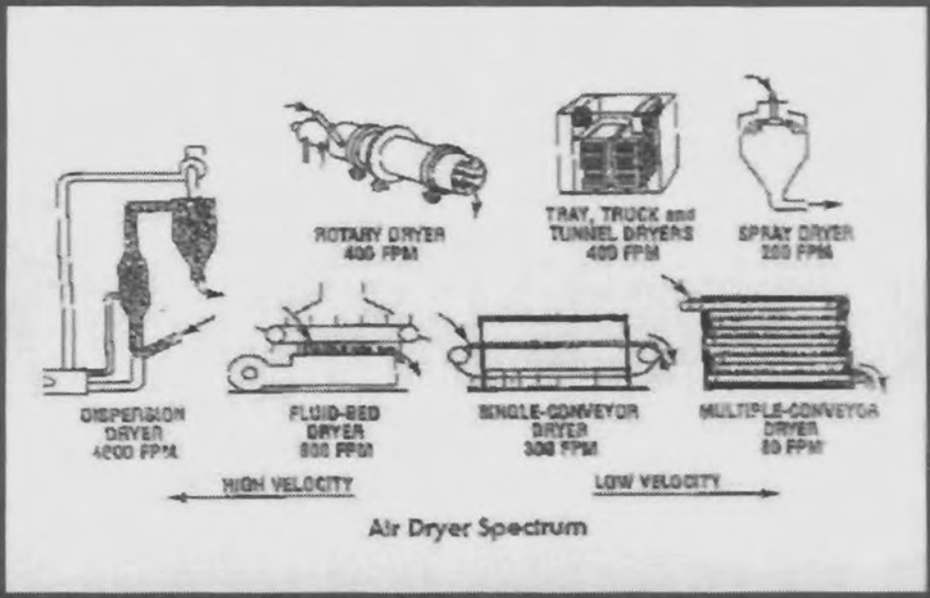
PN-ADC-842

DEHYDRATION OF FOODS: PROCESSING & MARKETING



Air Dryer Spectrum

June 5, 2001

Mr. Walter Frick

Agriculture Led Export Businesses

12 Dokki Street, 6th Floor

Dokki, Cairo

TEL 02-338-1445

FAX 02-748-0729

USAID PROJECT NO. 263-0264

Abt

Walter G Frick

EMAIL wgfrick@aol.com

Walter Frick studied Mechanical Engineering at Drexel University in Philadelphia, PA USA. Upon leaving Drexel he was employed by Proctor & Schwartz where he has remained for over 40 years. After several years of laboratory training in the basics of drying technology, he transferred to the engineering department and later to the marketing department. Since that time he has held many positions including International Manager and Director of the Food Processing Division. When the two divisions of the Wolverine (Massachusetts) Corporaton were merged in 1999, he became Vice President of International Sales, responsible for the international sales and marketing of all Wolverine Proctor products. Today he is working as consultant in the areas of dehydrated foods and food processing equipment.

Marwan El Kordy

Mr. Marwan Ahmed El Kordy is Co-director of the Market Information Services on the ALEB project. Prior to joining ALEB, Mr. El Kordy worked closely with the Chairman of the Nile Clothing Company and served as coordinator of the Egyptian Exporters Association (EEA). In this capacity, he organized business communications with the government and various donor agencies and facilitated a large food sector sampling show. Previously, he served as portfolio manager for the software and IT sector as well as International Cooperation officer for EEA/ExpoLink. Mr. El Kordy organized several large trade shows and conducted a variety of sector based studies. He also represented ExpoLink in several EU donor countries and negotiated and implemented mutual cooperation agreements with international donors.

REGISTRATION INFORMATION
DEHYDRATION – JUNE 5

Name _____

Title _____

Company _____

Address _____

_____

TEL _____

FAX _____

Email _____

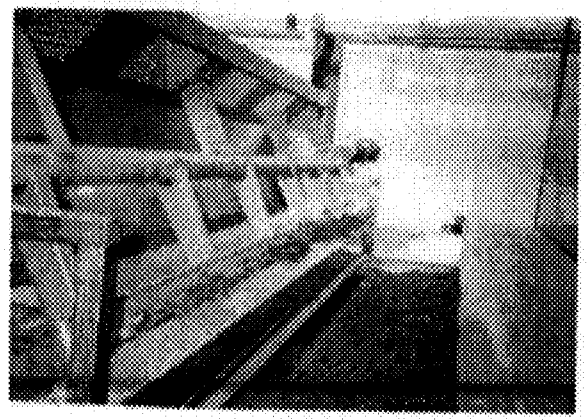
Attendees may register by calling in or faxing this registration to ALEB. They may also register on-site.

Registration Fee: There will be no registration fee for this program. Registrants will receive a course notebook and certificates of attendance. Snacks and beverages will be served.

For further details, contact:

Agriculture Led Export Businesses (ALEB)
12 Dokki Street
Dokki, Cairo, EGYPT
TEL 202-338-1445
FAX 202-748-0729

DEHYDRATION OF FOOD: PROCESSING & MARKETING



A TECHNICAL & MARKETING SPONSORED BY THE AGRICULTURE LED EXPORT BUSINESSES PROJECT (ALEB) CAIRO, EGYPT

- June 5, 2001 at 13:00 at the ALEB Training Center, 5th Floor 12 Dokki Street, Dokki, Cairo

DEHYDRATION OF FOODS; PROCESSING & MARKETING

INTRODUCTION

Dried fruits and vegetables and dried herbs and spices are products for which there are markets throughout the world. Since Egypt is blessed with abundant water and long growing seasons, there are many crops for which there are more than one season. The key to doing business on world markets is to take these raw materials and turn them into quality ingredients that will be in demand on the world markets.

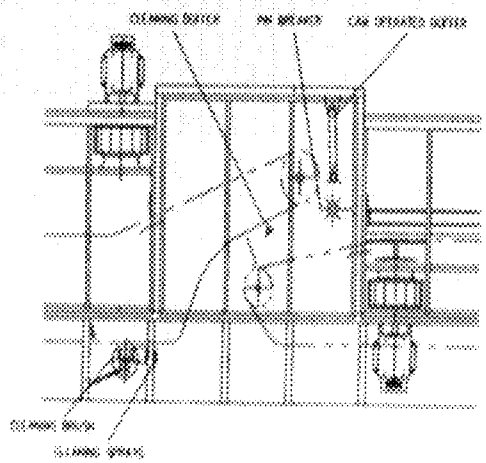
This program will discuss potential markets for these products, and how they can be processed to assure the best quality. The processing presentation will focus on the different systems available to the processor and how to begin working with a supplier to select and eventually buy a new (or used) system.

PROGRAM OUTLINE

The following topics will be addressed during the program;

- 13:00 -Introduction – Stier
- 13:15 Where Are Markets? - El Kordy
- 14:00 - Processing of Fruits, Vegetable and Herbs – Frick
- 15:30 - Break
- 16:30 - What the Supplier Needs from the Buyer - Frick
- Discussion – All Speakers

Handouts will be provided for the technical presentations. Participants will also receive copies of grade standards for products.



INSTRUCTORS

Mr. Walter Frick
Consultant

Mr. Marwan El Kordy
Co-Director, Market Information Services
ALEB

FOR MORE INFORMATION CONTACT:

Richard F. Stier
Technical Director
Morad S. Ahmed
Processing Specialist
Mr. Terry Dunn
Director, Market Information Services
Agriculture Led Export Businesses
ALEB
12 Dokki Street, 6th Floor
Dokki, Cairo
TEL 02-338-1445
FAX 02-748-0729

June 5, 2001 at 13:00 at the ALEB Training Center, 5th Floor, 12 Dokki Street, Dokki, Cairo

MarketPulse Egypt

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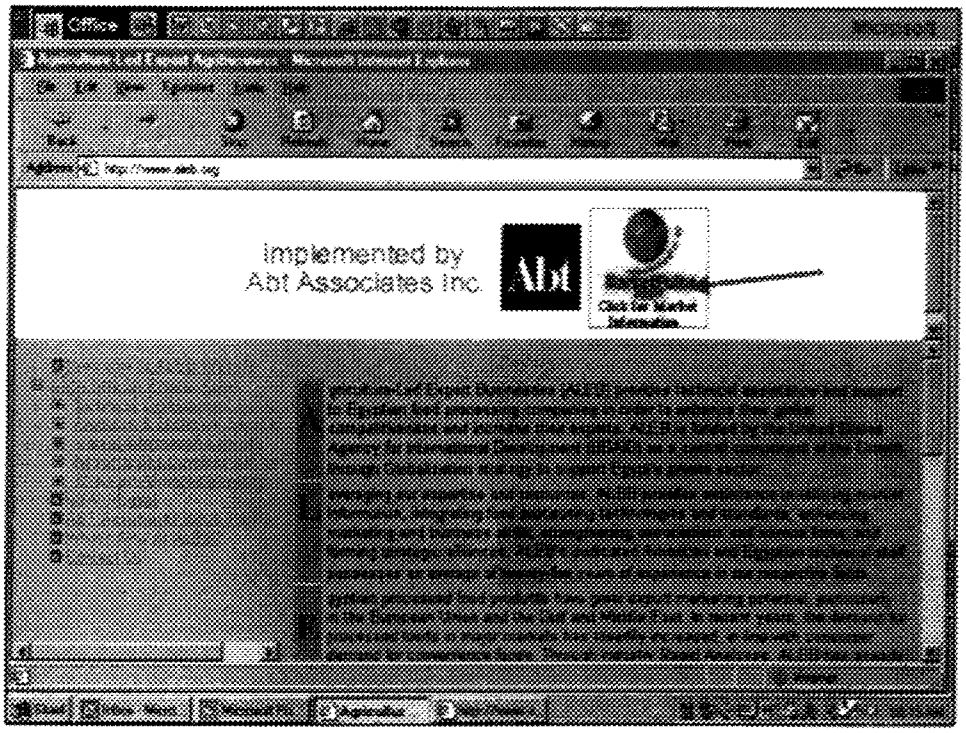
Click on the MarketPulse Egypt Icon located in the upper right hand corner of ALEB home page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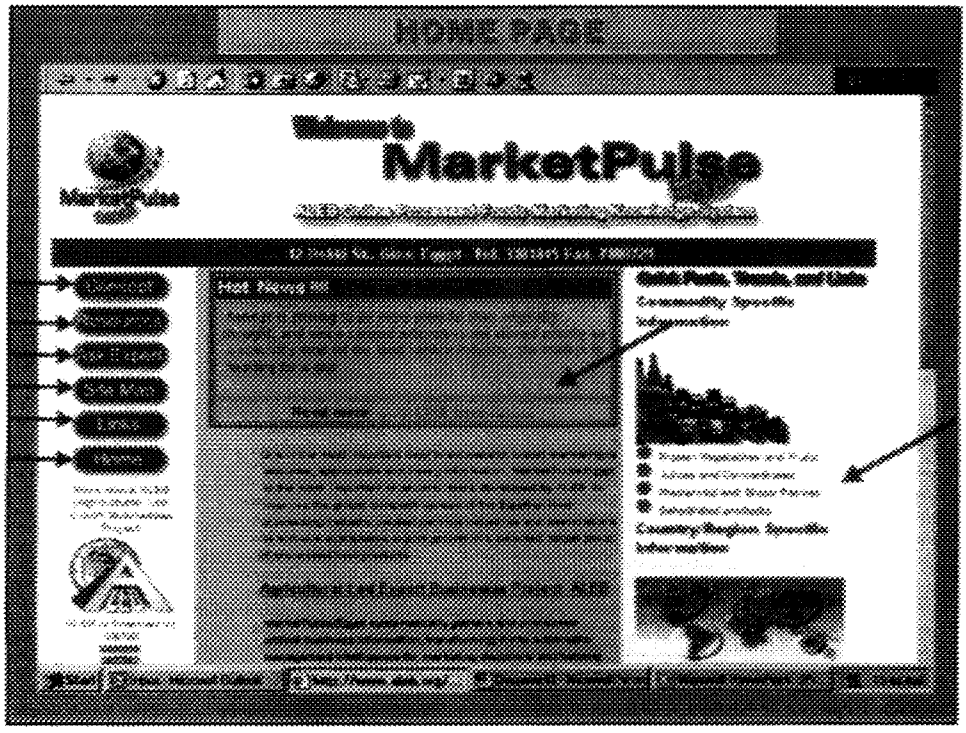
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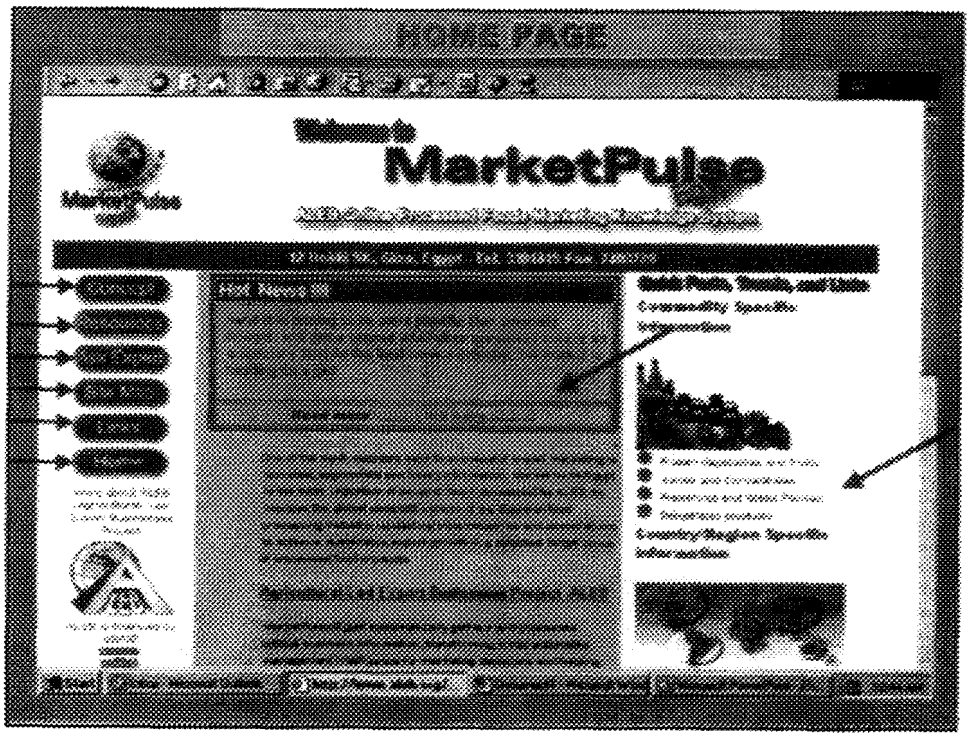
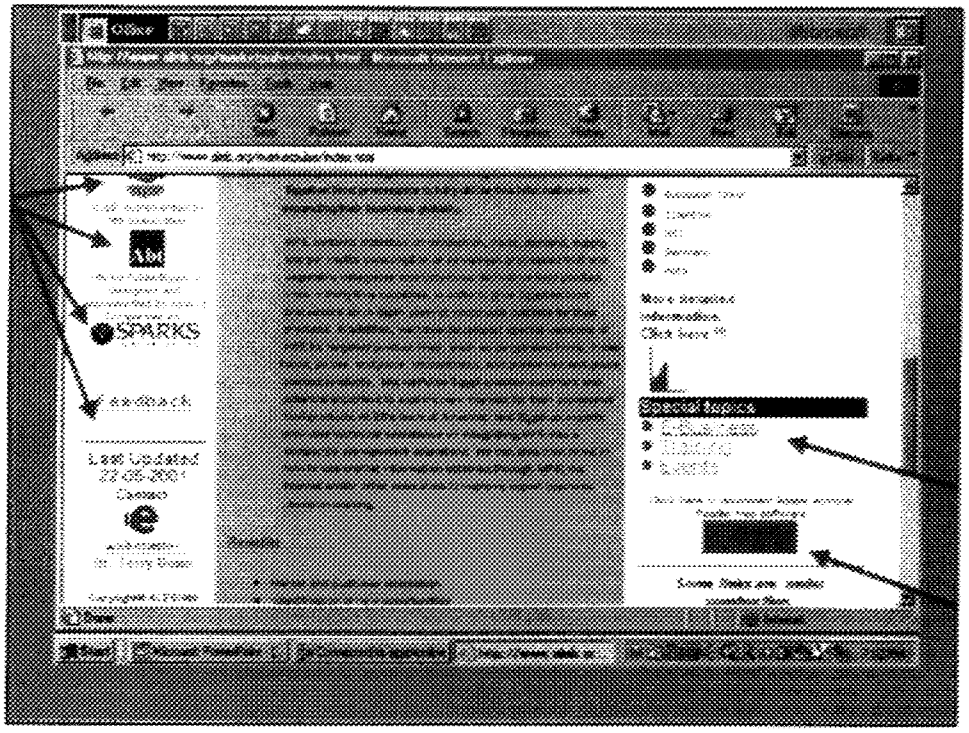
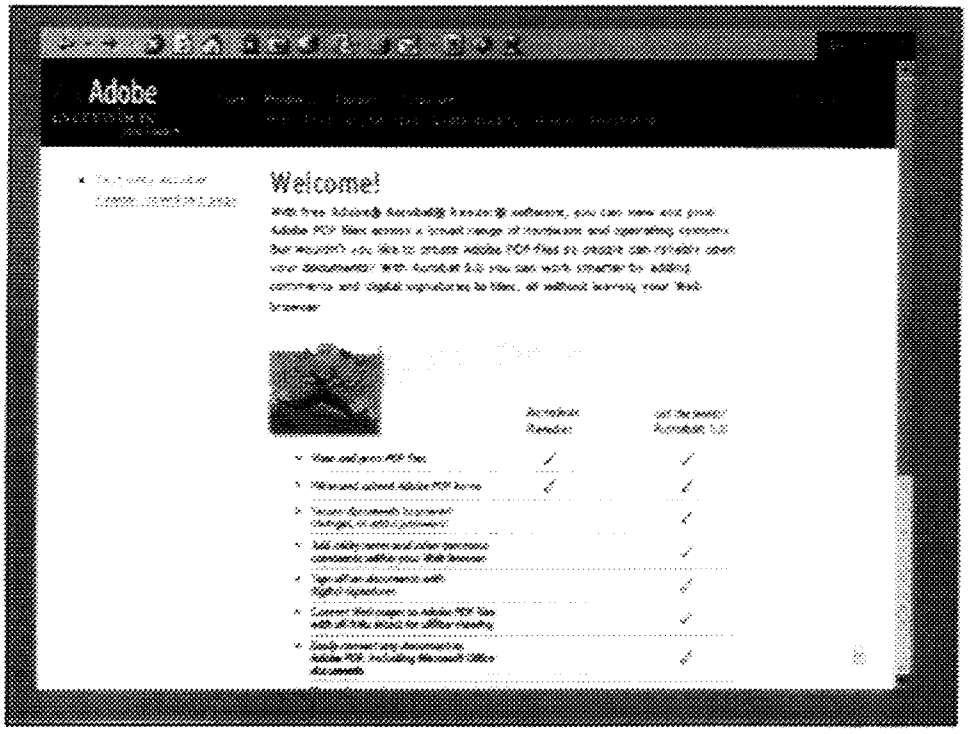



