



ADDEX NEWS

WINTER 2000

Editor Werner K Paulhardt

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OPINIONS

My association with ADDEX covers most of the 10 years and it is one which I have found rewarding and personally enjoyable. I admire greatly the technical skills and class ADDEX as one of the most innovative of the blown film manufacturers. Secondly I would like to thank ADDEX for the valuable help given me on numerous projects and for the willingness to help when problems have arisen, which I have to say has not been often. Finally I would like to wish well for the future. I very much hope that ADDEX will continue to maintain its technical leadership and grow as an independent company for many years to come. Certainly until after I retire! I look forward very much to my continuing association with ADDEX over the years to come.

Graham G Turner
BRITISH POLYTHENE INDUSTRIES UK

One of the things that immediately comes to mind as I reflect on ADDEX's history is being able to associate with and in some small extent support a terrific bunch of people.

James J Callari, Publisher
PLASTICS TECHNOLOGY

REDI A New Blown Film Die Concept

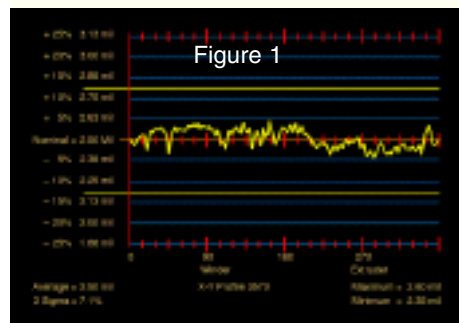
From Concept to Production Model The REDI Die a Smashing Success

When the marketing and design teams at Addex set a goal to design a die which overcomes some of the drawbacks of conventional spiral as well as side fed pancake dies, they had no idea that the first working model would already exceed everybody's fondest expectations. It did. As a matter of fact, it was so convincingly superior that a customer, watching a

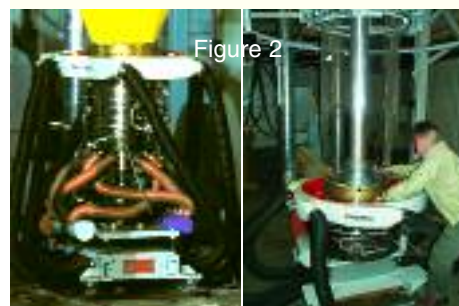
demo for an entirely different product, purchased the prototype on the spot.

It just so happened that, after a series of in-house tests, the REDI die was still on line, when Addex, on short notice, was asked to demonstrate their winder. The line was started before the customer arrived, and on arrival, the customer immediately concerned himself with the features and workings of the winder until, all of a sudden he asked how the film was made. His interest then shifted to the die and before long, the die was sold.

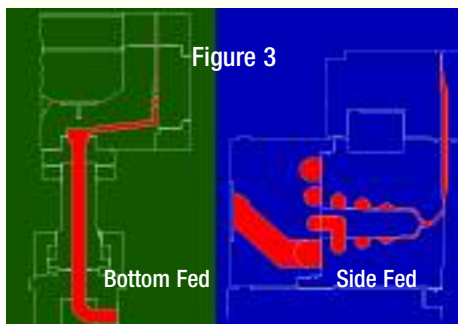
What then is so special about the REDI die? For starters, there is a 20%-25% unassisted reduction in film thickness variation; unassisted meaning without any gauge control devices. (see Figure 1)



Then there is low residence time. It is impervious to material changes. How about a low profile which permits operators to make start-ups and adjustments from floor level rather than ladders, fixtures, or perhaps even by climbing on the die itself? (Figure2)



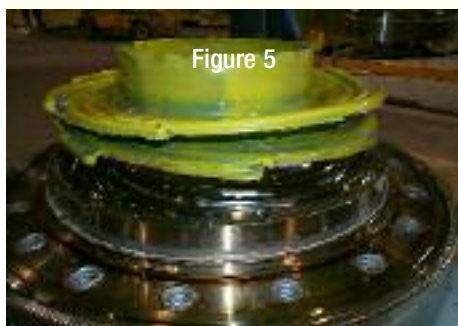
There are numerous features that make this die special. Being a side fed die, the REDI has a much lower profile than the spiral mandrel die. This in turn accounts also for low residence time and permits a greater number of materials with different properties to be processed. (Figure 3)



