 series.

Erik Peterson: Twenty-seven.

Question: On charging for water and that talks about the value of water in there and how people use water based on the way it's charged for. The other thing in talking about your waste water issue, and it's been a long going conversation, at least in California among people that understand water, that there's not only a cost or a charge for the water coming in but what's the cost of the waste water. In another words, what should we pay for that water if we return it in less than potable instances, and then I guess the last comment may be to add to what you talked about in terms of point source treatment of water, two quick points. The Air Force Academy has had a great water system that I know is well over 40 years old, because they had signs everywhere with non-potable water. My father had a great water system that he personally installed on his house in 1977. So we're talking about technology that's been available for a long period of time. And then in my own personal applications we do a lot of waste water treatment where we take the water right from the septic tank, run it through a digester and then use it for irrigation. That can either be on the lawn in the front of the house or for a small community it could be a green area or a park. So those kind of applications are there, and then in terms of your Florida application, if we take and couple that with a very efficient irrigation system where we cut the evaporation in the drainage dump, particularly in Florida where we have high water tables, and deep percolation is an issue, the cost-of-entry for your equipment, you know on the price and elasticity associated with that, may very well increase the number of golf courses that could afford your system.

Question: Thank you.

Bob Ayers: Good points.

Question: Thank you.

<<Jerry Gallaway>> I'm Jerry Gallaway with the University of Maryland Water Policy Collaborative. I've got a comment and a question for you. The comment is the American Water Resources Association just finished its second national water policy dialogue, and you would be happy to note that he said about national policy just what you said, and are preparing a report to be released here shortly, which would back up what you've said. The question is, it appears to me that we are dealing with today's problem and maybe tomorrow's problem, but not the day after, when we talk about the water purification and looking for the future, it seems to me we're neglecting the problems that we can now see over the horizon. And what I mean by that is the chemical soups that are being created. The issue of chlorine and what can come out of use of chlorine. The problems we see around the industrialized Great Lakes, we are now facing treating all sorts of products, chemicals, things that come out of the pharmaceutical industry, that we are exporting to other nations, not for them to treat, but for them to use; how are we preparing, as we move forward, to deal with problems we haven't even dealt with, and how are we helping foreign countries deal with these issues so that when we learn, they're ready to learn and proceed at the same time.

Bob Ayers: It's another great question, I don't have an answer for it. I totally agree with you, I'm right in line lock-step with you. I know in our business, I always ask our leaders to look out where they feel they should move the business in a certain amount of time, and then tell me what that looks like, and then look back to where you are, and how do you pull forward? And rather than trying to look where you are and just roll forward, and that's, I think that's what we are doing. I think that whether the visionaries would create such a picture that's just so monumental that it would frighten the people today, as to what they have to invest and what they have to do. I know that in certain places I've talked and people say, yes we've heard these things twenty years ago, thirty years ago but look, everything is fine. I think, I truly do

believe that water is the white gold of the twenty-first century. I truly do believe, when I say that the issues are just overwhelming, extremely critical, I think there will be wars in this century. Hopefully not on this continent, but throughout the world as a result of this. There are clearly a lot of meetings, we talked about the Stockholm Water Symposium which is a huge international gathering, that's why I herald Peter and Eric for getting this started here. We just need to talk and create more awareness just like yourself and what's going on, I mean just the more awareness that we can create as to the immensity of that problem in the future, maybe people would be willing to step up. And I think Senator Dominici's bill, if it goes through, and really investigating more in the technology means to solve these issues will also go a long way. Europe does much more research, much more government-sponsored research than we do in the U.S. to solve the water issues.

Erik Peterson: Maybe two other questions?

Bob Ayers: Sure, sure.

Bob Ayers: First here, please.