SPARKS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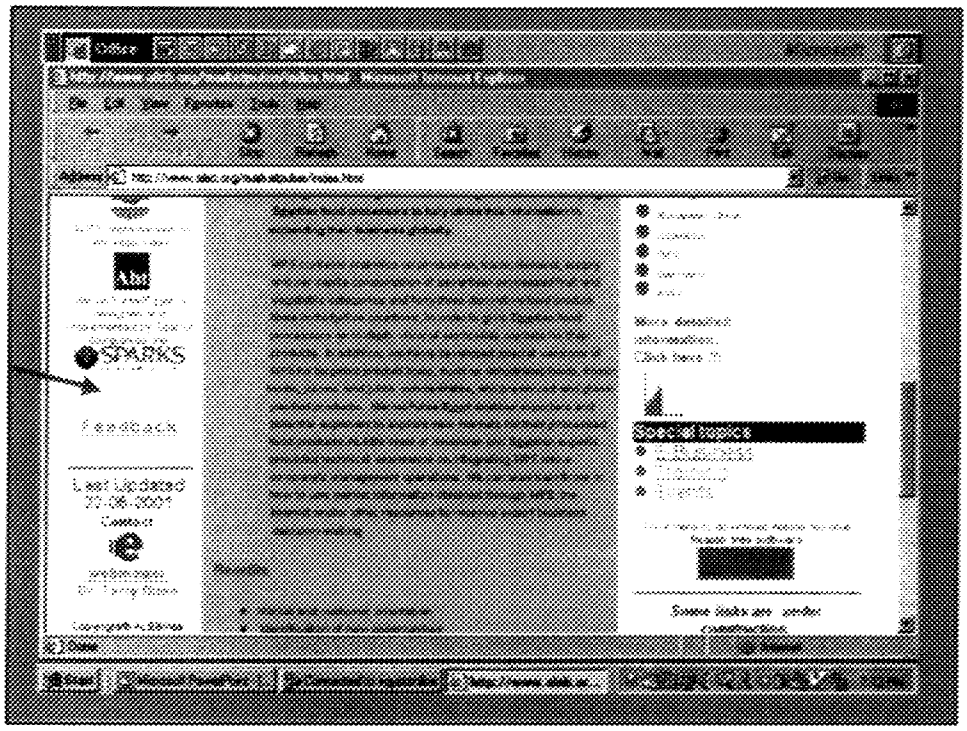
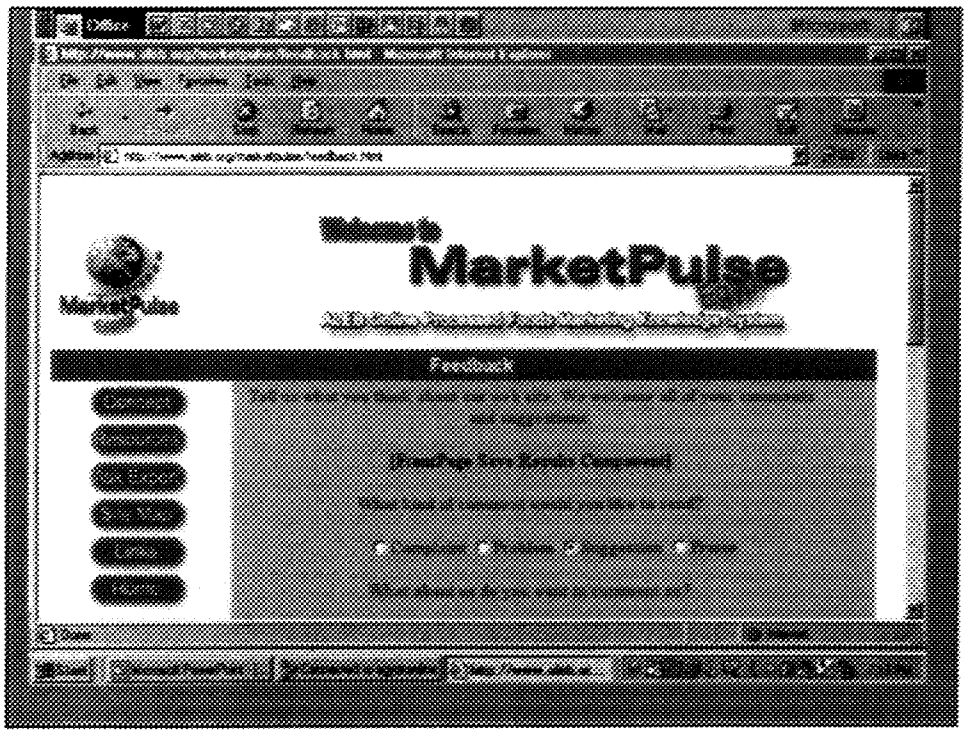

SPARKS
Feedback
Last Updated
Contact
Special topics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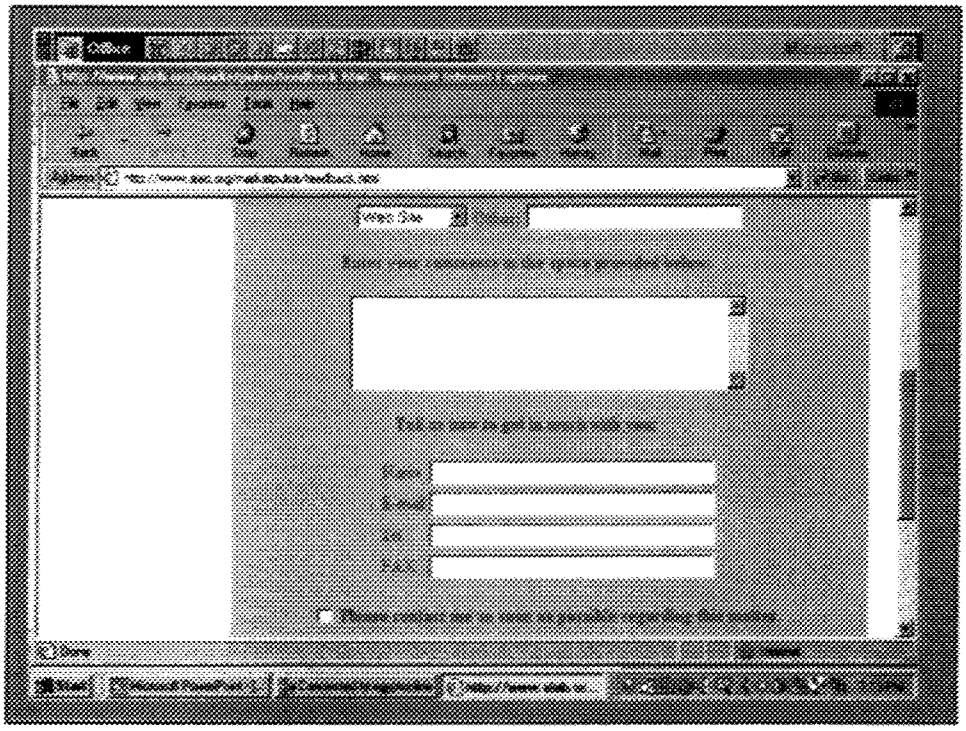

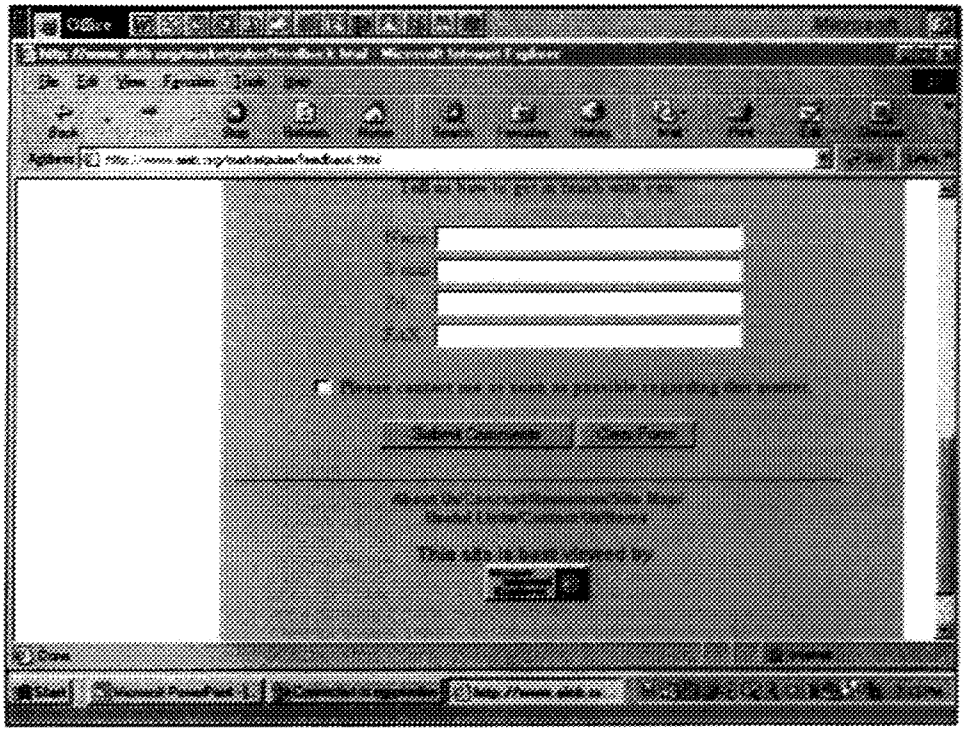

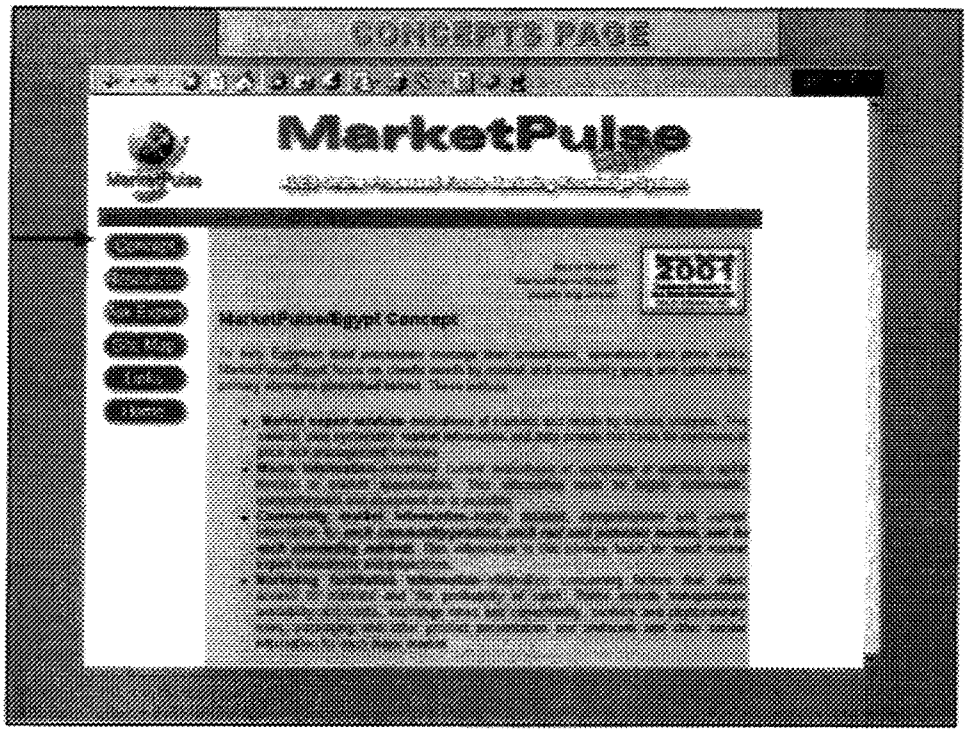
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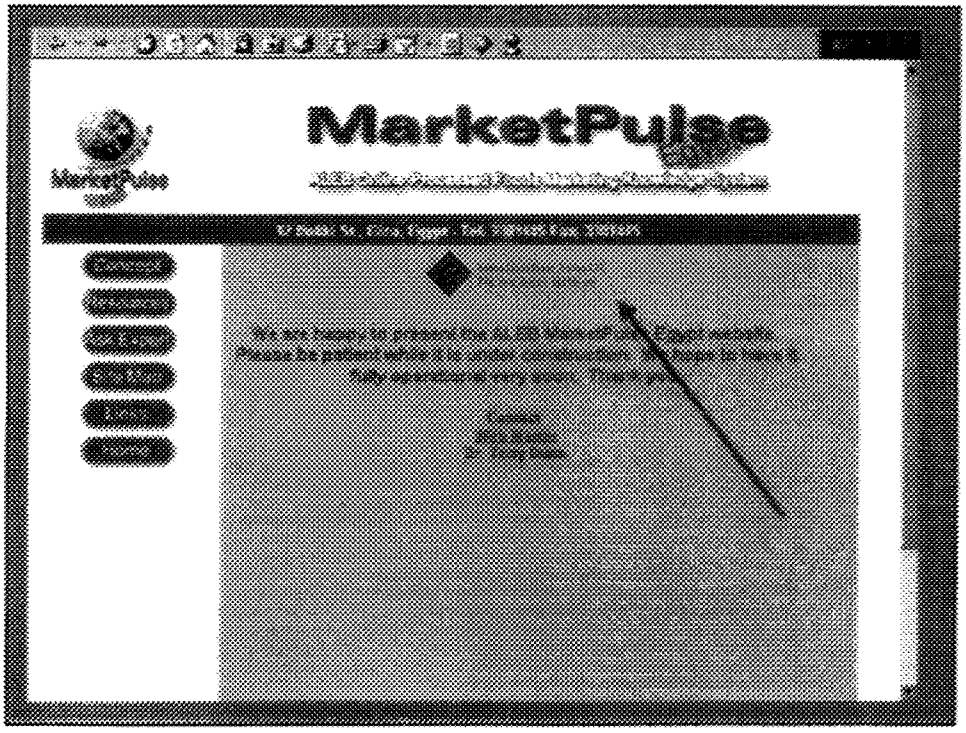
2001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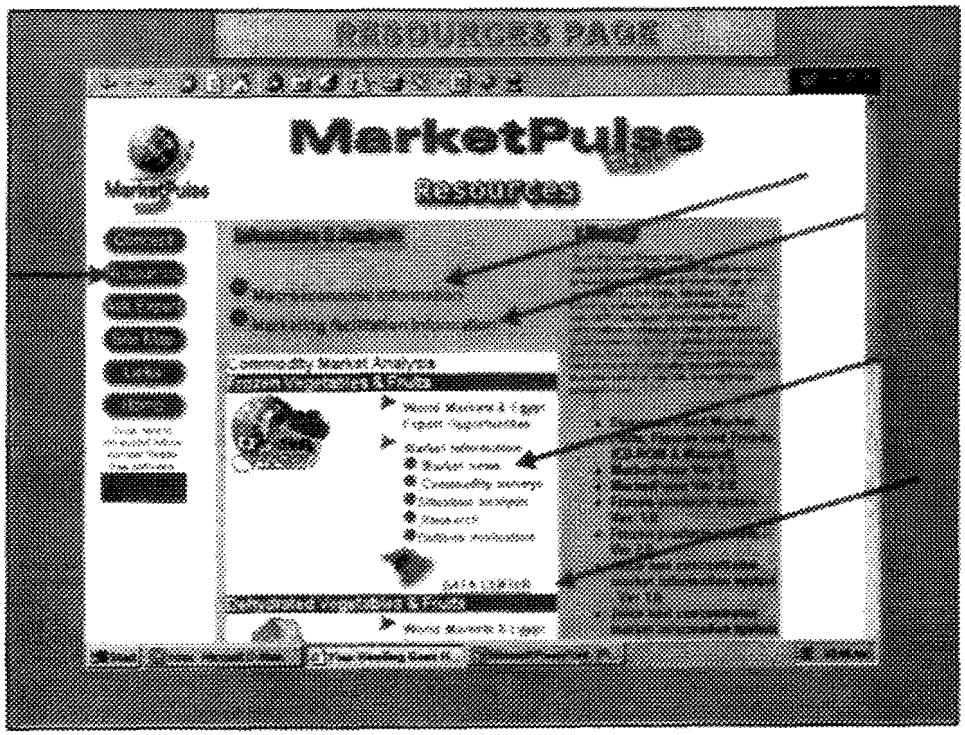
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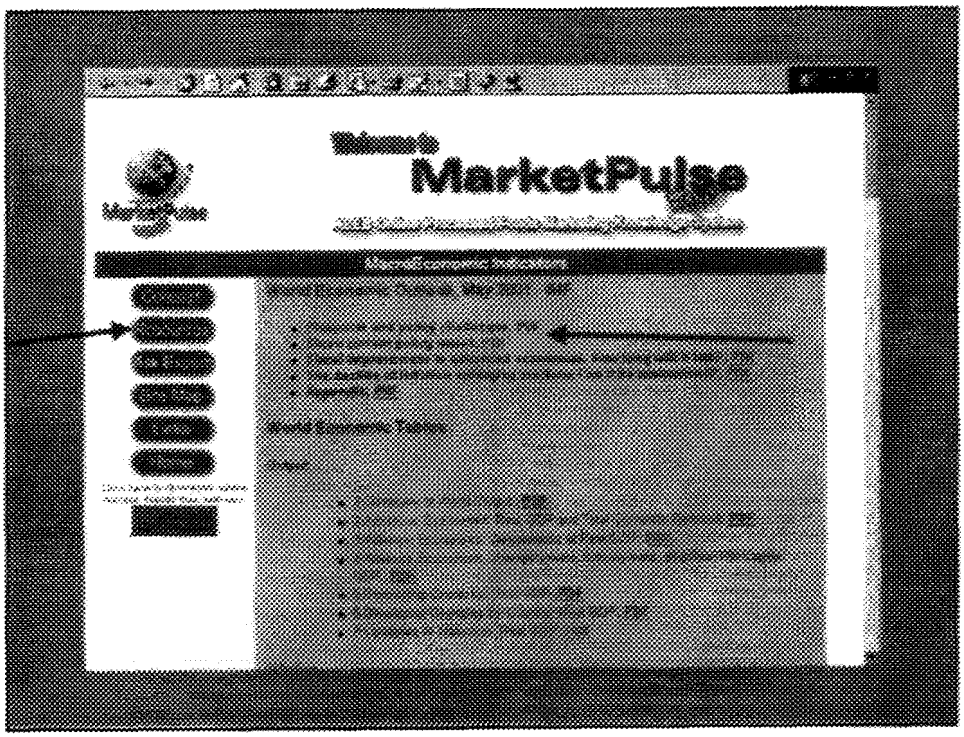
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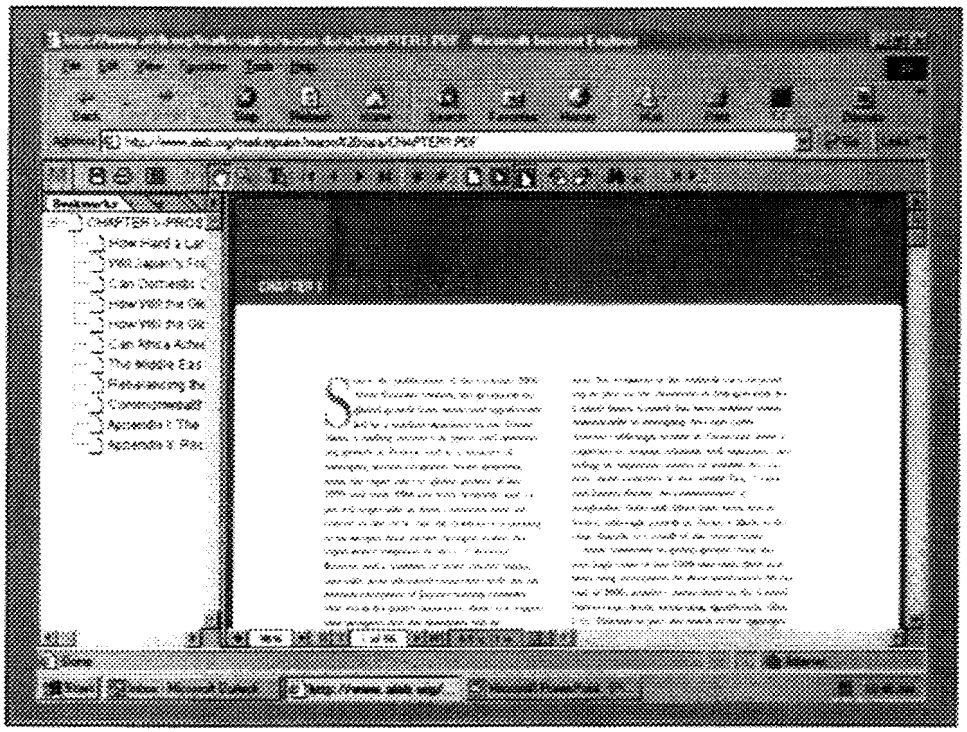