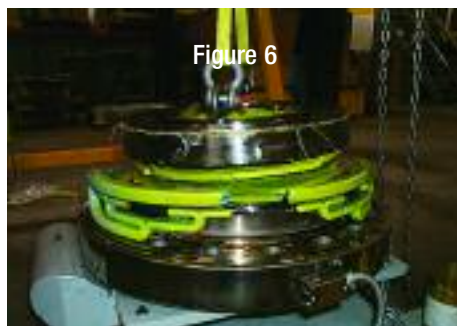
Binary division technology is used to divide the melt stream from the extruder evenly around the die. This assures similar melt parameters (pressure, shear, residence time) at any two points equidistant from the supply port. (Fig 4)



Whereas conventional pancake dies divide and combine the melt flow on a horizontal plane the REDI die divides in a vertical plane to reduce internal (horizontal) pressure, thus reducing the need for an excessive number of bolts to hold horizontal plates of the die together. (Figure 5)



After dividing the melt around the die, it is brought back together to eventually form a seamless tube and exit through the die lips. This is accomplished by feeding the melt in spirals toward the die's center pin. (Figure 5). In order to avoid film thickness variation, caused by "memorized" port patterns from the spirals, two sets of spirals are used on a horizontal die plate. (Figure 6)



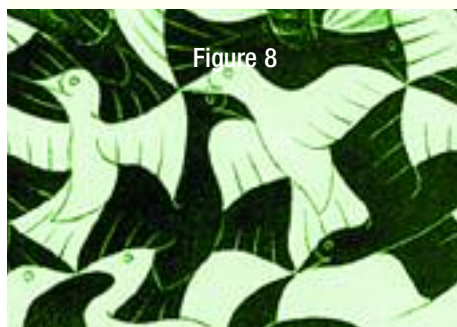
The melt is alternately fed from the top and the bottom of the plate, producing a melt cross section wherein melt flows from the top are placed between those from the bottom, producing an even thickness throughout the circumference of the die lip. Several advantages of this die have been borne out through actual production runs. The fact that it cannot be rotated (being side fed) has been identified as the only drawback so far, in fact that can be considered a drawback.

ADDEX INTRODUCED THE REDI DIE AT NPE 2000!

The concept can best be illustrated by the paintings of M.C. Escher, a 20th century Dutch painter. His works exemplify REgular Division. To achieve optimum distribution to the die lips, mixing, and homogeneity, the melt is first divided into a number of melt streams, each time halved, until the desired number has been reached. (Figure 7)



It then is brought back together in a fashion that matches low flow patterns with high flow patterns, completely filling voids until, finally, the melt stream becomes one again, but in tubular fashion. (Figure 8 & 10)

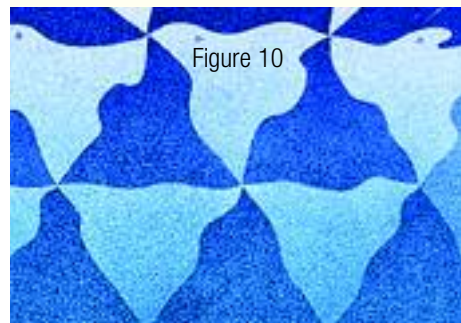


If one were to take a cross section of the melt flow, as it exits the die, it would look something like this sine wave pattern. (Fig 9)



Two mirrored sine waves, offset 180°, producing essentially the same gauge, no matter where the measurement is made across the entire width.

The resulting film has markedly improved gauge properties. As a matter of fact, improvements in gauge variation of as much as 25% over film from conventional dies have been experienced during demo as well as production runs. Thickness profiles of identical materials run on a conventional spiral mandrel die and a REDI die show marked reductions in thickness variation by the latter.



Tests and production runs confirmed 20%-25% better uniformity.

