THE CONSULTANT

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Chairman's Corner — *John Dunn*

Practitioners of aux cuisine, professional or amateur, competition or hobbyist, have nothing to fear from this quarter. The kitchen stove and I don't much like each other.

In spite of that, my wife once asked me to make some French toast. Having no idea how, I decided to seek a consultant, a widely respected authority on the subject . I took out a copy of The Joy of Cooking, by Irma S. Rombauer and Marion Rombauer Becker, © 1964.

It was like running into a verbal bridge abutment. I couldn't understand anything they wrote!

I have no doubt that the authors knew about making French toast and that they'd written words which they thought would effectively convey the necessary steps to the reader, but they didn't do it in any way that this reader could comprehend.

I found my rescue in The Wise Encyclopedia of Cookery by Wm. H. Wise & Co., Inc., © 1971, in which it said you make your batter by adding as much volume of milk as the volume of each egg. So how much was that?

Out came the measuring cup and thus began the engineering method.

It turned out that the volume of a hens' egg is about fifty milliliters (mL). So for each egg, I added a measured fifty mL of milk and the result was delicious. That was years ago, but today, I still make French toast by first measuring out milk in multiples of 50 mL.

Now this may seem kinda silly to those of you who know which end of a spatula does what, but to me, it was a challenge. However, it was also a great frustration with the two authors, call them consultants, of the first book.

I feely admit that there is much in the world of which I am ignorant and that I am surely as capable of error and misunderstanding as any other human being. However, I will not admit to being stupid!

It took Mr. Wise (no pun intended) to put me wise. He was the consultant with whose work I was satisfied. He was the one effective consultant who expressed himself in a way that I could actually understand.

Ah, the importance of good communications skills.

Meetings

February 2006

"Anonymous Night" questions discussed:
 # How to keep up with changing technology.
 # How to protect against virus and other computer attacks.
 # How to turn down or get out of an assignment that appears or turns out to be a loser.
 # What to do about an opportunity to consult outside of our area of expertise.
 # Should you be optimistic when things are going well?
 # Best way to determine whether prospective client is a flake.
 # Cooperation vs. competition with other consultants.

March 2006

7:00 PM, Wednesday, March 1, the first Wednesday of the month. Great Room, Briarcliffe College, 1055 Stewart Avenue, Bethpage, NY

"Hurricane Suppression by Forced Upwelling" by Richard LaRosa. Admission is free (no charge). No pre-registration is required. For further information, contact the coordinator, John Dunn, by e-mail: ambertec@ieee.org, or by telephone: (516)378-2149.

Hurricane strength can be reduced by a slight cooling of the surface of the Caribbean Sea and the Gulf of Mexico. The Deep Western Boundary Current brings 4.5 °C water from the Arctic to the tropical Atlantic Ocean just outside the Antilles Island chain. This cold water is found at a depth of 1400 meters. It can be pumped to the surface and mixed with the warm surface currents flowing through the passages between the Antilles Islands, most of which are too shallow to pass the deeper cold water.

The talk will explain how the pumping power can be derived from the thermal energy stored in the ocean, how the cold water will be mixed with the warm current, and how the floating pumping stations will be configured. The number of pumping stations and their placement will be estimated.

Expected environmental benefits are: reduction of hurricane intensity, slower melting of Arctic ice sheets, reduced sea level rise, and upwelling of nutrients to increase the production of needed phytoplankton.

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Deadlines: Flexible
Articles for publication in ***THE CONSULTANT:*** Send them in. We need them.

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The HurriTame System

Rob Berlijn, General Manager of HydroConsult BV, The Netherlands, sent me a copy of their proposal to test a hurricane extinguishing system that is capable of being implemented much more quickly and inexpensively than the suppression system that I am working on. The HurriTame System involves pumping cold water into a vessel that carries it to the base of a spawning hurricane and sprays the cold water into the cylinder of rising, humid air. I have excerpted portions of his work to form the following article. I can send the complete document to anyone who requests it. - Editor.