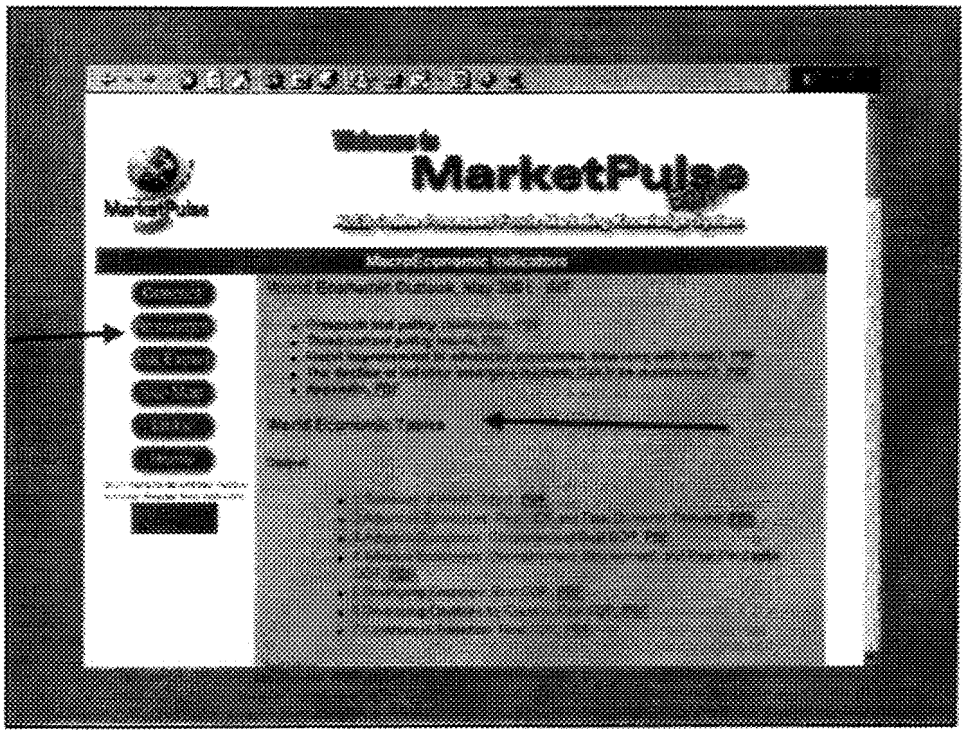
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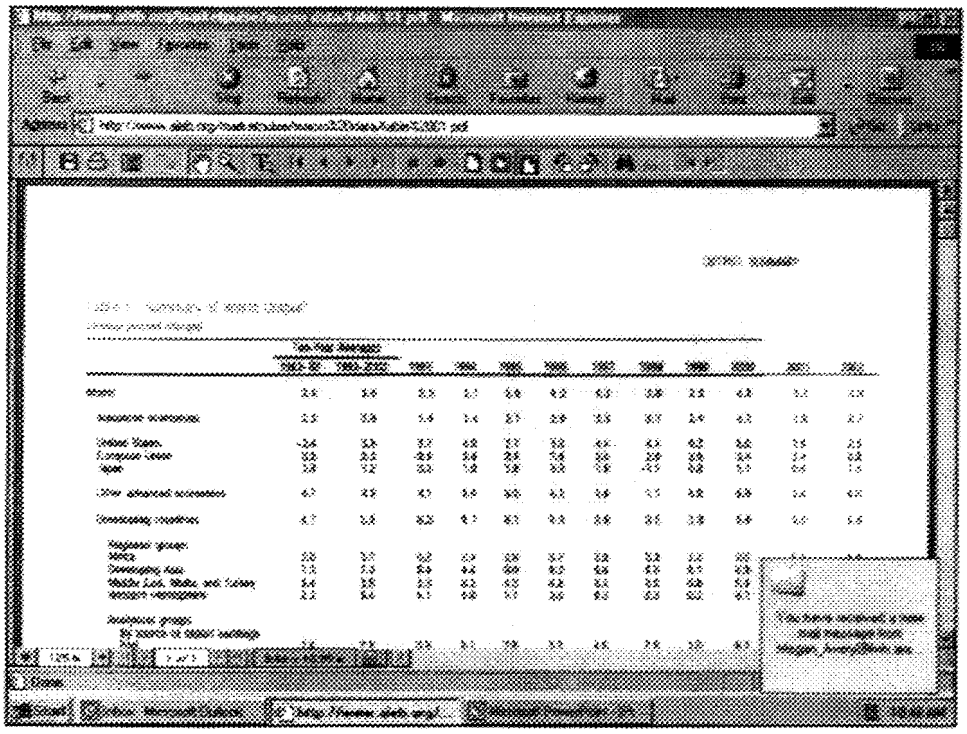

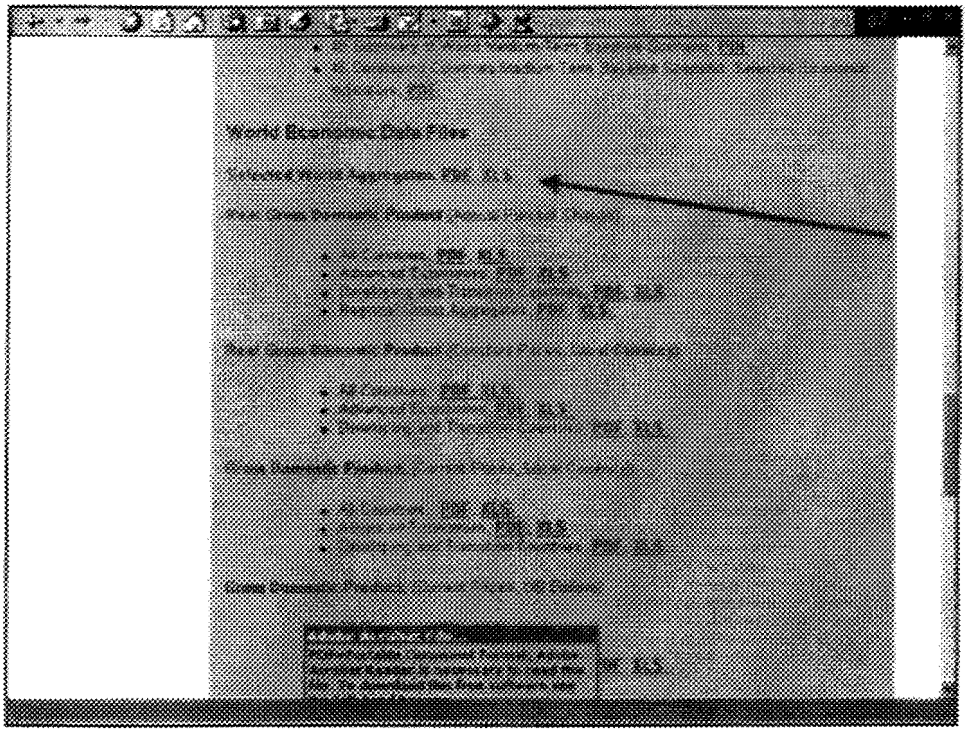

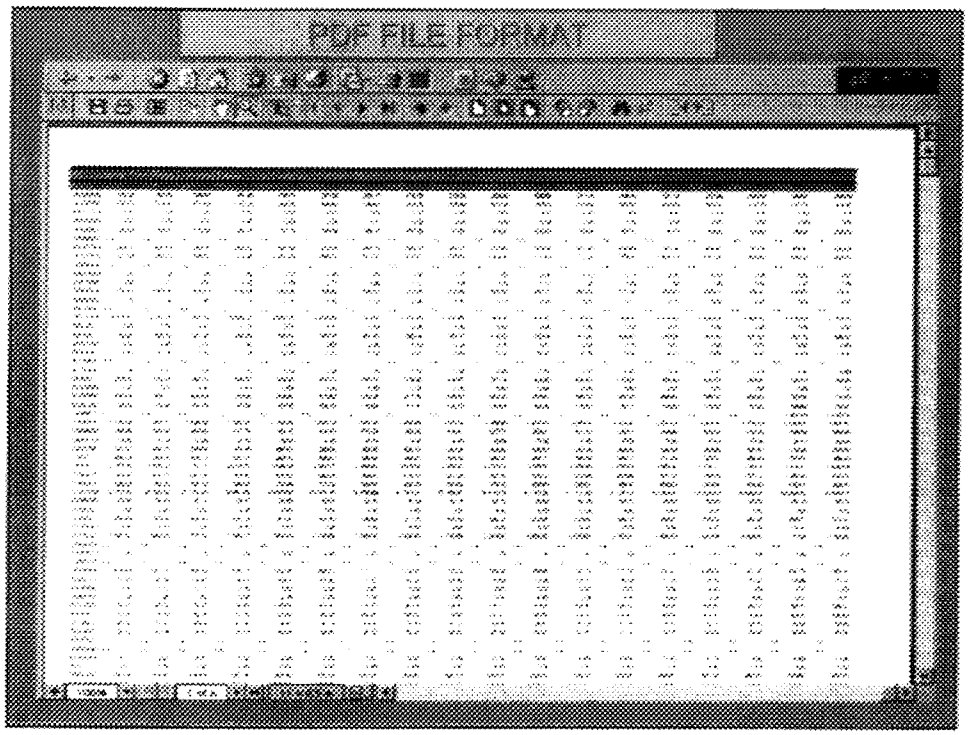
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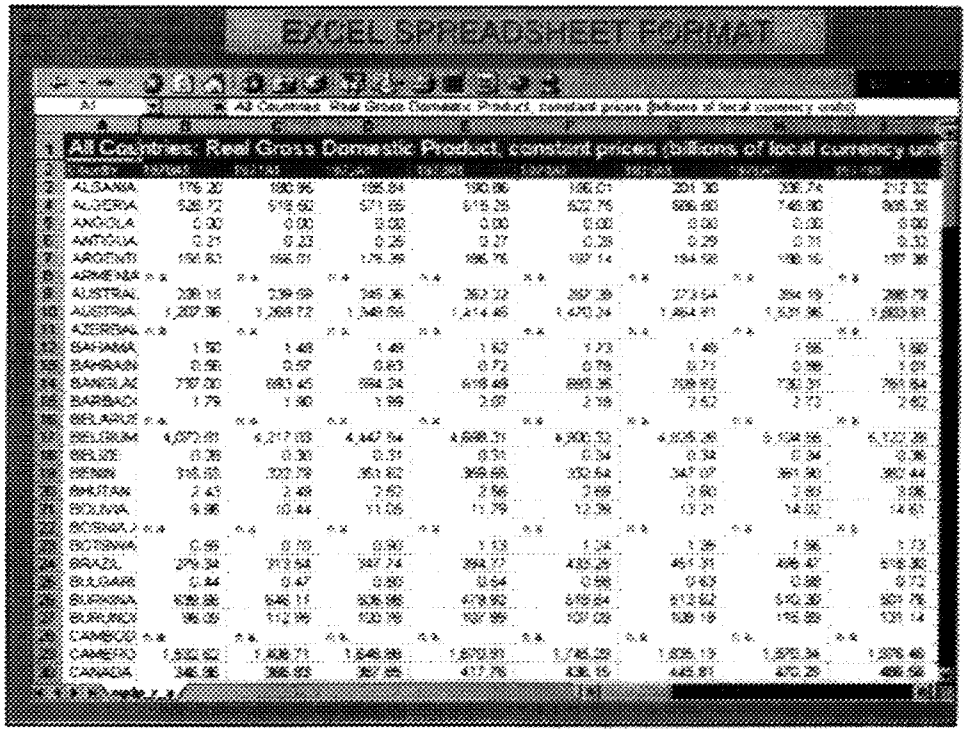
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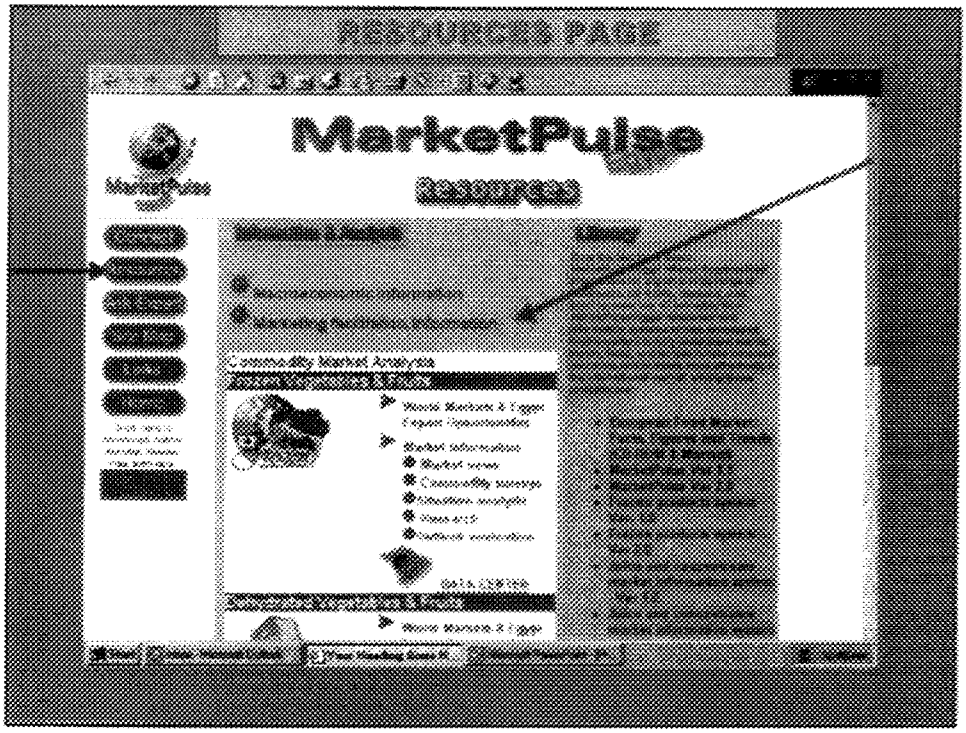
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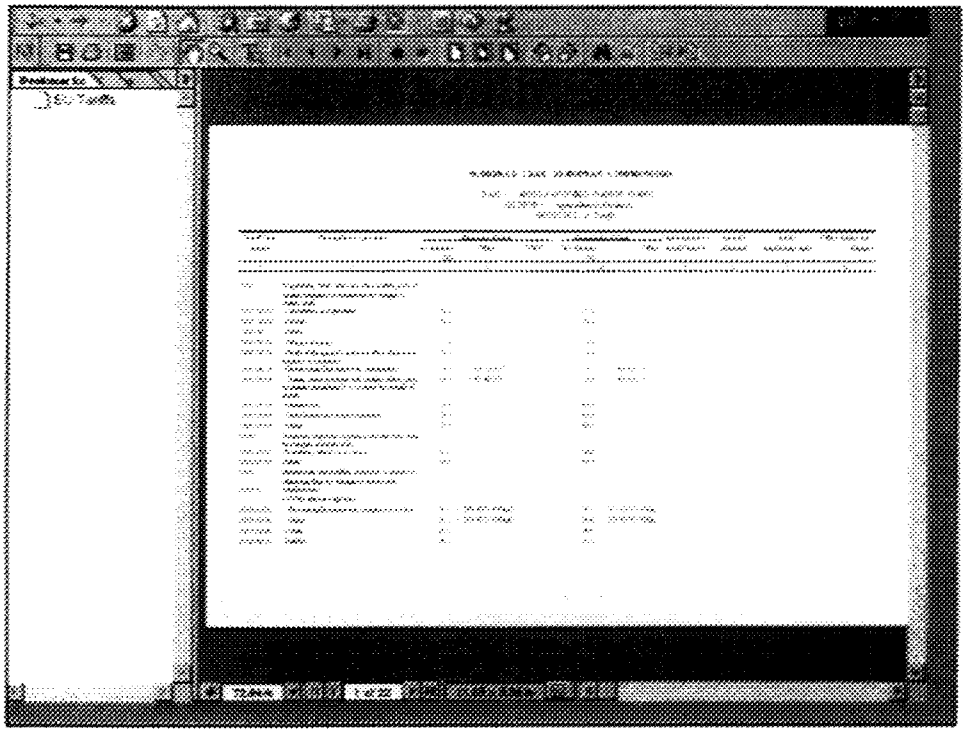
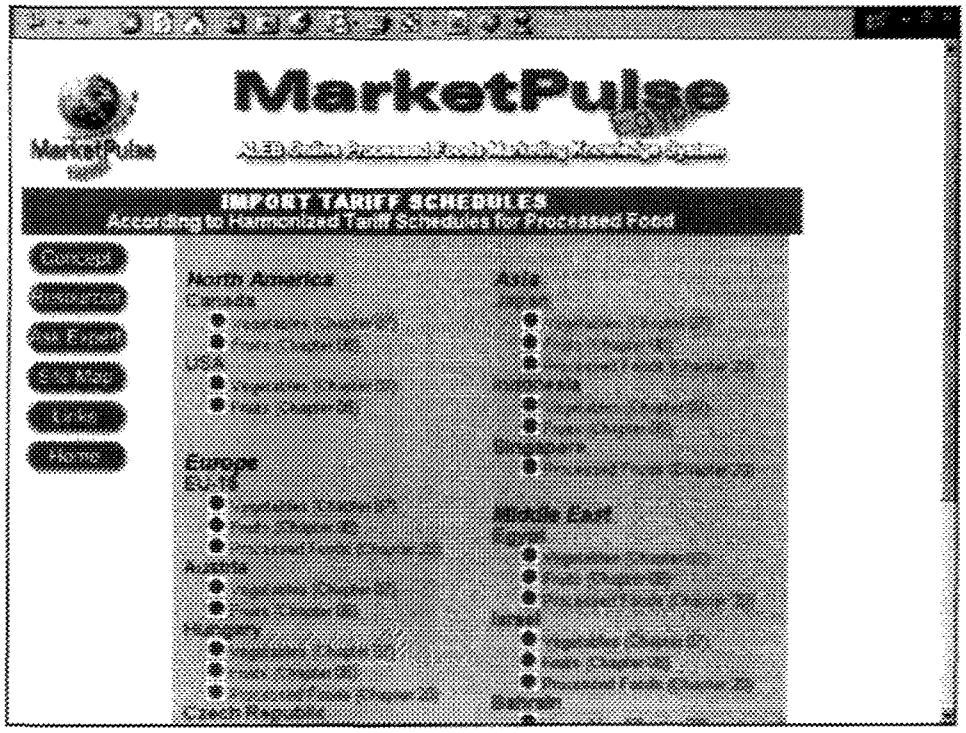
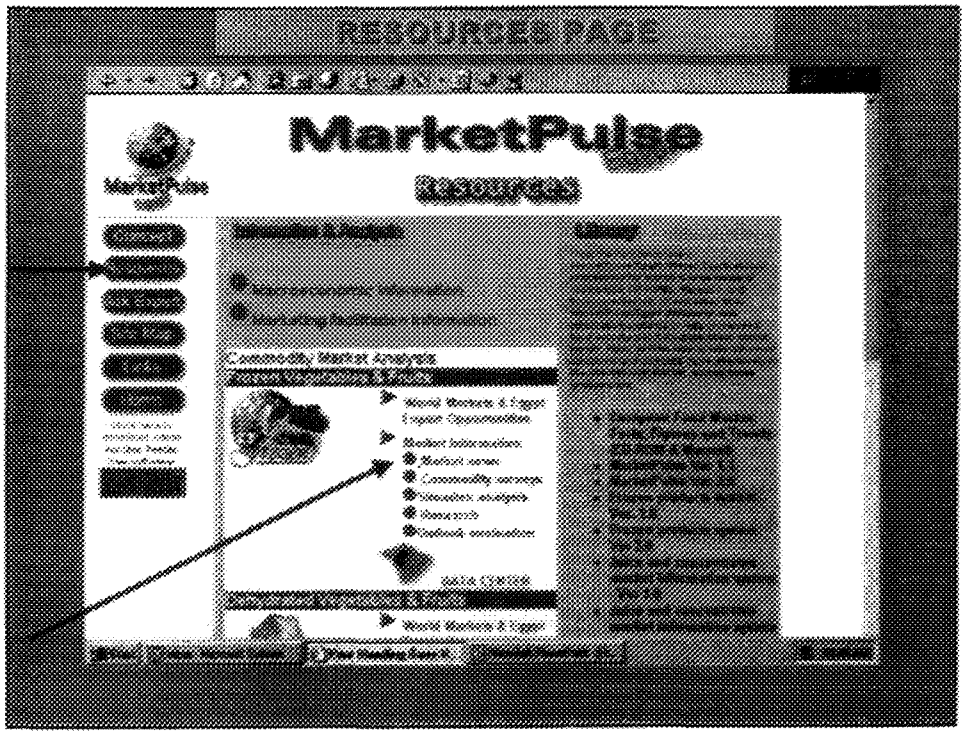