This stripe, incorporating a sine wave profile, represents a cross section of the melt as it exits the die. (fig 9)

The lower half shows the melt stream from the bottom of the die plate, the upper half the melt stream from the top, offset by 180°. In conventional, spiral mandrel dies the profile would consist only of the bottom portion, leaving thin spots between the melt streams just being placed next to each other.



OPINIONS

We purchased our first GBR in 1995 and have now just installed our third unit.

The equipment is easy to operate and its unique design features make it effective over a wide range of materials. We are very pleased with the performance of the units and would certainly consider purchasing another GBR in the future.

*Gary Buchalter
ADVANCED FILMS
BRITISH POLYTHENE INDUSTRIES, UK*



CUSTOMER PROFILE

OWENS-ILLINOIS LABELS INC.

One of every two glass containers in the world is made by Owens-Illinois (O/I). In the US, O/I is a market leader in plastic containers, labels, multipack beverage carriers and packaging material.

The company's customers include Anheuser Busch, Philip Morris and Proctor & Gamble. The company's predecessor Owens Bottle Machine Corp. was incorporated in 1907 in Toledo, Ohio where the headquarters are still today. In 1929 Owens bought Illinois Glass Co. and became Owens-Illinois Glass. Today after many other domestic and interna-

tional acquisitions and changes it is a public company with more than 170 locations worldwide. In 1998 sales exceeded \$ 5,3 billion of which 57% were in the US, 20% in Europe, 13% in Latin America and 10% in Asia/Pacific. KKR (Kohlberg Kravis Roberts) Associates owns about 23% of the company. In 1991 Addex supplied Owens-Illinois Labels Inc. with a three layer IBC die package. It was supposed to be a spare coextrusion IBC die package for an existing W+H line. Due to its superior performance it soon became the main die on that line. Since then O/I expanded by adding three more complete lines. The lines always incorporated Addex' latest developments: first, the Air Shroud, a device that protects the bubble from the effects of the ambient air on the film's thickness variation; then the revolutionary IGC

(Internal Gauge Control) System which took care of all the thickness variations regardless of their origin. Addex actually developed the IGC system on O/I's production floor before going commercial with it in 1995. Addex' other popular components like the LFR (Laminar Flow Air Ring) and GBR (Gauge Band Randomizer) are also standard features on these lines. Bruce Atcher, Operations Manager, in the Bardstown, Kentucky operation had this to say when we interviewed him for this article: *"We went through a rather rigorous evaluation process when we chose Addex as our blown film equipment supplier almost ten years ago. We felt that Addex had the best technical expertise to handle our tough requirements. Today, we can say we made the right choice".*

ECONOMIC OUTLOOK

Most sectors of the US economy are currently in the late stages of an expansion period. However, there are some sectors of the economy that are actually in the early stages of a recession. How deep this recession goes and how long it lasts is still a matter of speculation. But there is now no doubt in my mind that the near-term outlook for many industries is for conditions to get worse before they get better. To review, the late stages of an economic expansion are characterized by rising interest rates, rising raw materials prices (i.e. petroleum products), sated consumer demand, a strengthening dollar, and slow (or even negative) growth in the stock market. These are the conditions we have been living with for the past several months, and they are gradually curbing the rate of economic expansion in this country.



1995 Live Ring with Sensor (part of IGC)

Nowhere is this more apparent than in the data on US housing starts. For the year to date, the number of houses started in this country is 3% below the comparable total from last year. This may not seem like much of a drop, but the rate of decline is accelerating. Our current forecast calls for a 5% decline in the total number of houses started in 2000. The data on housing starts is the best indicator of plastics products demand in the US. Corroborating this trend in housing starts, most of the other major consumer end-markets are also experiencing a slow down. The growth rates for retail sales of big-ticket items such as motor vehicles and appliances have peaked, and they will gradually decelerate for the remainder of the year. Unfortunately, I do not expect these declining growth rates to hit bottom until the second

quarter of 2001 at the earliest. This is because it will take several months for the conditions that are currently restraining economic growth to correct and become conducive for the next expansionary phase.

A big factor affecting short-term growth is the sharp rise in the price of petroleum products.