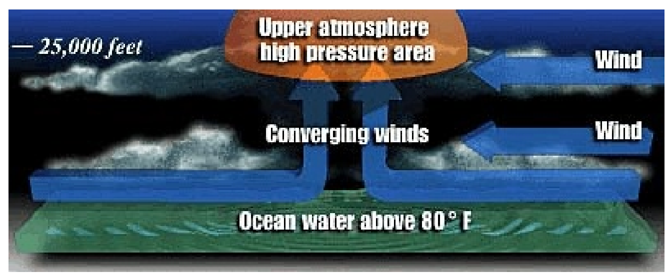
The HurriTame System *— Rob Berlijn, HydroConsult BV, The Netherlands*

www.hydroconsult.nl

This document describes a possible method to combat hurricanes, based on the implementation of physically available resources at the place where hurricanes spawn, combined with advanced, proven offshore techniques.

Hurricane Formation

A hurricane or tropical cyclone is one of the means of maintaining the orderliness of circulation in lower latitudes, serving as a kind of escape valve for the transport of accumulated heat and momentum from warm tropics to the colder middle and higher latitudes.
Hurricanes are formed under special, critical circumstances:
At parts of the ocean where the surface temperatures exceed thresholds of
26˚-27˚ C, and
The atmosphere of the general environment is without temperature inversions
(Temperature increasing upwards), or
Very dry layers of air, which debilitate cloud towers trying to grow to great heights



In other words, the birth of a hurricane requires at least three conditions:

First, the ocean waters must be warm enough at the surface to put enough heat and moisture into the overlying atmosphere to provide the potential fuel for the thermodynamic engine that a hurricane becomes.

Second, atmospheric moisture from sea water evaporation must combine with that heat and energy to form the powerful engine needed to propel a hurricane. Third, a wind pattern must be near the ocean surface to spirals air inward. Bands of thunderstorms form, allowing the air to warm further and rise higher into the atmosphere. If the winds at these higher levels are relatively light, this structure can remain intact and grow stronger: the beginnings of a hurricane!

After and during the initial formation, an Atlantic hurricane will travel in a Westerly to Northwesterly direction, thereby approaching the Caribbean and South-Easterly states of the United States of America.

Physical Characteristics of Hurricanes

The most prominent feature of hurricanes is that they look like narrow funnels. The periphery can grow to a radius of 1000 km but everything of importance occurs within a

radius of 100 km.
In this inner circle, winds which only rarely exceed hurricane force rise with increasing steepness of slope to their maximum. The highest speeds are confined to a ring of 1-2 km width around the edge of the eye of the hurricane and are, on the average, about 30 km distant from the very center, with a variability of 10-80 km.
Most of the inward temperature rises associated with rising cloud masses occur in this interval, together with rapid barometric pressure drops. Nearly all inflowing air travels upward in the funnel, which may be vertical up to 5-10 km height and from there curves outward.
The heat is originating from the surface of the ocean at the location of the hurricane and flows from outside to the centre of the funnel. The more heat is available, the stronger the flow and thus the more forceful the process which takes place. Cooling down this heat flow will slow down this process and eventually halt it. A hurricane will not form any closer than 500 kilometers to the equator. The Coriolis Force is needed to create the spin in the hurricane and it becomes too weak near the equator. The Coriolis Force is a force that deflects moving objects to one side because of the Earth's rotation. The object is still going straight but the Earth moves underneath it, making it look like it is moving to one side. In the Northern Hemisphere, the Coriolis Force deflects objects to the right.

Principles of HurriTame

In order to explain the principles of HurriTame, it is necessary that the concepts of heat capacity, latent/sensible heat and the vertical structure of the ocean are described briefly:

Heat Capacity
As explained, the basic condition for a hurricane to spawn and develop is a sea surface temperature of at least 26º C. HURRITAME is based on a certain interaction between the ocean and the atmosphere; in order to understand these interactions between oceans and the atmosphere, the concept of temperature has to be defined.
Temperature is the measure of kinetic energy of motion of the molecules that make up a substance. As heat is added to water, it is either taken up as sensible heat or latent heat. Sensible heat can be measured by thermometers and is the result of the increased vibrations of the molecules, compared to latent heat which disappears and goes into the breaking up of the bonds of the water molecules.
Ocean temperature in general varies less than that of landmasses, because when heat is absorbed by the oceans, most of it goes into breaking the internal structure of water molecules (latent heat). In other words, water has a high heat capacity *, higher than land and much higher than air.
The HurriTame system makes use of this phenomenon.