MarketPulse
IMPORT TARIFF SCHEDULES
North America
Europe
Asia
Middle East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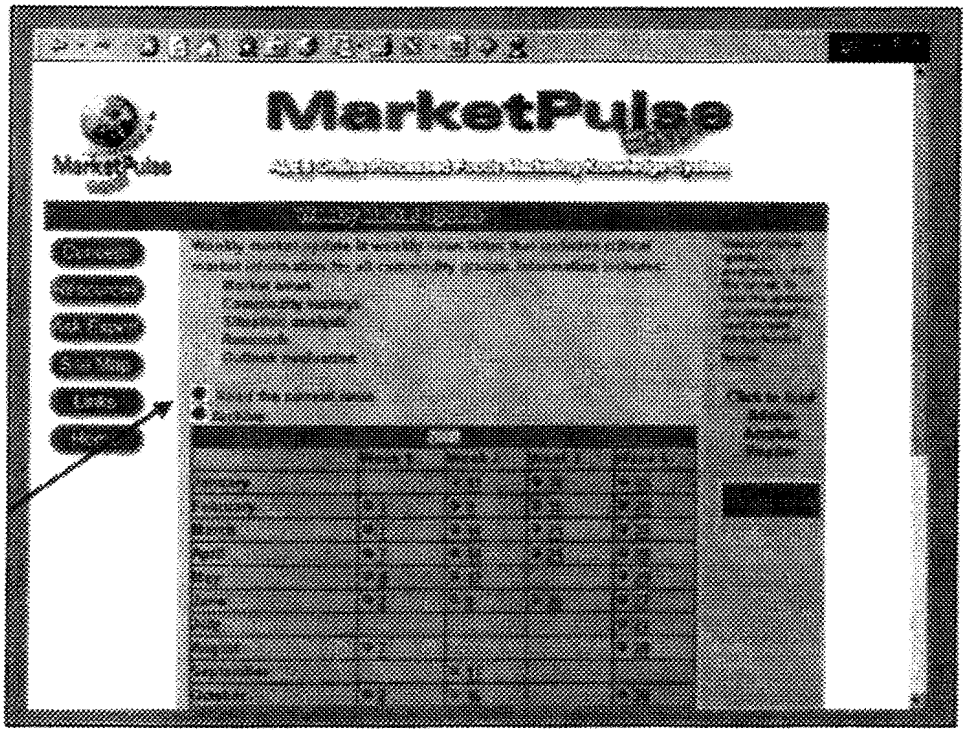
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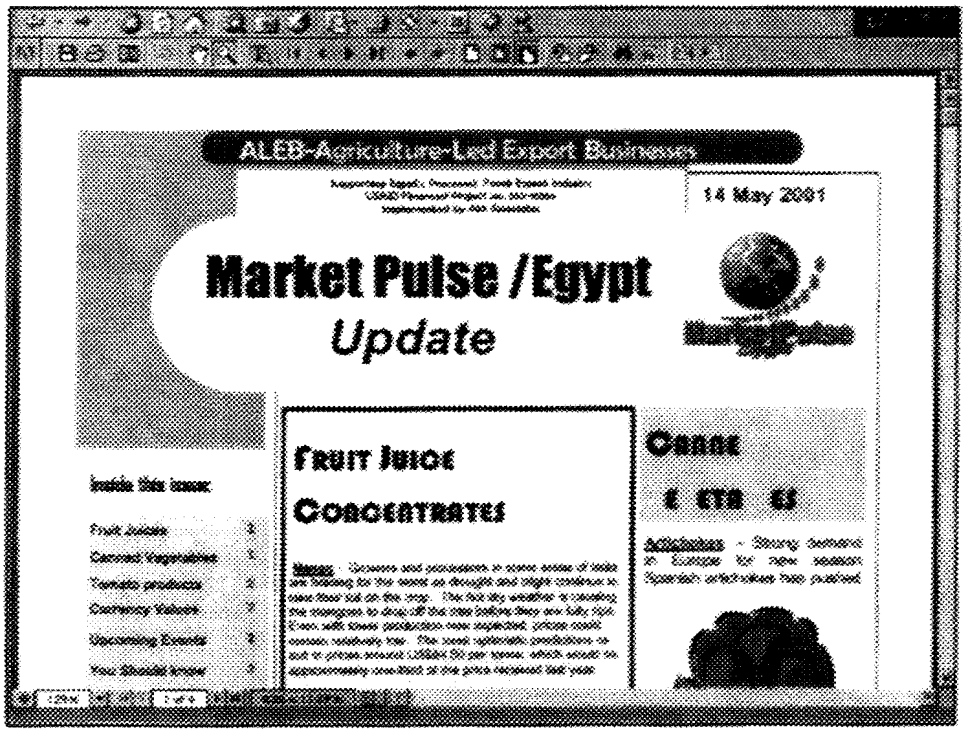
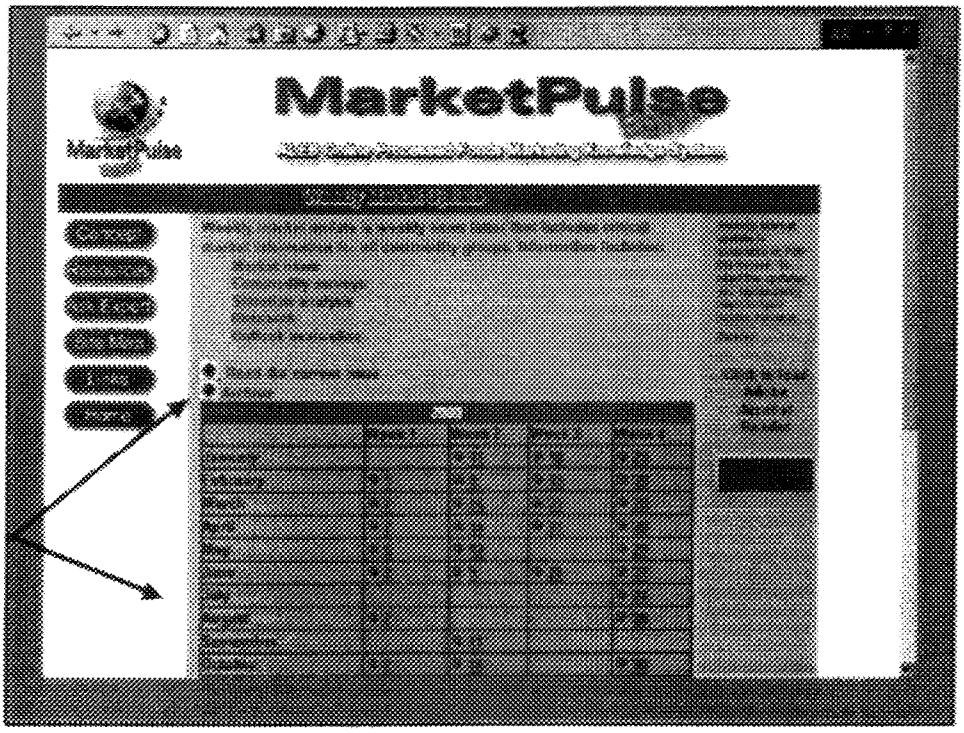

ALEB-Agriculture-Led Export Business
14 May 2001
Market Pulse /Egypt
Update
Fruit Juice
Concentrates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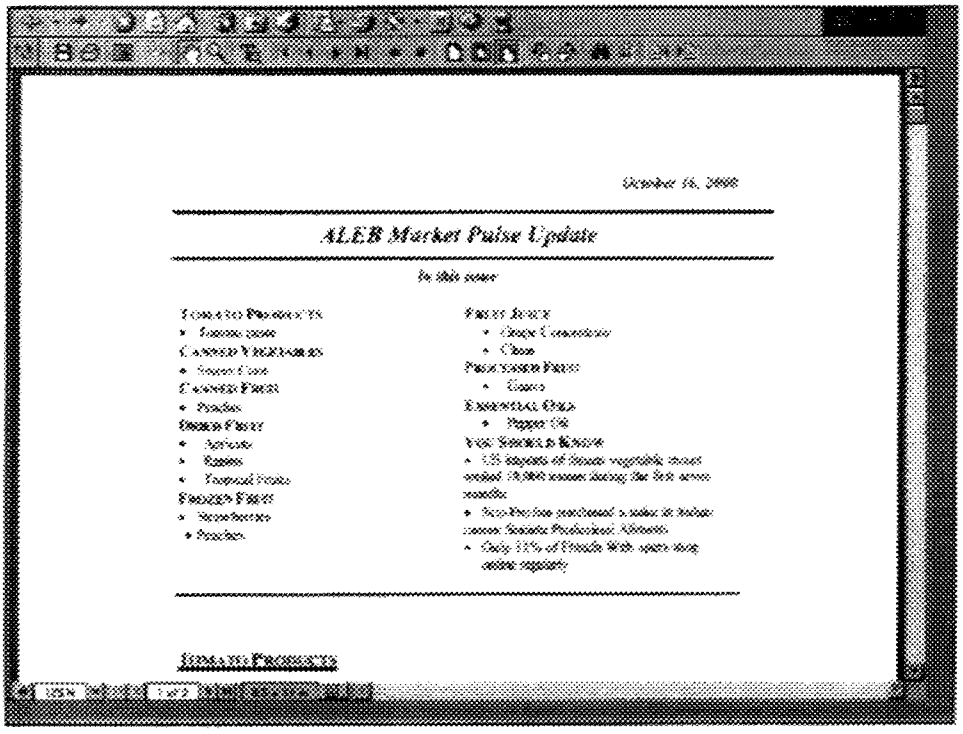
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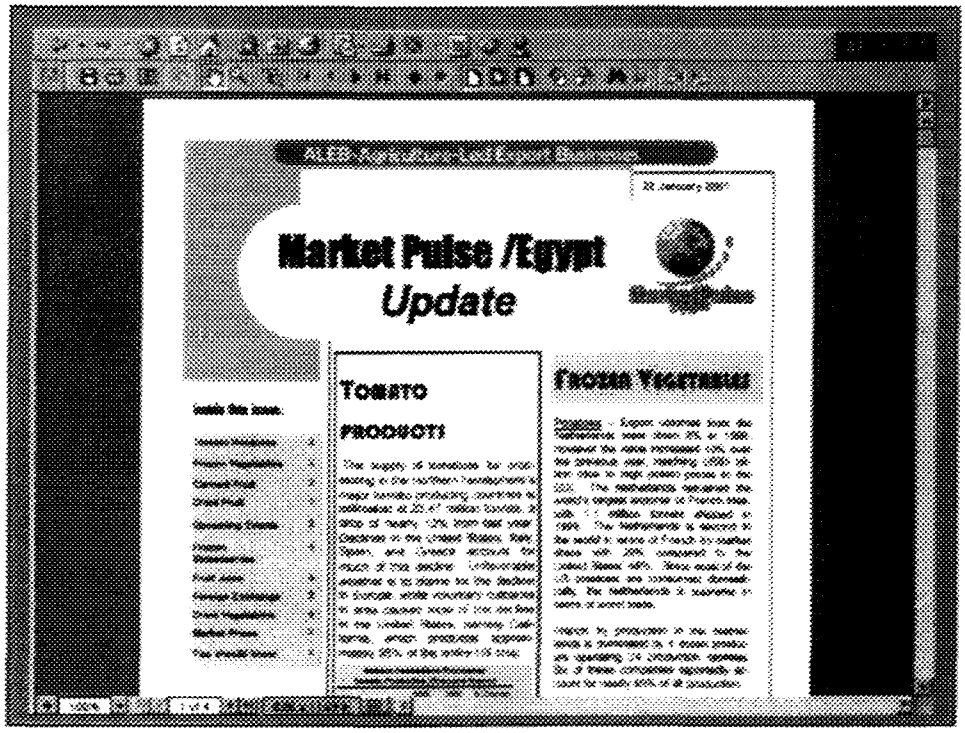
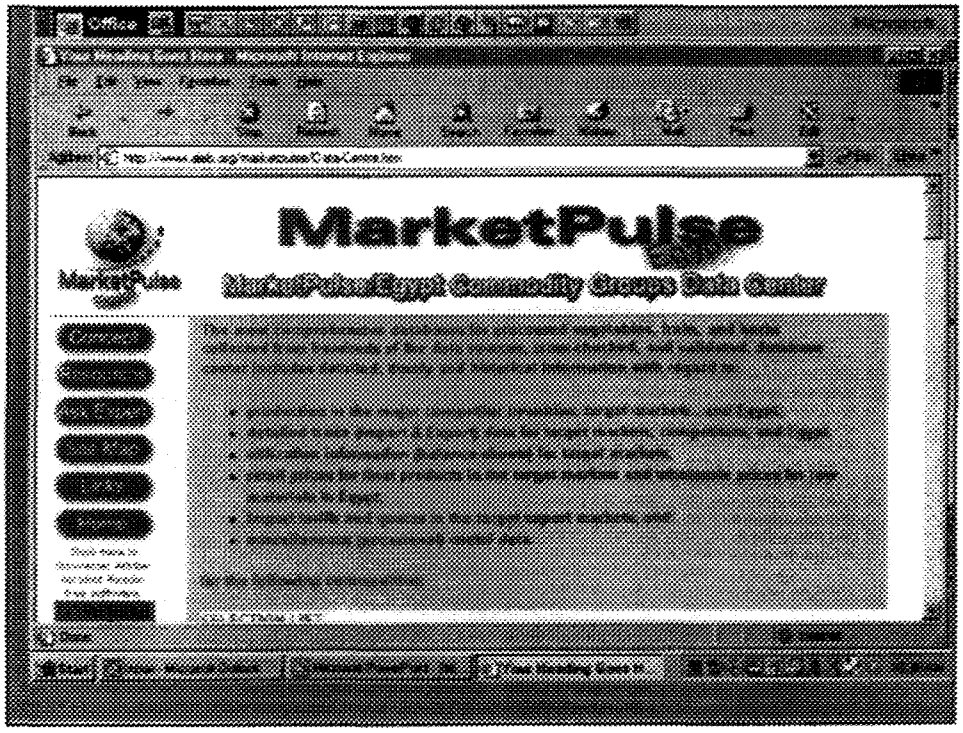

Market Pulse /Egypt
Update
TOMATO
PRODUCTS
FROZEN VEGETABLES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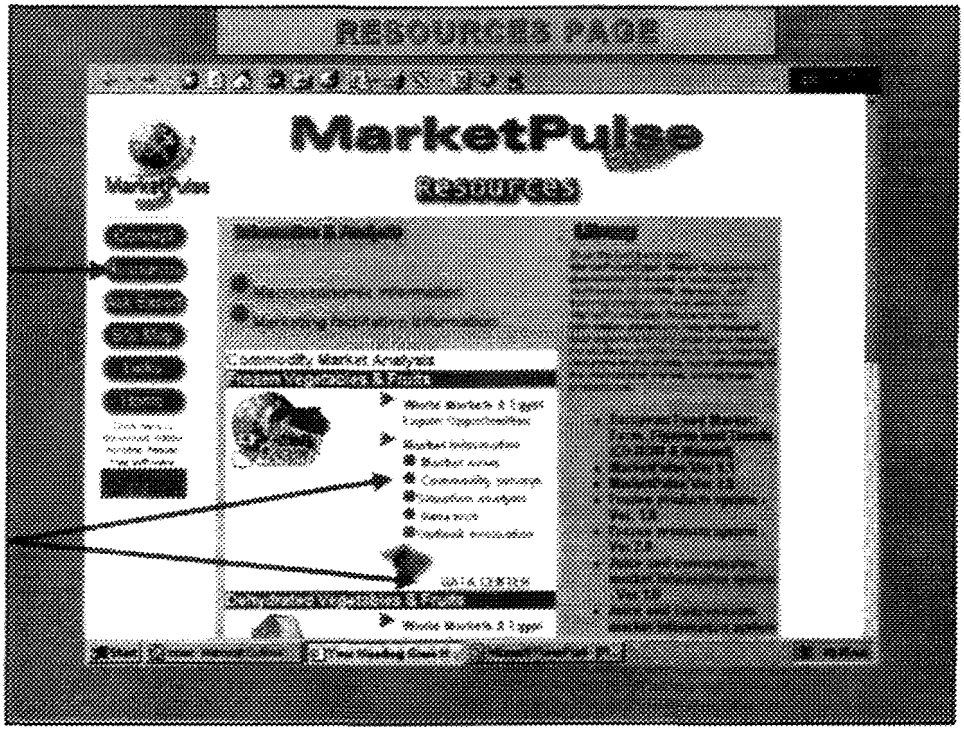
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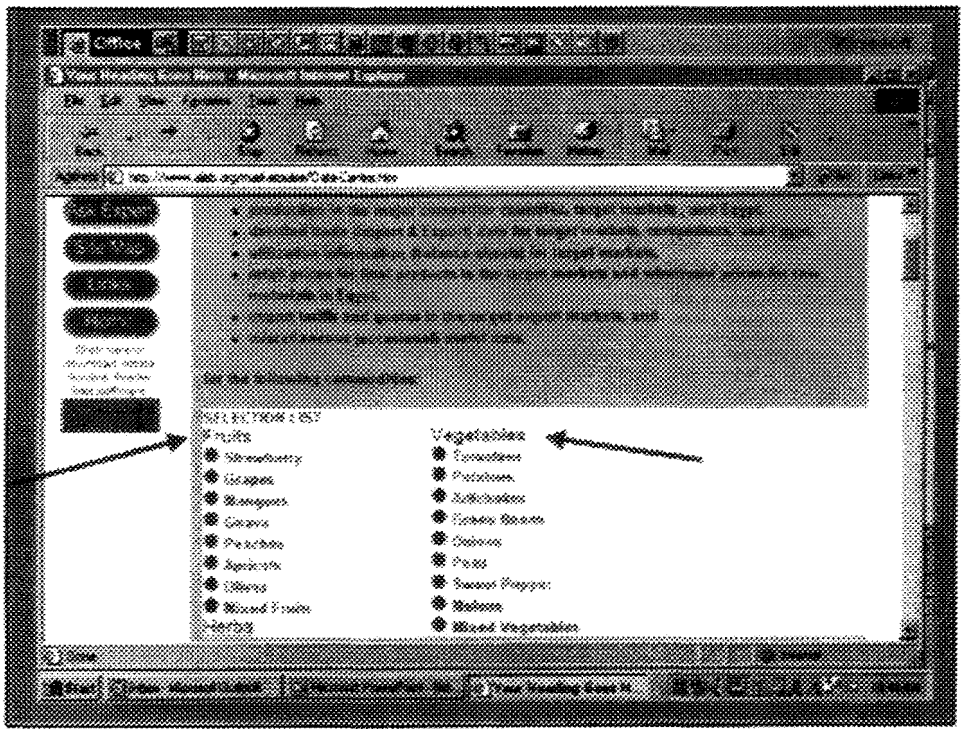