1993 Three Layer Die Block

In the past 12 months, the price of gasoline has ascended 37%, the price of heating oil has jumped 65%, and the price of natural gas has skyrocketed 100% to an all-time high.

Now I realize that we are all getting more productive, but increases like this are difficult to swallow without some kind of ill effect, especially if these high prices persist for a sustained period of time. If there is not an increase in the price of all goods to offset these costs (also known as inflation), then there must be a decrease in spending.

An excellent example of this kind of problem is the plastics industry. The price of resins rose dramatically during the past 18 months, but the prices received for plastic products grew at a much slower rate. Processors, like all US manufacturers, have become much more efficient in recent years. But as consumer demand has slowed, their problems with dwindling margins have become more acute.

Exacerbating this problem for many US manufacturers has been the upward march of the value of the dollar. This has made US products more expensive in the global market, and at the same time has made foreign products less expensive to US consumers. While many companies have adopted strategies to reduce their exposure to exchange rate risks, there remain many that have not.

Finally there is the performance of the stock market this year, and the effect this has had and will have on spending behavior. It is not too late for the stock market to stage a fourth quarter rally and thereby generate more paper wealth for all of us to spend. But it is by now clear that the market could actually decline and post negative results for the year. If corporate earnings have anything to do with the price of stocks, then I do not expect the stock

market to mount a significant rally in the fourth quarter. It might hold steady, but chances are increasing that it will decline.

To summarize, I expect that the GDP figures that will be released at the end of October will show that the growth rate in the US economy slowed substantially in the third quarter of this year. And I expect that the rate of growth will be even slower in the fourth quarter. We will not have a recession in the overall economy this year (officially defined as two consecutive quarters of negative growth in total GDP), but many markets will suffer negative growth. For 2001, the forecast calls for a slow start to the year in most end-markets, with gradual improvement starting in the second half. The rate of growth in the overall economy will be relatively slow next year, but I currently believe that it will remain positive. However, if the price of oil continues to rise, or if there is a substantial break in the stock market, then the forecasts for next year will be adjusted downward.



1991 Three Layer Spiral Mandrel IBC Die

The Film Market

This year has not been very good in terms of growth in the plastics markets. For the year to date, total demand for injection molded products has increased a modest 1%, while demand for both extruded and blow molded products has actually declined.

As I expected, the rate of change curve for total demand of film products is clearly following the trend in housing starts. The question now is "When will these trends hit bottom and then start to recover?"

I do not expect the housing curve to rebound sharply next year, but rather flatten out at a rate somewhere in the range of -5% for most

of next year. The extruded products curve will also spend much of next year in negative territory, but by the end of the year some sectors of the market will pick up. These forecasts are based on the "soft landing" scenario for the total economy. As I stated earlier, if the stock market or the overall economy suffers a more severe decline, then these forecasts will need to be lowered.

The film market is a large segment of the plastics industry, and it is a very good indicator of overall consumer demand in the US. Much of the decline this year may have been the result of some inventory adjustment by processors; nonetheless, it is troubling.

To summarize, the outlook for the plastics industry is indicative of the forecast for the entire US manufacturing sector. The prevailing business conditions are not conducive for accelerating growth in market demand for manufactured products. Growth in many market sectors will be flat, while lackluster corporate profits, slow income growth, and higher interest rates will result in a recession in sectors such as industrial machinery.

These conditions should begin to improve next year, but not until we have survived a period of consolidation. If all goes well, a short period of slower economic growth will be all that is required to relieve the pressure of rising labor and materials costs, and it will restore some balance to the foreign exchange markets. Such a period will also give the stock market a chance to establish a firmer footing upon which to begin another ascent. So 2001 will be challenging, but 2002 should be a good year.