* Due to this high heat capacity, the oceans prevent the world's temperature from having wide variations, whereas for example the moon, without any water, has variations of about + 135º at noon to about -155º C at night.

Vertical Structure of the Oceans

Due to the high heat capacity of (sea) water, most of the heat, generated by solar energy reaching the earth, will remain in the top layers of the water column in the ocean. This is also caused by the fact that vertical water motions, which can be induced by density instabilities in the water column, are inhibited by stable density structures in deeper waters.
In the open ocean, the water column can be divided into three depth zones:

Surface Zone of uniformly warm water. Due to sea water's transparency property which allows for the transmission of light on an average depth of 60 m in the ocean, the photic layer, the sunlight penetrating through the water is converted to heat energy, more at the surface progressing down. This surface zone is capable of holding large amounts of heat. From observations, it appears that in this surface layer of approximately 60 m, temperature variations are only in the order of 3º-5ºC. Temperatures at equatorial latitudes are between 25º and 29ºC.

Thermocline. The middle layer, the zone in which temperature changes rapidly with depth, is called the thermocline. This zone is located between 100m and 1000 m deep in the ocean.
Thermoclines are not identical in form for all areas or latitudes. The principal thermoclines in the oceans are either seasonal, due to heating of surface waters in the summer, or permanent. The thermocline is proportional to the available sunlight and henceforth primarily a mid- and low latitude phenomenon. Surveys have shown that thermoclines in equatorial waters generally show temperature variations of some twenty degrees C over a depth span of 150-500 meters. However, the major changes occur in the top layer, just below the Surface Zone.

Deep Zone. In this zone, the water is very cold, varying in temperature from -1ºC to +3ºC.

Generally speaking, in Equatorial Waters, cold water (< 6ºC) can be found at water depths of 400-600 m.

The Hurritame Concept

As explained, the birth of a hurricane starts with higher than normal (26º-27ºC) water temperatures, whereby excessive heat escapes upwards, slowly transforming into a full-blown hurricane. It is apparent that, in order to stop this process, the hot air is to be cooled down, preferably at an early stage of the process. The problem is to find the necessary cooling material to make this possible.

The HurriTame system makes use of the abundantly available "cooling material", cold seawater at the aforementioned water depths of > 400m plus the fact that, due to its enormous heat capacity of water versus air, a little water can cool off a lot of hot air. (Fire fighters also make use of this principle: it is quite amazing what impact a relatively small amount of water can have on ultra-hot air, flames).

The HurriTame system is designed to work as follows:
A suitable platform, on stand-by in the area, moves to the location where a hurricane is about to spawn. This area can be determined, based on the aforementioned available remote sensing / GIS techniques.
Cooling water to be pumped from the lower- or sub-thermocline water depth and sprayed in the overheated atmosphere. The rotating, upwards oriented winds will disperse the cooling material over the entire hurricane circumference.

The platform is to follow the general path of the hurricane-to-be and keep cooling until the moment that the danger of development to a full-blown hurricane is over.

Ship-mounted HurriTame System

The areas where hurricanes are formed are, at the time of this formation, not the most mariner-friendly environments. A large work platform, suitable to operate in these circumstances, will be required. Also, in order to be able to pump large quantities of seawater from great depths and traveling with special pumping equipment in order to follow the path of the hurricane-to-be, heavy equipment is needed.
Operational height should be sufficient for being physically able to spray the cooling material at a reasonable height in the center of the hurricane-spiral.
To the opinion of HydroConsult BV, TSHD-type vessels are existing vessels which are most suitable for this task, at least for the initial trial period.

Later on, when (if) the system has been successfully proven during a full hurricane season, a specially designed hurricane combat vessel can be designed: after all, the vast bulk capacity of a TSHD is not required, only a large pump capacity and spraying booms, situated on a fast and weatherproof spraying platform. A "stealth-like" vessel is envisioned at present.

Dutch offshore dredging / engineering companies are capable to design and develop necessary hardware components, required for the execution of this project.

The basic concept of the HurriTame System Configuration may be as described in this chapter. Undoubtedly, better alternatives will be brought forward prior to and during the development and fine-tuning of the system.

Platform.