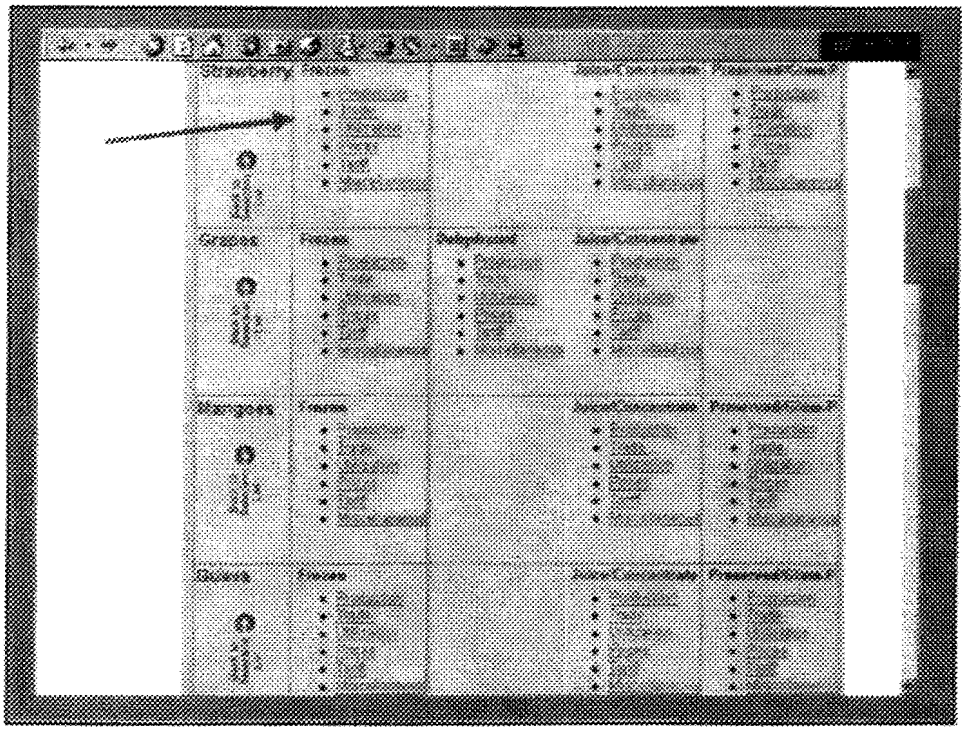

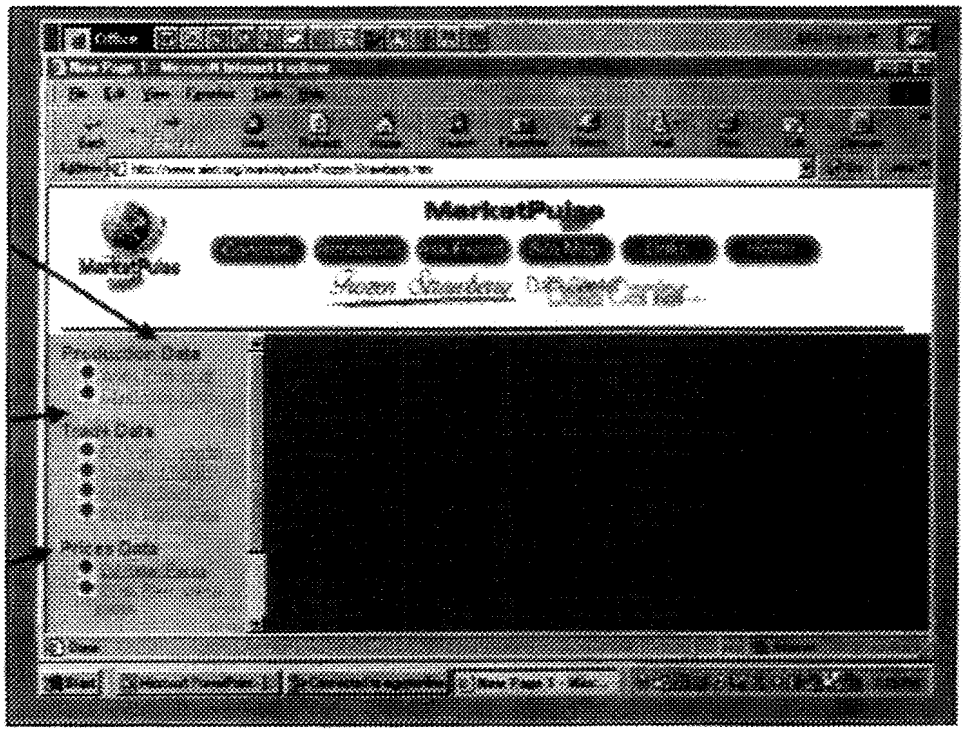
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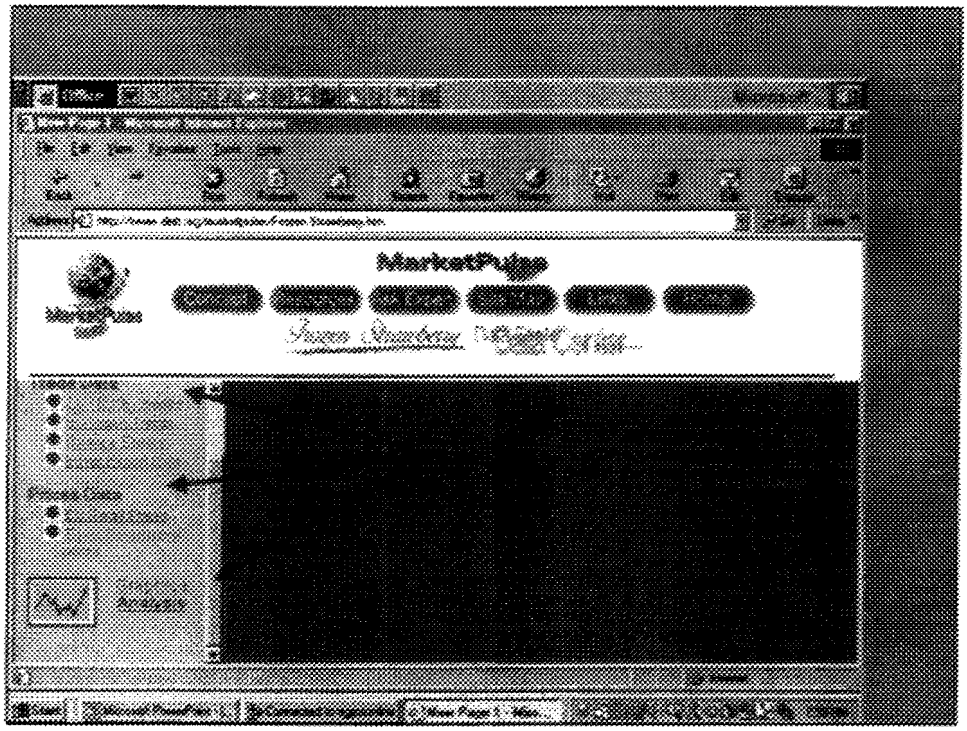
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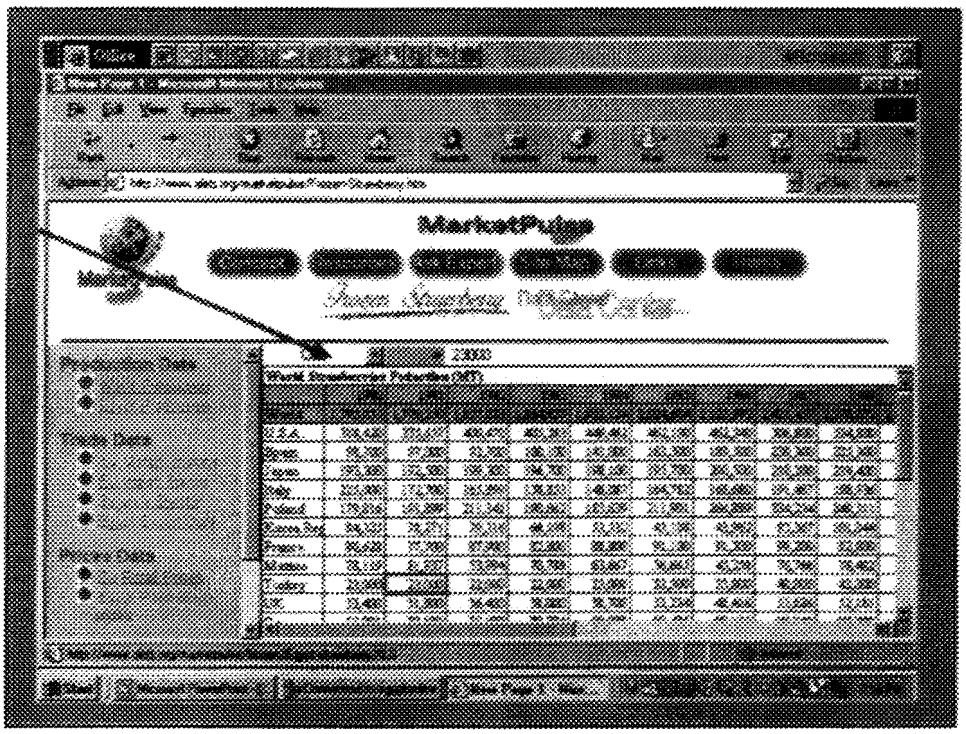
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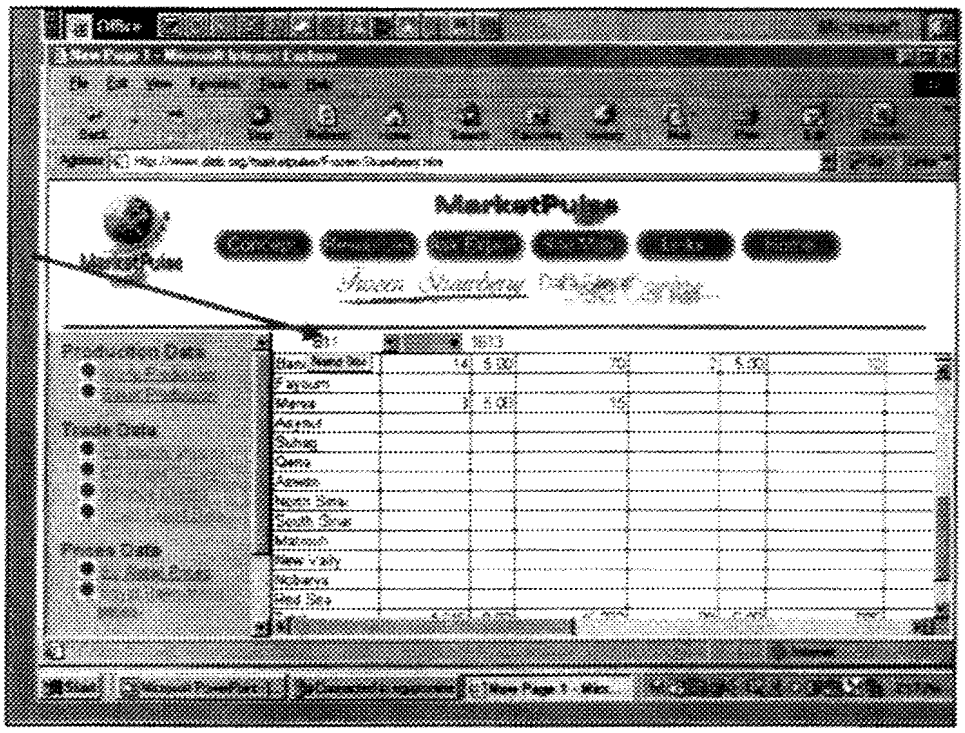
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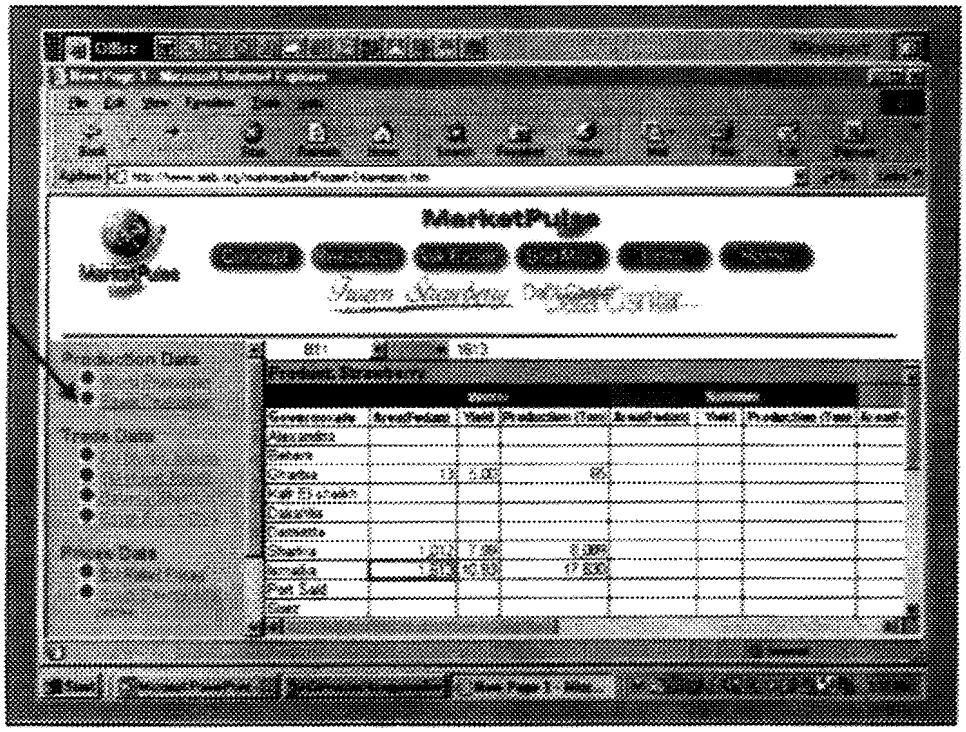
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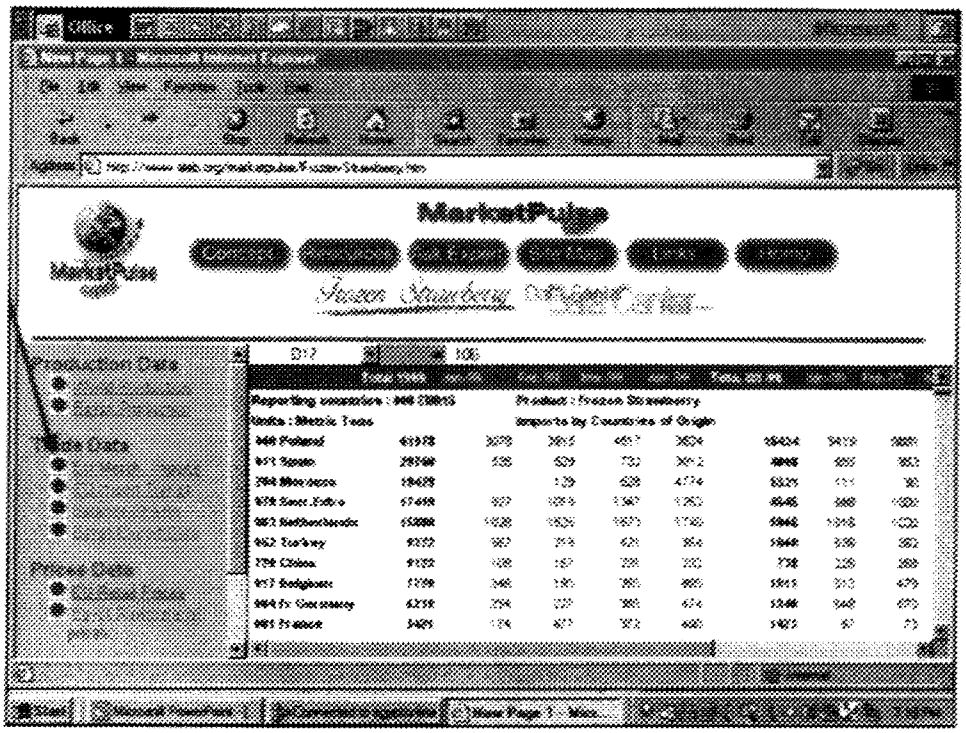
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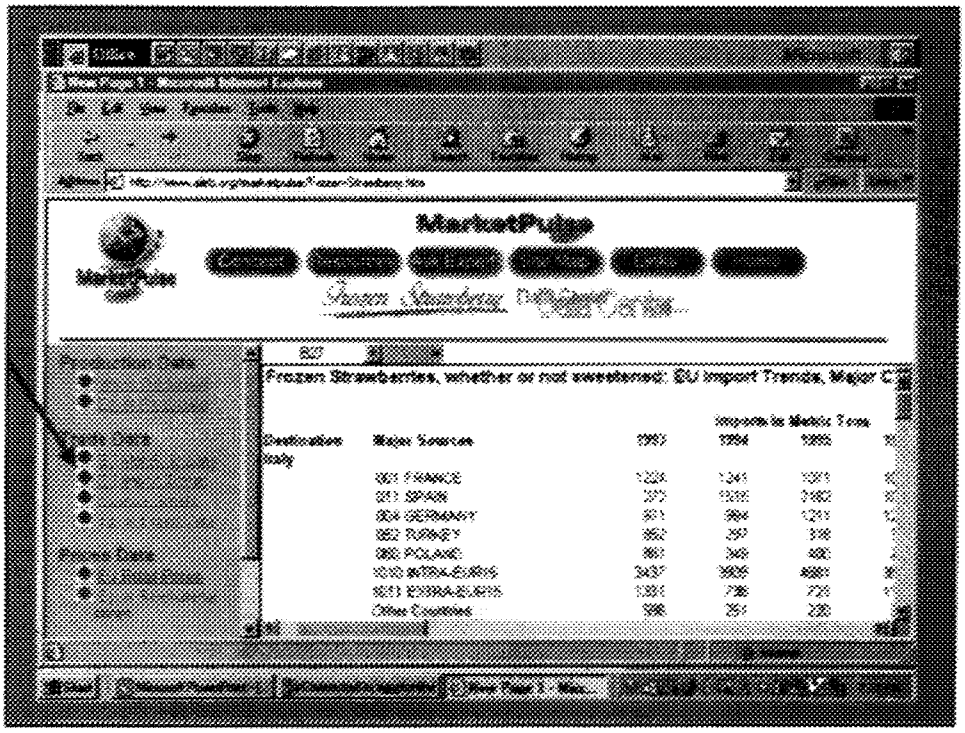
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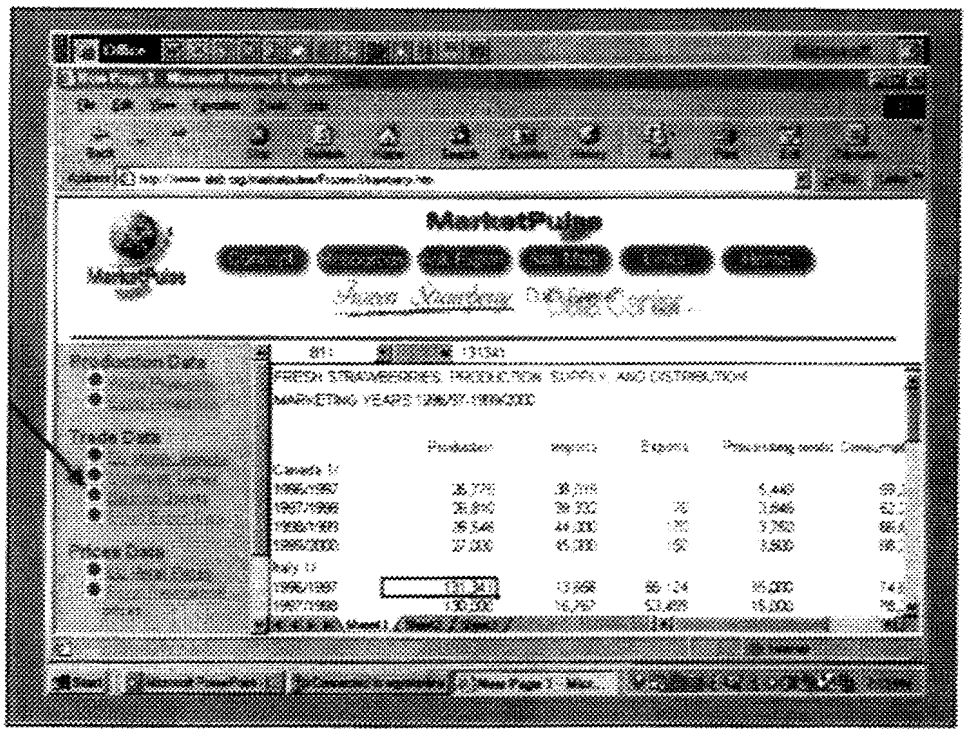
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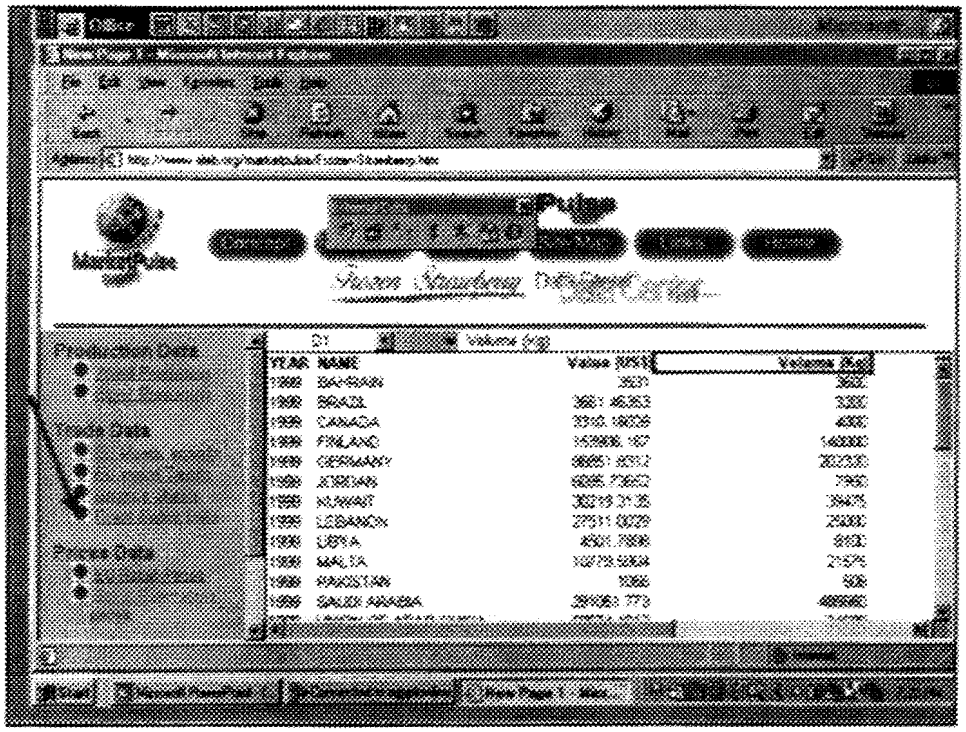
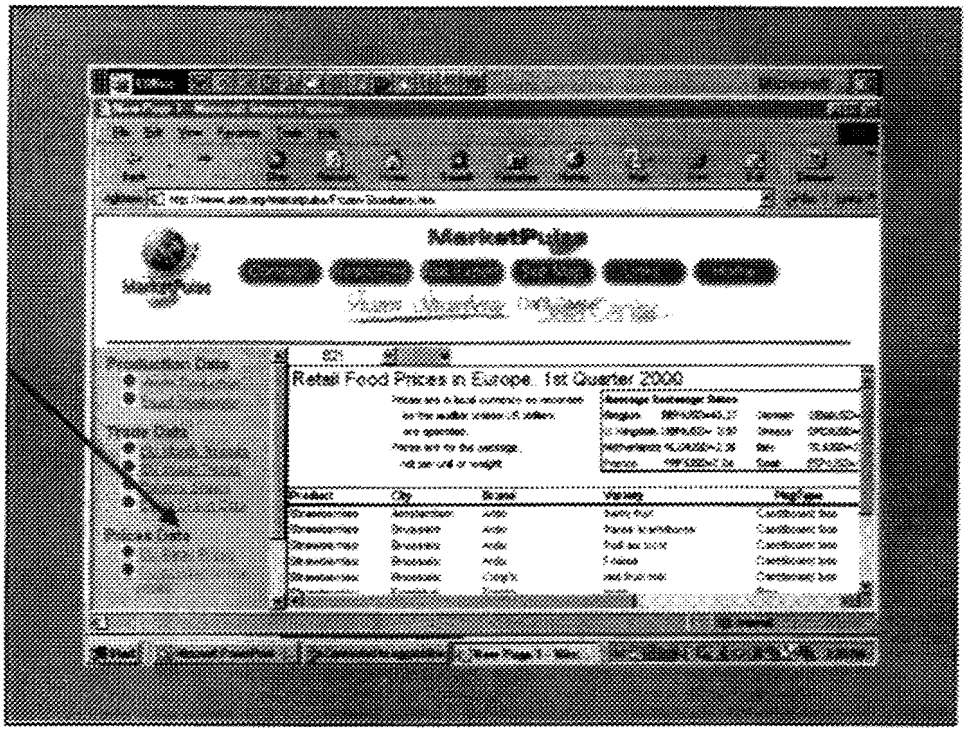
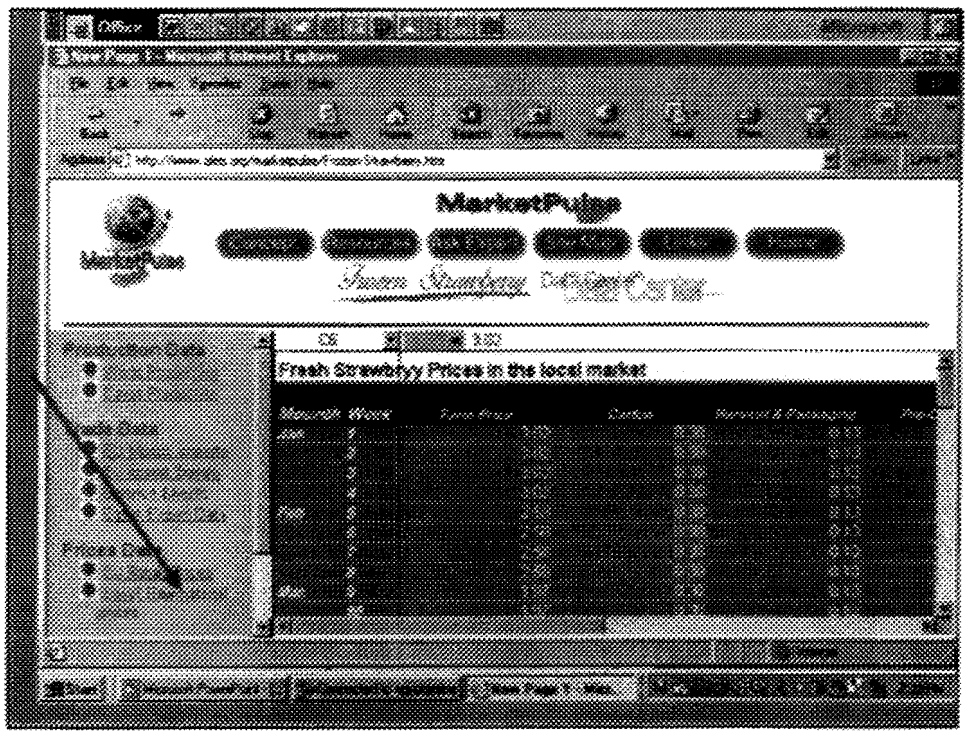
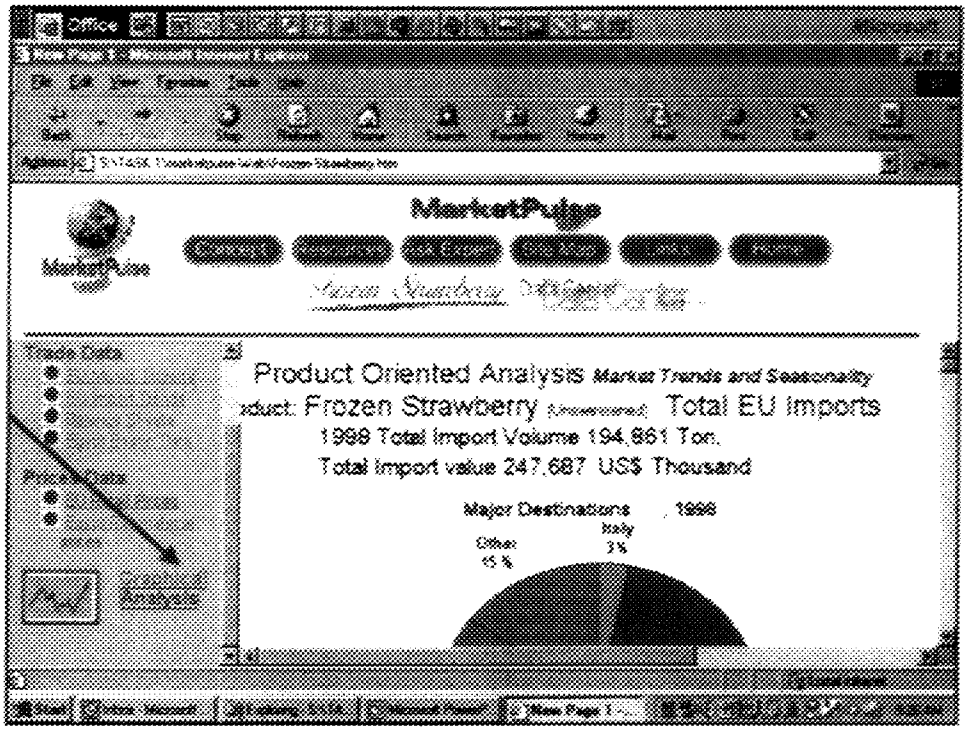
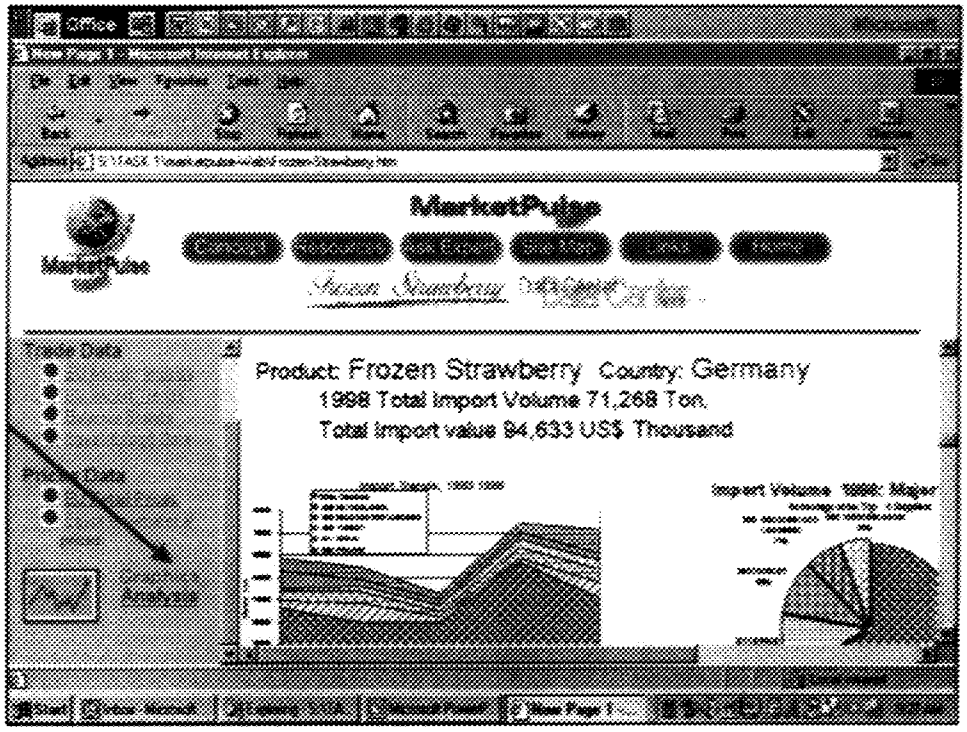
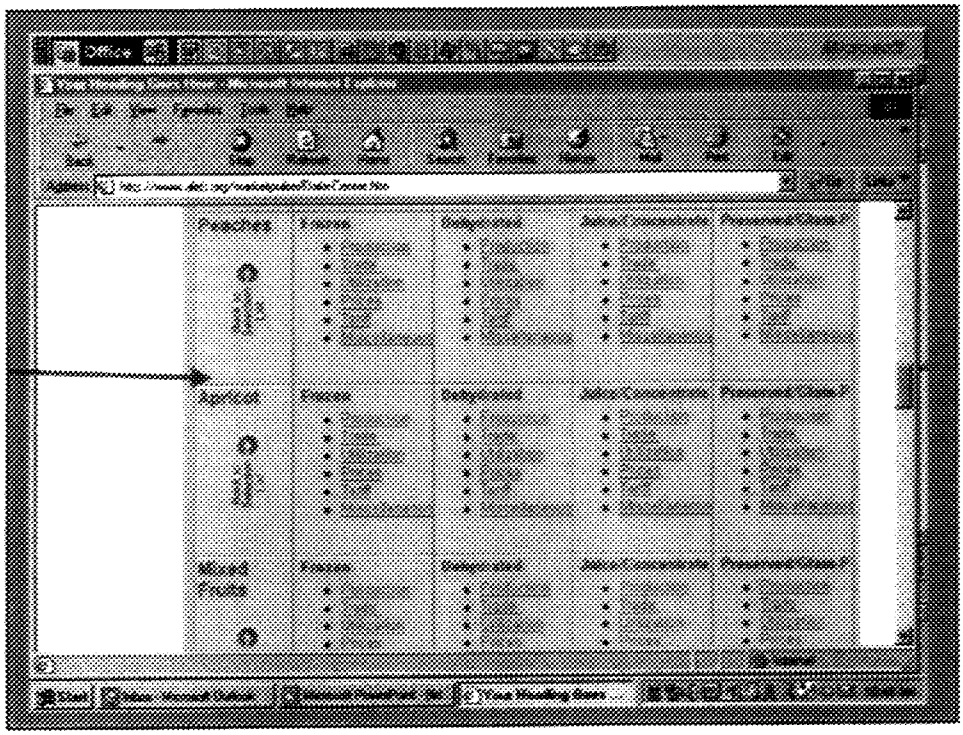