Bill Wood Plastics Market Economist



1992 Extruder



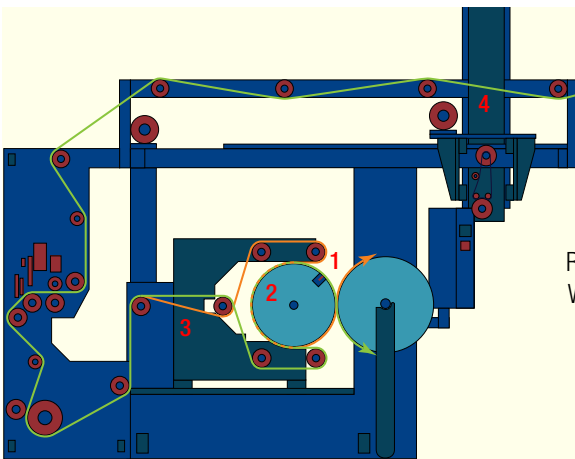
SPECIAL! SPECIAL! WINDER ON SALE!

This facility isn't big enough for two winders. It will only be a few more months before the NEW Addex winder comes on stream.

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 can be increased to 47"/ 1200mm
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 Reverse Winding by simply changing the Web Path from Over to Under the Drum.

- 1 Retracting Knife (allows reverse winding)
- 2 Lay-on Vacuum Drum
- 3 Vacuum Drum Carriage
- 4 Robot



ADDEX MILESTONES & INNOVATIONS

1989 August, Addex was founded.

1990 First sizable order, two large diameter five layer IBC die packages sold to James River Corporation.

Ultrasonic IBC Control System developed and commercialized.

1991 Gauge Band Randomizer (GBR) developed and patented.

1992 Air Shroud (reduces the effect of ambient air on film thickness variation) commercialized and patented.

1993 Dual Lip Air Ring optimized to the level of industry standard.

1994 First three layer side fed die sold.

1995 Internal Gauge Control (IGC) System commercialized and patented.

1997 Vertical Oscillating Haul-Off (constant speed oscillator) developed and patented.

1998 Digital IBC Control System perfected and commercialized.

Complete Blown Film Extrusion Demo Line starts operation at Hingham, MA.

1999 Regular Division (REDI) die technology commercialized and patented.

2000 First External Gauge Control System (EGC) sold.

Surface Wind/Center Assist Winder developed, building prototype.



FILM BUSINESS INDEX (1990 = 100)

Latest available data: July 2000

Data Sources:

- ◇ Mountaintop Economics & Research, Inc.
- ◇ American Plastics Council
- ◇ The Society of the Plastics Industry, Inc.

The film index is the largest component of the *Extrusion Business Index*. More resin is processed into film than any other plastic product. This index is an excellent indicator of packaging demand in the US.

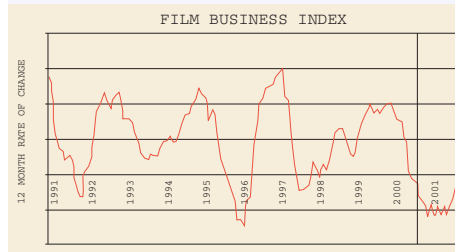
The *Film Business Index* tumbled a 14% in July when compared to the same month a year earlier. This followed a whopping decline of 20% in June. This index has now declined for four consecutive months. Total output of plastic film decreased 10% during the second quarter. The peak for the rate-of-change curve of the Film Index occurred in the fourth quarter of

1999, and the growth rates will continue to abate during 2000.

The total film market is currently forecast to decline 5% in 2000. In 2001, film sales will expand a moderate 2.0%

1990 = 100

Latest month	Previous Month	Year Ago	Year to Date Ch
112.3	120.6	129.8	-5.0 %



Annual % Change

1999	2000	2001
8.1	-5.0	2.0

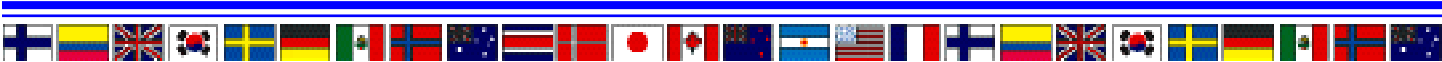


MEET THE ADDEX BOARD OF DIRECTORS

Left to right

J. Arthur Binner, Director
(Former President of Deerfield Urethane)
Ruediger H. von Kraus, President
Ambassador **Henry L. Clarke**, Director
John H. Morton, Secretary
(Partner at Hale & Dorr Law Firm)
Charles P. Barker, Chairman
(Former President of Deerfield Plastics)
Robert E. Cree, Executive Vice President