Question: Jeff Albert from the Triple A S (?), thanks so much for the really stimulating talk. I asked this question yesterday, Tom forgive me I am going to ask it a little bit more forcefully today, and what inspires this question is your mentioning the Singapore example, which I really thank you for because -- so, secondary treated sewage has a TDS, correct me here anyone, I'm sure there are plenty of people who could correct me here, on the order of several hundred parts per million salinity, and sea water is what, in the order of thirty-five parts per thousand? Is that about right? I guess it's going to vary, depending on what ocean basin you're in but, I guess, considering the fact that we do have again a major social acceptance question, just from an engineering standpoint shame on us for not, for building any desalination facility, sea water desalination facility, before we install a membrane desalination facility at the outlet of every sewage treatment facility, it's just cheaper. It's just simpler to do. Again we have membrane experts here so please correct me if I'm wrong, but it seems to me what we really ought to be focusing on doing is getting the social acceptance, is convincing the public that this is safe, which we all know it is, and then we have a just a much cheaper alternative. So I'd appreciate, you know, your comments on it.

Bob Ayers: Well, first of all, I think you're absolutely right as far as the most economical means of attacking the problem. I can't get into the social issue with the behavioral change, I'm not a behaviorist, that's not my area of expertise. I'd be glad to listen. I think, I would tell you I was intrigued yesterday because I do think that's an area that our business has not paid maybe as much attention to as we should. We have been focused more on the technology change to bring what we now know is socially acceptable to the world. Maybe we should look at more behavioral characteristics, more the voice of the customer so to speak and how we get there, it's interesting. I've got to toss that idea around a little bit. I think in China you will see again the acceptance of treated waste water as potable water. I certainly think in Israel there is some cases, certainly they use it for all their irrigation today. So I think it will be, it's going to be forced in many areas of world to be more acceptable, but I just, it's a big issue in the United States, certainly, how we get there. I agree with you, you know, outside, once again, fair water pricing, pricing the water to encourage the behavior.

Eric Peterson: And last question please.

Question: You've certainly given us a lot to think about here today. I am sorry, my name is Vince (?), I'm with Sandia National Labs. But what I want to ask you about a little bit is your ideas about sustainability, and certainly I agree that's the direction that we have to be moving and thinking in terms of sustainability, but how we get there, I guess is the question I have. It seemed as though you may have been suggesting that the idea of sustainability met some sense of reaching some level of equilibrium, and I am wondering if maybe not the way we should be looking at it is more of a sense of managing change. That is, all of our systems are in a constant state of change and maybe the parallel I'm thinking about is in terms of energy use. And if we look back over the last hundreds of years, you might think about all the changes that have occurred in our energy supply starting back in many, many hundreds of years ago, wood was the primary source of energy and then that moved to coal, which then changed to oil and which is now changing more to natural gas and other kinds of materials. Eventually may become a hydrogen economy. And whether maybe we should be thinking about sustainability in our water sense in the same way, that over time we've moved from direct potable water sources to more treated water sources. Maybe de-sal is the next sense of water supply that we should be looking at, and it's this linkage between technology and water and whether really what we should be looking for is managing change and as the centerpiece of that, the technology that allows us to make those changes.

Bob Ayers: In all fairness, remember I did mention whiskey as an alternative.

Question: (laugh) I'm sorry, I left that one out.

Bob Ayers: I'm sorry if you gather that from my presentation, because what I'm really advocating here, more than anything else, is that we look at technology as the solution, okay. Not that we find a balance -- clearly, it's sustainable, I mean we have to make sure that we replace what we use to make it a better future for our children. I mean that's, that's the whole idea of sustainability, but that doesn't mean that we're in an equilibrium. To me that means that we utilize our advances in innovation in technology to even more than replace, to give them a greater abundance of sources of water than what we have today. And I mentioned two; one is desalination, one is water reuse, and there also is a plethora of others. I just wanted to take two that I am fairly close to. I know that I presented at the, once again in Sweden at the water festival, and I was challenged by the Nobel, or the laureate, not the Nobel Laureate but the water laureate, because he really thinks that the replacement of wetlands will go a long way in creating and solving, resolving the water shortages in this country. And, I wouldn't argue with him there. I just would rather bet on technology. I think they're both very viable solutions as well as others, but to me, what I would advocate is that we invest more, we work more with government, we work more with NGOs in finding alternatives, but technology to me is the base of resolving that issue.

Erik Peterson: Bob, thank you so very much for your comments. Very, very grateful to have you here. Ladies and gentlemen, let's take a short break.