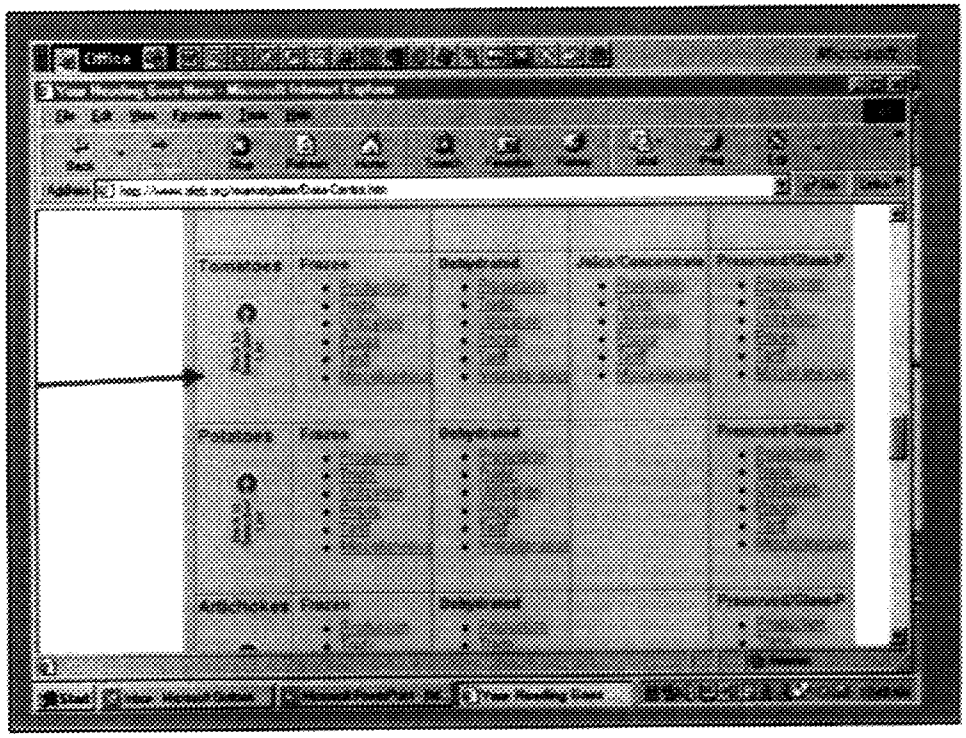

MarketPrice
Retail Food Prices in Europe, 1st Quarter 2000

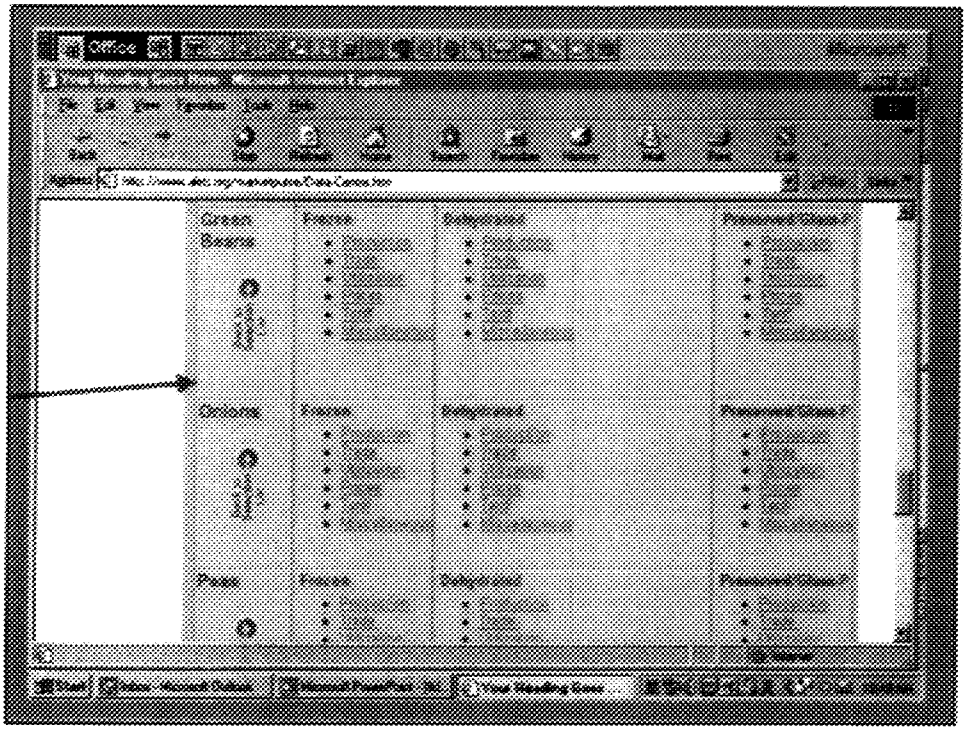

MarketPrice
Fresh Strawbrry Prices in the local market

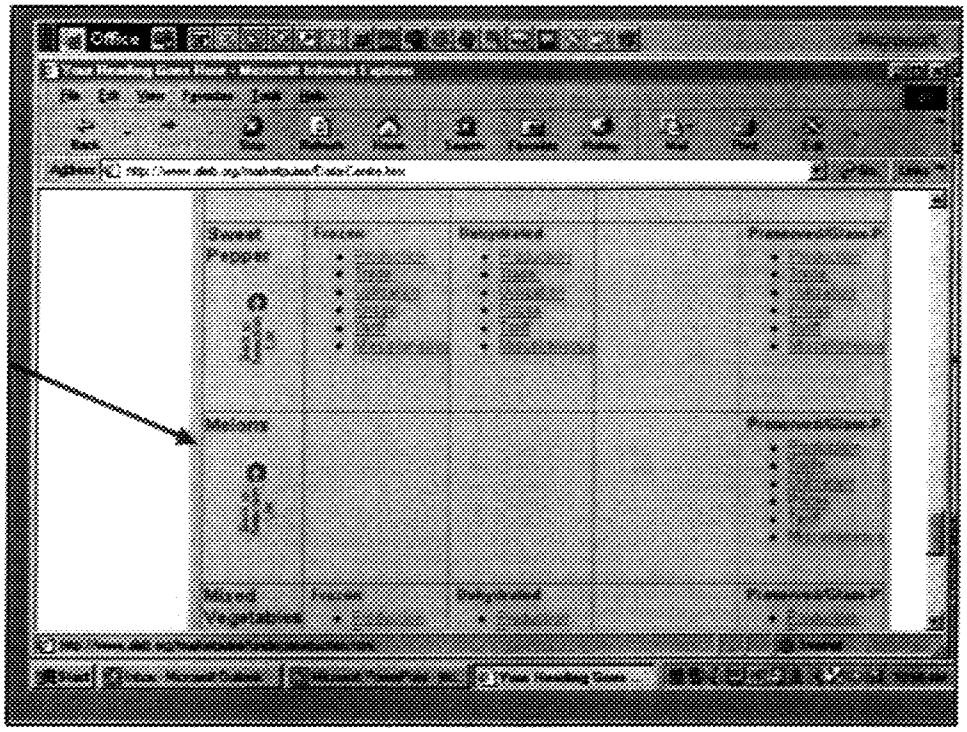

MarketPulse
Product Oriented Analysis Market Trends and Seasonality
Frozen Strawberry Total EU Imports
1998 Total Import Volume 194,861 Ton.
Total Import value 247,687 US$ Thousand
Major Destinations 1998
Italy
3%
Other
45 %

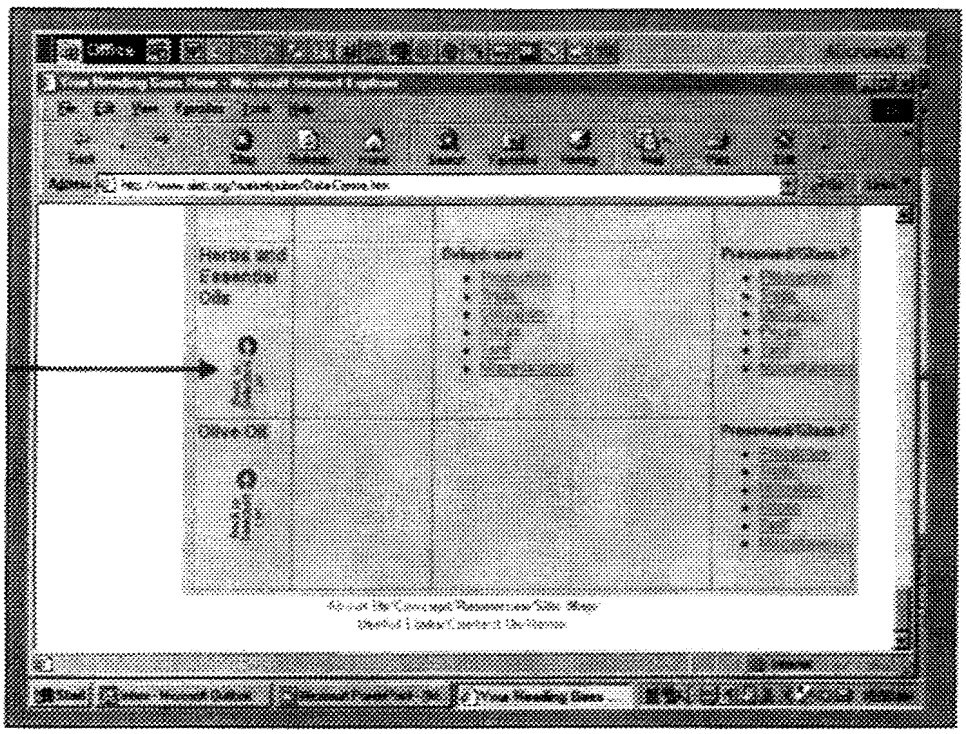

MarketPulse
Product: Frozen Strawberry Country: Germany
1998 Total Import Volume 71,268 Ton.
Total import value 94,633 US$ Thousand