We Wish All Our Readers
a Happy Holliday Season
and a Prosperous New



NPE 2000

It seems like only yesterday that we put the finishing touches on our booth, just prior to the opening of NPE 2000, yet it has been three months already since then. Time seems to pass at ever increasing speed and even at the current rate, "three months ago" seems like ancient history. However, a summary of the event should still be mentioned here. After all, the results are still coming in. Bigger than ever. Best attended ever. – Those were some of the superlatives that were bandied around at and after this year's NPE. Well, it was all that, and more. For Addex, the show was very productive. We had a roomy booth in McCormick- East and a steady stream of customers, prospects, and interested parties from the US, Canada, Mexico, and several other foreign countries. Addex personnel, all US representatives, and the representatives from Turkey, New Zealand, and France all shared in making our visitors



comfortable and providing them with the information they were seeking. The REDI Die was, without doubt, the focal point of our exhibit. Customers came, listened to Bob Cree's presentation (PowerPoint, projected onto a screen), left, and came back with colleagues and associates for a second, in some cases even a third look. Although this was already the second REDI die, this type was still not for sale at the time of the show, pending additional production testing. However, even this die has proven itself in the production environment since and we now accept orders for the single-layer as well as well as the multi-layer version.

The GBR (Gauge Band Randomizer) and IGC (Internal Gauge Control) attracted a great deal of attention as well. Many customers had never seen a GBR or an IGC up close and having had a chance to compare them to what else was offered at this show, they were duly impressed by the compactness of the GBR and the unequalled control accuracy and the retrofitability (new word, never before published in dictionaries) of the IGC. Air rings, bubble cage, screen changers, extruder, spiral mandrel die, and the cut-over/lay-on drum of our winder (under development) rounded off the exhibits. All received their due attention and a number of orders were received for them.



**YOU WILL KNOW WHAT
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There are a number of ways to increase the "bottom line" of your operation. One is practically a "no brainer". Whether there is a need for higher output or for improving film gauge, the Addex dual lip, laminar flow air ring has proven itself hundreds of times over

the years. Plants that originally tested one Addex air ring now have one on practically every die in the house. They have paid for themselves, again and again and again. Whether directly or indirectly, they have helped to improve the bottom line.

TRY BEFORE YOU BUY!

It has been a long standing Addex policy to let first time air ring customers "try before they buy". Unless it was a request for a very unusual size, Addex has let customers test the first air ring for as many as thirty days before they had to decide whether to keep it or not.



The only conditions were: treat it well during the trial period, while in your possession; pay the return freight if you decide not to keep it. This policy is still in effect today. Why not give one a try today?

SUCH A DEAL (for all alike)!

Starting with receipt of this newsletter, Addex will accept air ring orders from all customers, payable on an installment basis. Pay 20% down with the order and pay the balance plus interest in up to 12 months in equal installments. This way, the air rings earn their keep and pay for themselves even before they have been fully paid for. Call our representative in your area or us, here in Hingham, for the details and take advantage of "such a deal". We reserve the right to withdraw this offer without notice.

**WHAT IF IT REALLY WORKS?
IMAGINE THE POSSIBILITIES!**



NEW PEOPLE

Herbert Aufderhaar

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Addex Representative For Northern Germany. Herbert Aufderhaar, resident of Ibbenbuehren in Westphalia, Germany, was recently appointed representative for all Addex products in the Northern part of Germany. Herbert, 53 years old, has a degree in machine design from the Osnabrueck Engineering College. His blown film machinery know-how stems from several sources, among them a seven year period as sales manager for film extrusion lines at Windmoeller & Hoelscher/Garant. For the past three years, Herbert maintained his own engineering office for planning and sales of plastic converting machinery and has represented, among others, Klaus REINHOLD, well known manufacturer of equipment for the cold portion of blown film lines. Since his appointment, Herbert has introduced Addex equipment to several new customers, and we are looking forward to a long and mutually beneficial association with him.



1995 Customized Feedscrew

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