TSHD/Tanker/Stone Dumper. One or more large type vessels will be stationed in the area. Via suction tubes, the ship will be loaded with cold water from under the thermocline, just prior to the moment that a hurricane may spawn. A volume of several hundred thousands of cubic meters of cooling water will thus be available to cool down the area where the hurricane's formation is taking place. The cold water is to be sprayed at heights which are most effective for cooling.

Suction Pipe. Under the TSHD/Stone Dumper, a 600m long suction pipe will be mounted. Taking into account the length of the vessel itself, this pipe will consist of three lengths of 200 m each with swivel-joints. At the bottom and at intermediate distances, strong pumps will be mounted to bring the cold water up in high volumes. At each joint and at the bottom part of the Suction Pipe, strong thrusters are to be fitted: during the operations, a reasonable forward speed will have to be maintained in order to keep up with the progress of the storm. Presumably, the pipe will have to be aqua-dynamically shaped (form of tow-fish), using the "feather" as cable duct. At the end of the pipe, relevant instrumentation will be mounted (thermometers, inclinometers etc.)

Pump / Distribution. On board the ship, the flow of water to its two nozzles mounted on the cranes will be controlled in the Pump/Distribution Room. Presumably, the main pump capacity will be here as well. Alternatively, if spraying may be not advisable (for example, if a strong vertical airflow is already present), the water is to be dispersed via several paravanes which pump the cooling water just under the surface.

Pipe Control. During the operation, a Pipe Control crew will steer the pipe in such a way, that maximum depth will be maintained while keeping pace with the actual movement of the storm. Thrusters at the joints and possibly at intermediate locations at the suction pipe should have ample power to move the pipe forward with the same speed as the vessel. Thrusters should also be direction-adjustable in order to maintain proper course and to avoid excessive strain on the joints. The suction head can be adjustable in forward direction: this way the head will also act as a powerful thruster. It should be realized that the control of the suction pipe at considerable forward speed will require a fair degree of skill and expertise.

Spray Units. Large nozzles will be mounted at the top of two booms on the aft-deck of the vessel. These booms are to be fixed due to the heavy winds which may occur at time of operations. During spraying of cooling material, the booms are to be elevated to required heights. Determination of the most effective height can be carried out by means of Doppler wind sensors. Alternatively, cooling water can be dispersed via under-water nozzles, attached to paravanes which will steer themselves on both Port and Starboard side of the vessel.

Operation Control. During the operation, all activities are to be carefully monitored and controlled, making use of all available data gathering tools,
such as GPS, satellite temperature observations, airplane measurements and other sources of information.

Marketing the HurriTame system

In the foregoing chapters, reference has been made to the hurricanes in the Atlantic Ocean, especially the USA affected area. This has been done with reason: if the HURRITAME system is to be developed, the costs of the operations will be tremendous. Probably the only country, which could afford to fund the exercise, is the USA, whereby the Caribbean Countries will benefit. If the system proves to be successful, countries in other hurricane areas may follow.
The hurricane season starts June 1st and is officially over by November 30th. If the costs of having the SSCV-mounted HURRITAME system are, for example, in the order of $ 1 million per day, the total costs ($180 million per season) would only be 3% of the damage which would have been caused. An insurance premium of 3% appears to be quite acceptable…

Funding of the development of the system, building, testing and commissioning would be a heavy burden on a company. It may well be that potential clients are interested in co-funding this part of the project, if they can benefit from the result in a later stage.
Potential clients may be Governments, Insurance companies and private parties. A detailed marketing plan has not been prepared at this stage.

NOTE: Although hurricanes cost the USA taxpayers quite some money each year, the five major US insurance companies (Chubb, Allstate, Hartford, CAN and American International Group) which cover 90% of all costs after each hurricane, appear not to be interested in a concept to suppress or avoid hurricanes. Letters have been sent to those organizations, describing the system and its advantages (but also the costs) and no answer from any of these companies has been received.

Time Schedule

Although the HurriTame concept may appear to be new, components to build up the system are readily available in some form or another. Large pumping systems are already in use by dredging companies, suction-pipe systems are developed for companies like Van Oord for their deep-sea stone dumping vessels. Large thrusters are available from various sources and companies like Seatec, IHC etc, can build underwater-control systems to specification in short time.
It is assumed that field trials in the year 2007 hurricane season should be a reasonable target.

Groot Ammers, 15 February 2006

Rob Berlijn
General Manager
HydroConsult BV