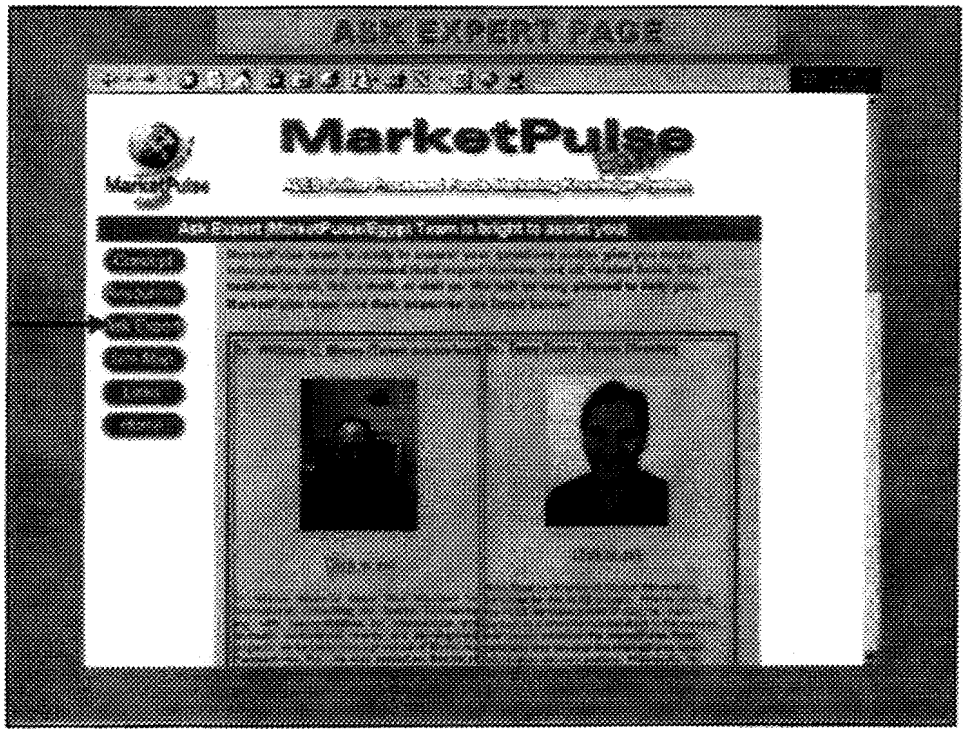








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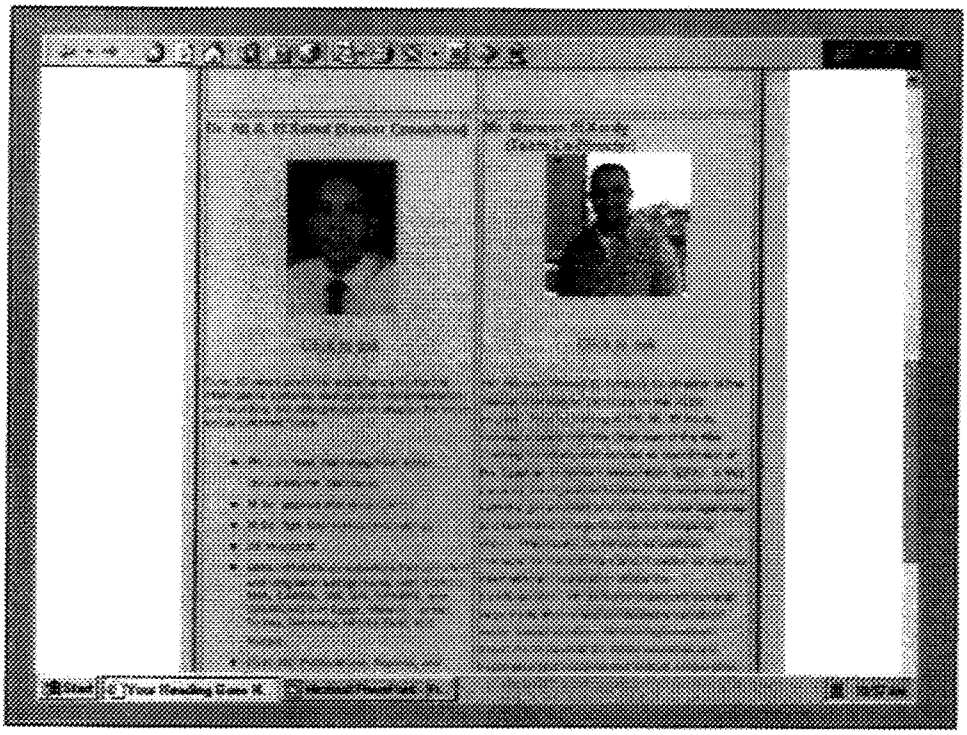

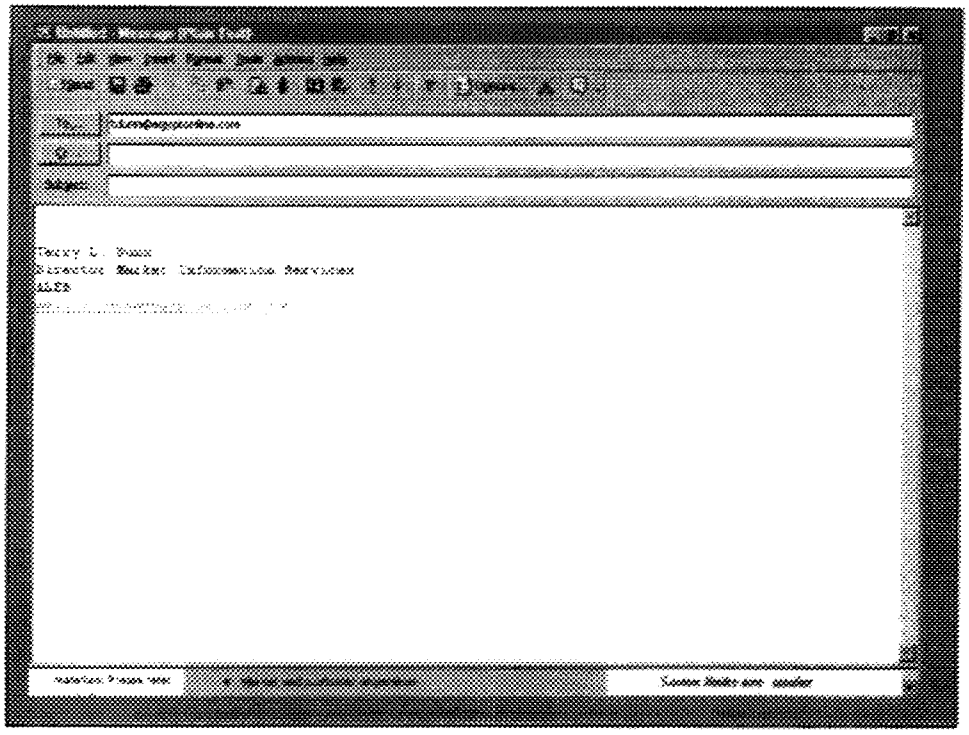

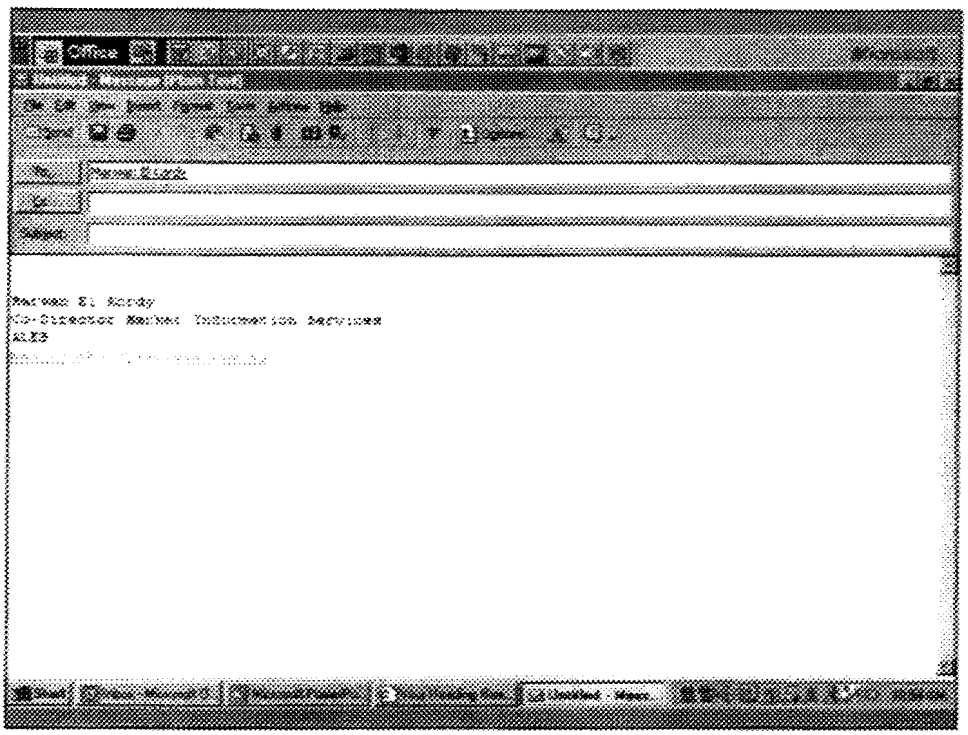

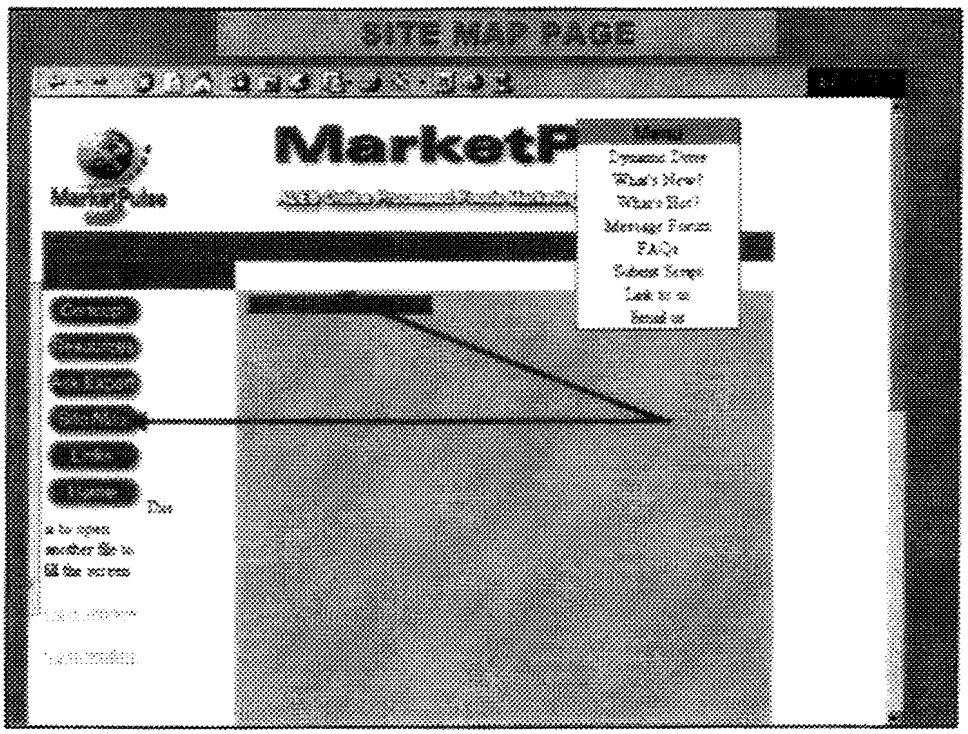
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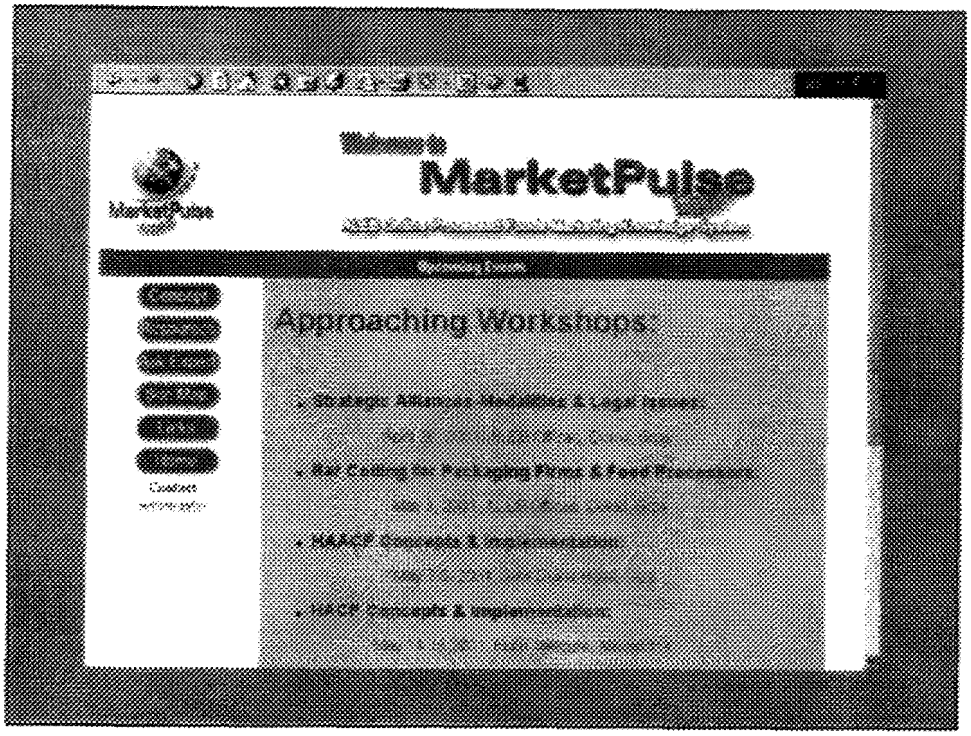
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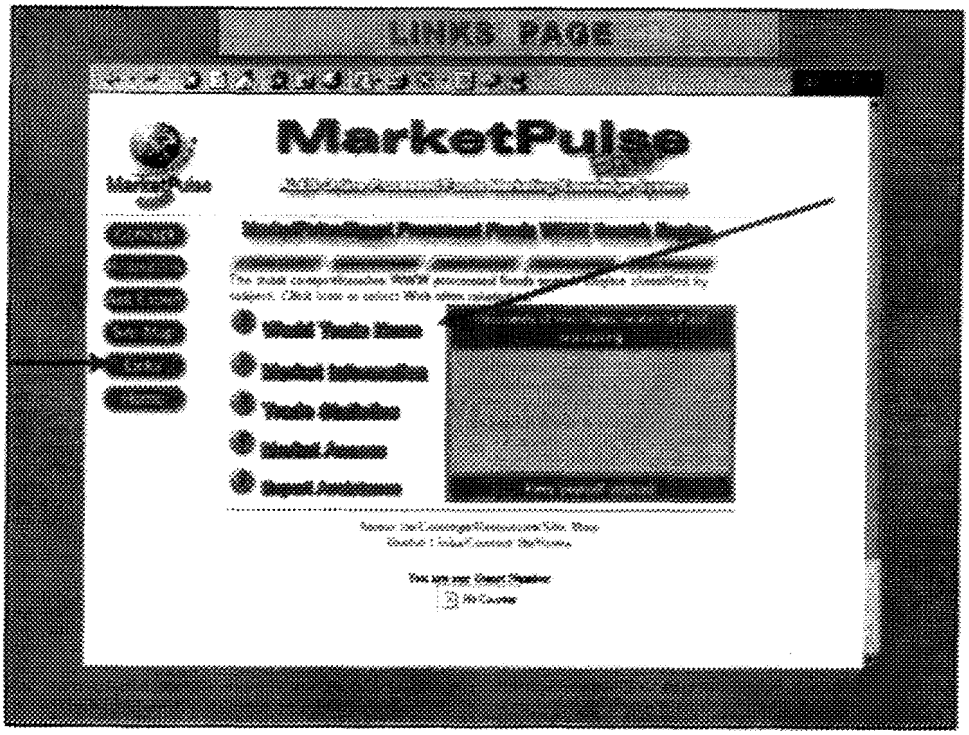
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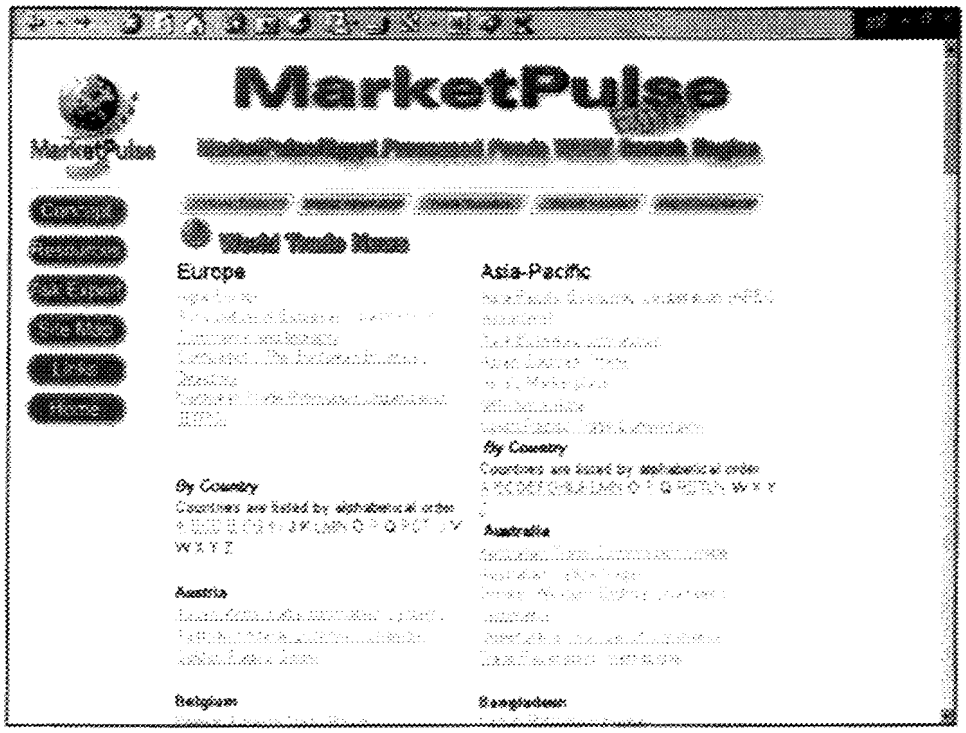
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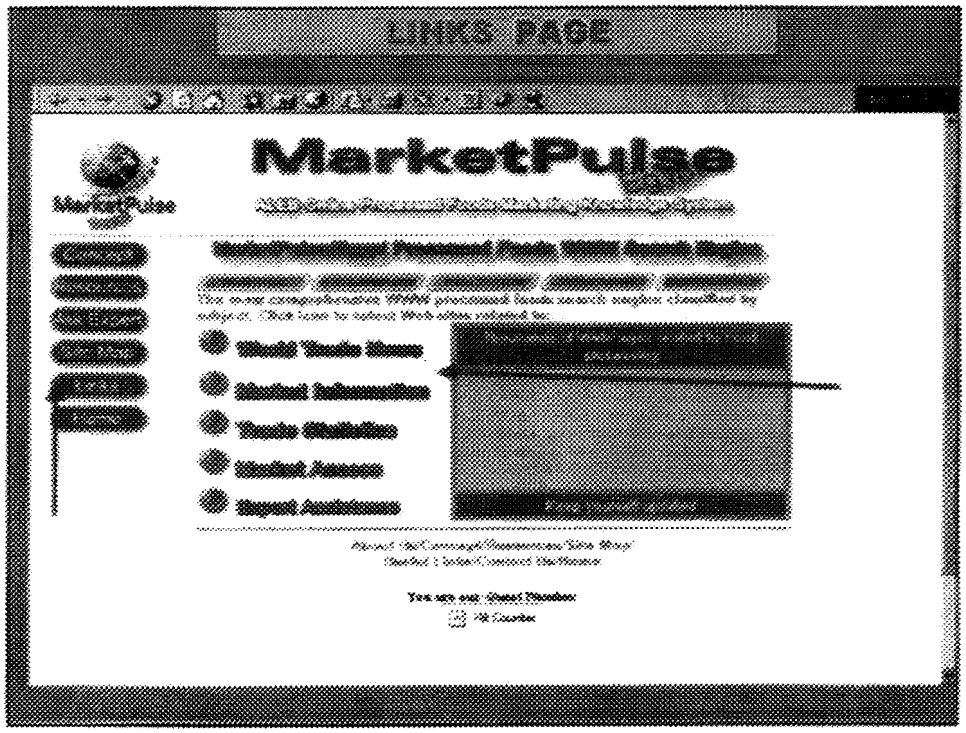
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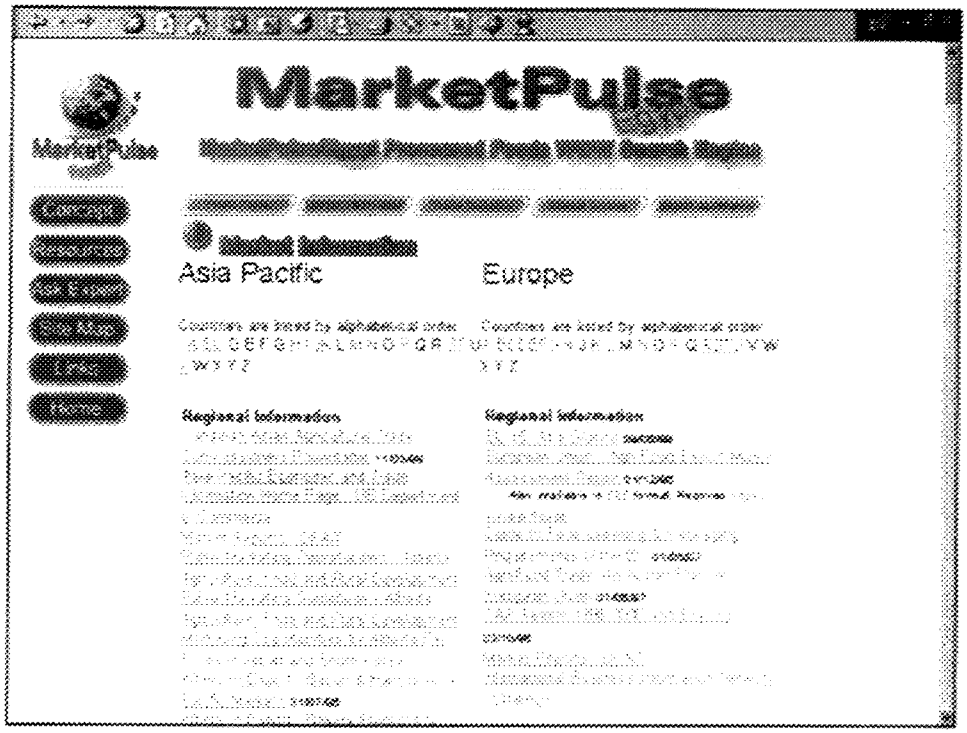
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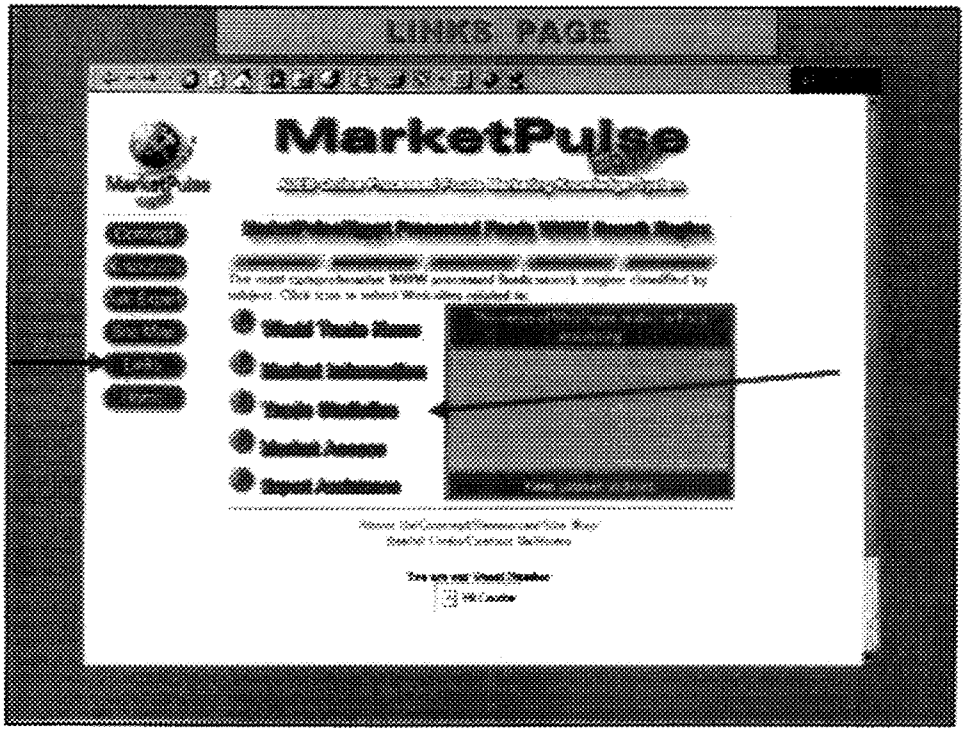
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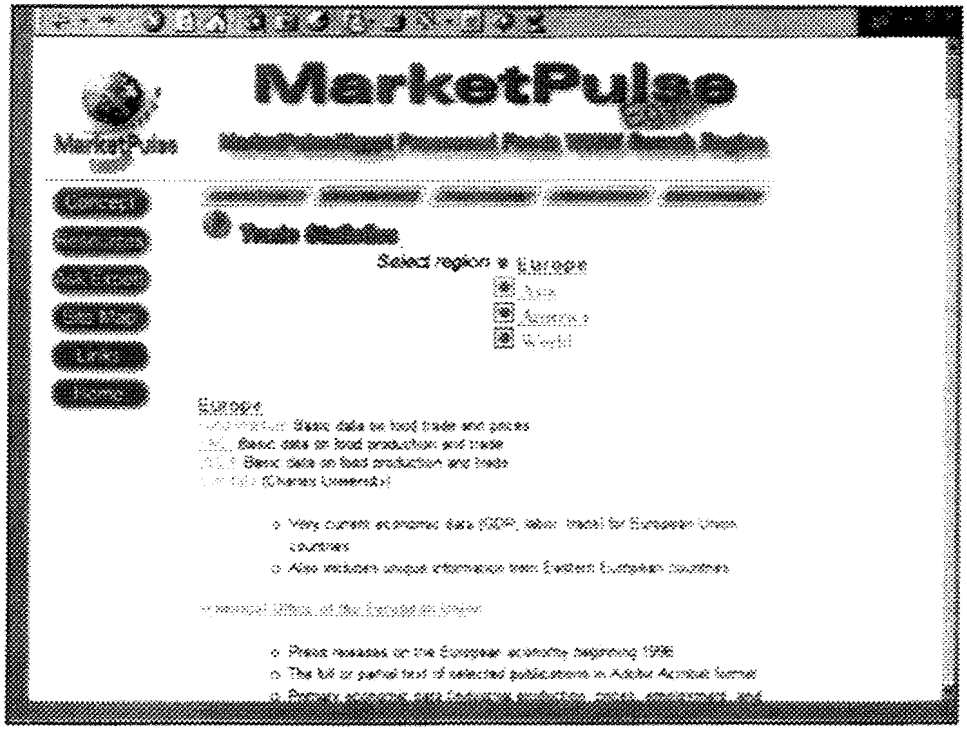
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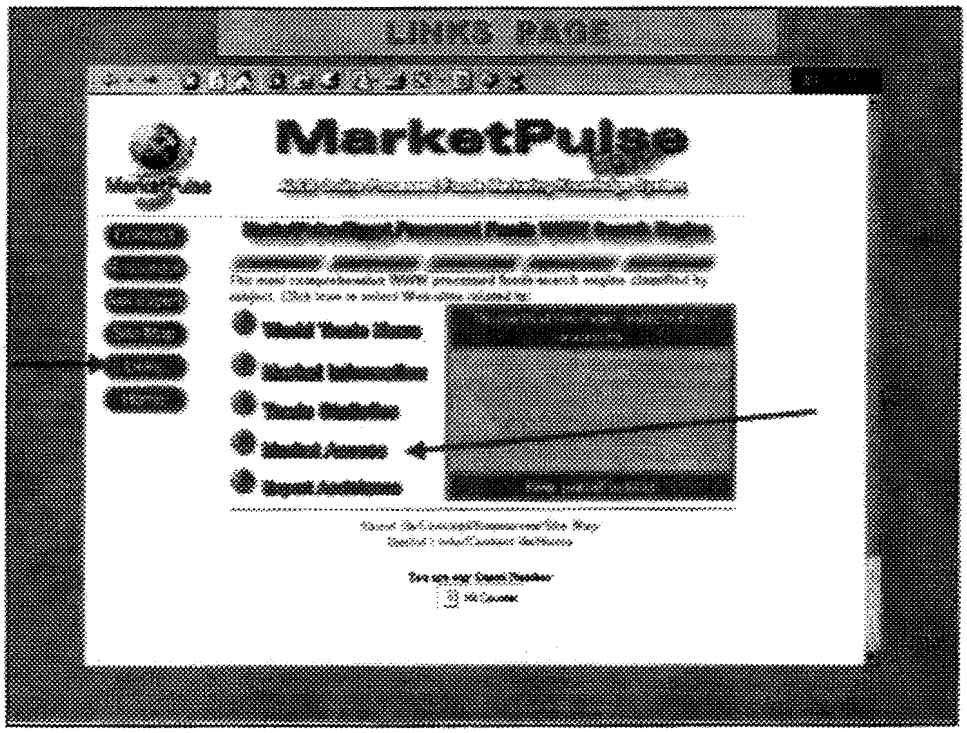
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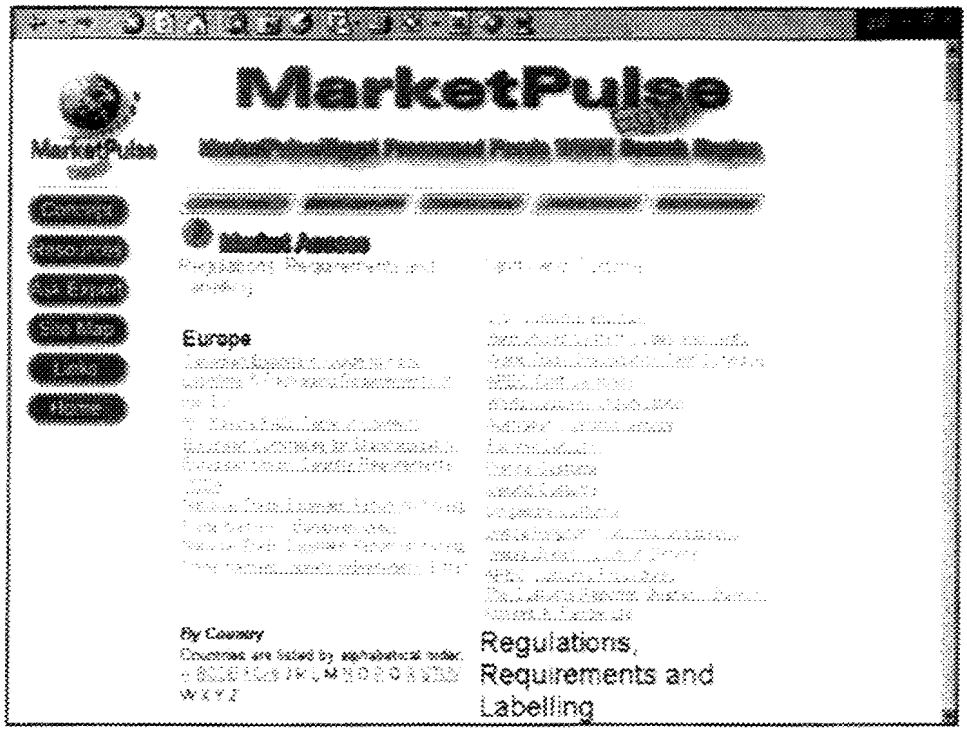
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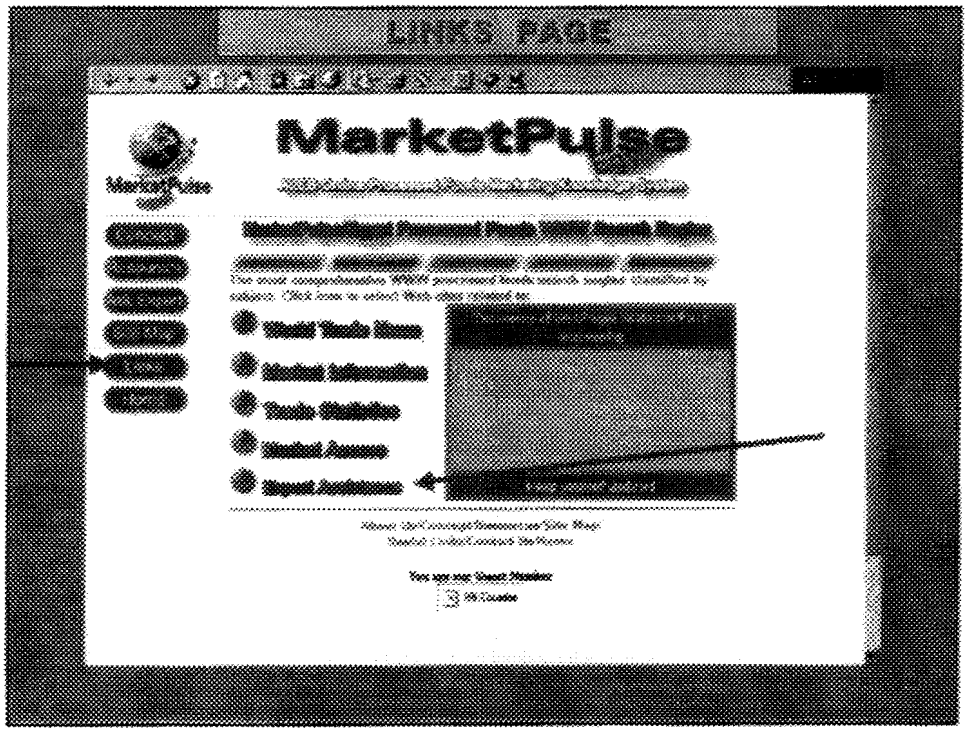
Regulations, Requirements and Labelling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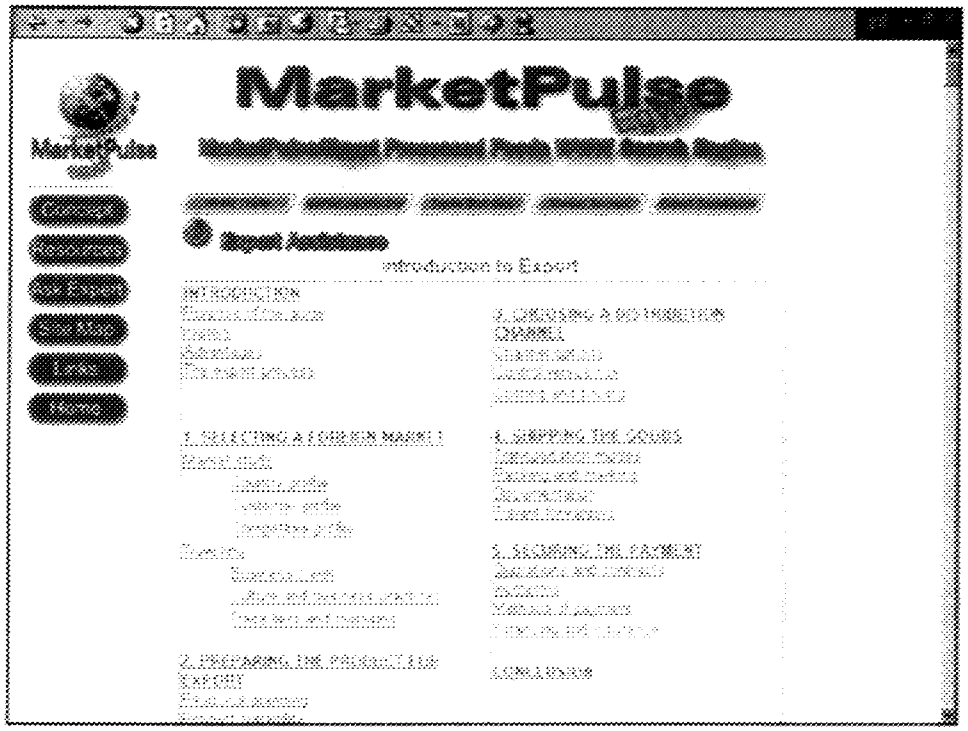
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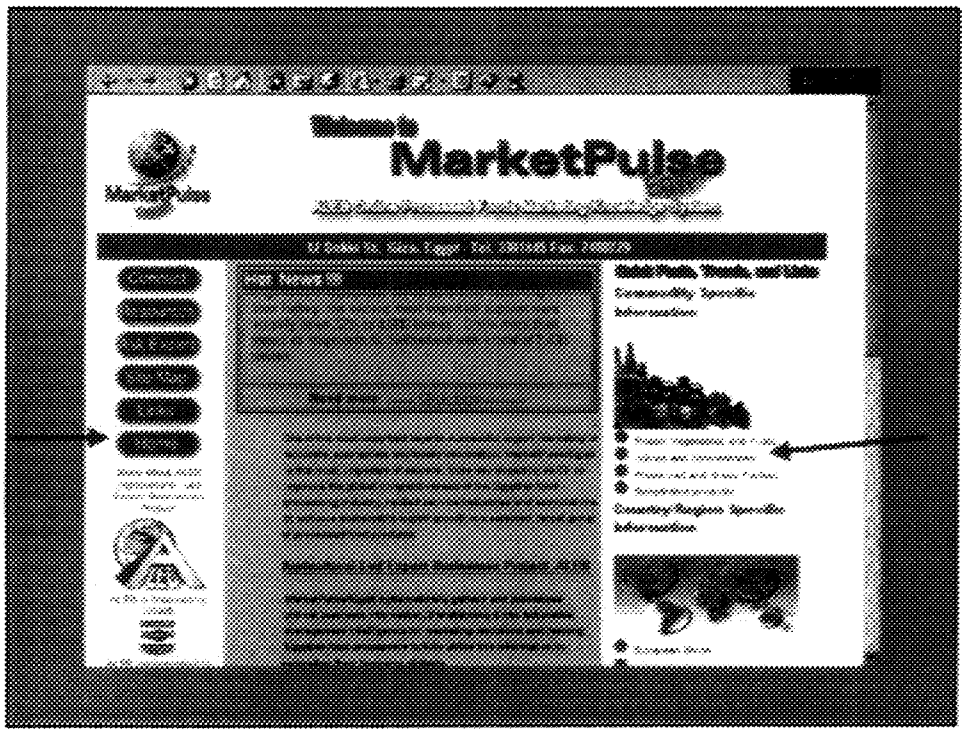
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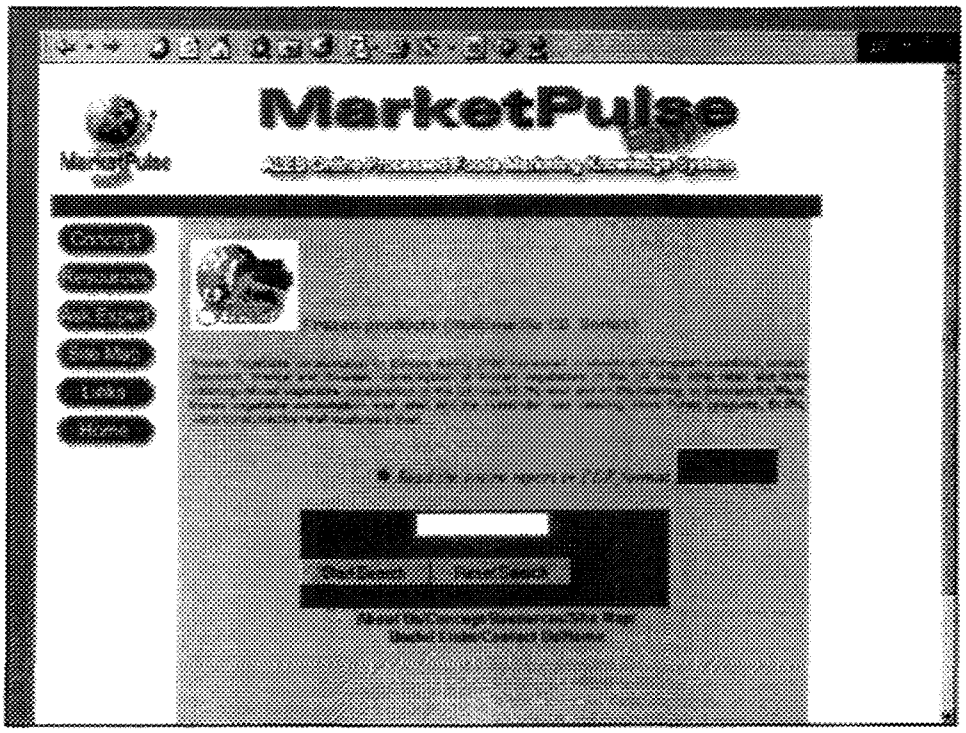
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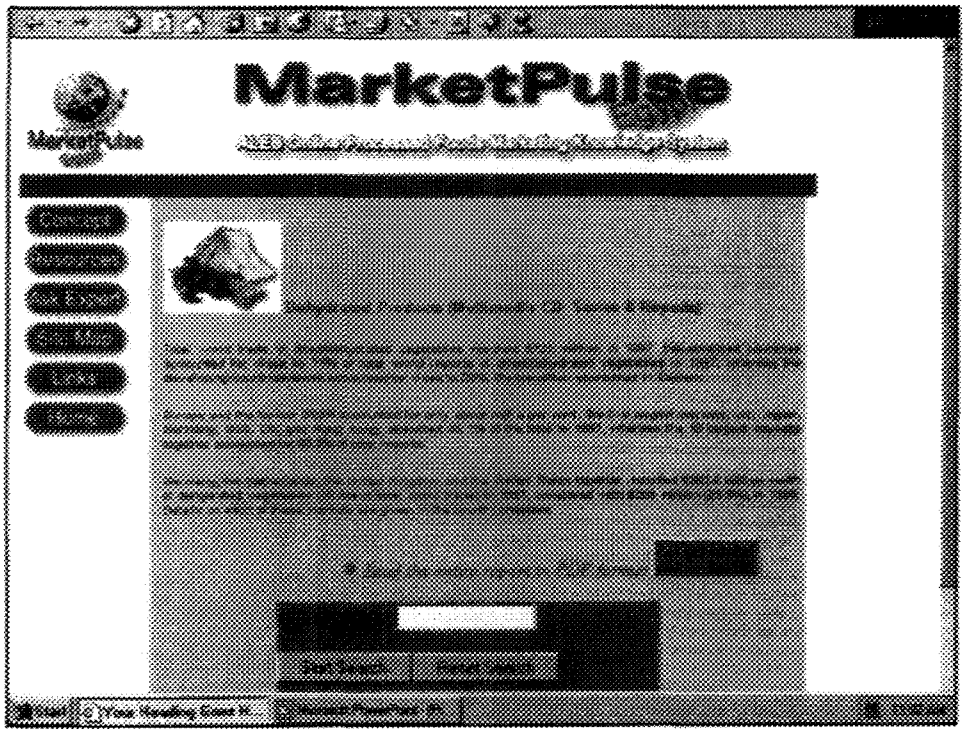
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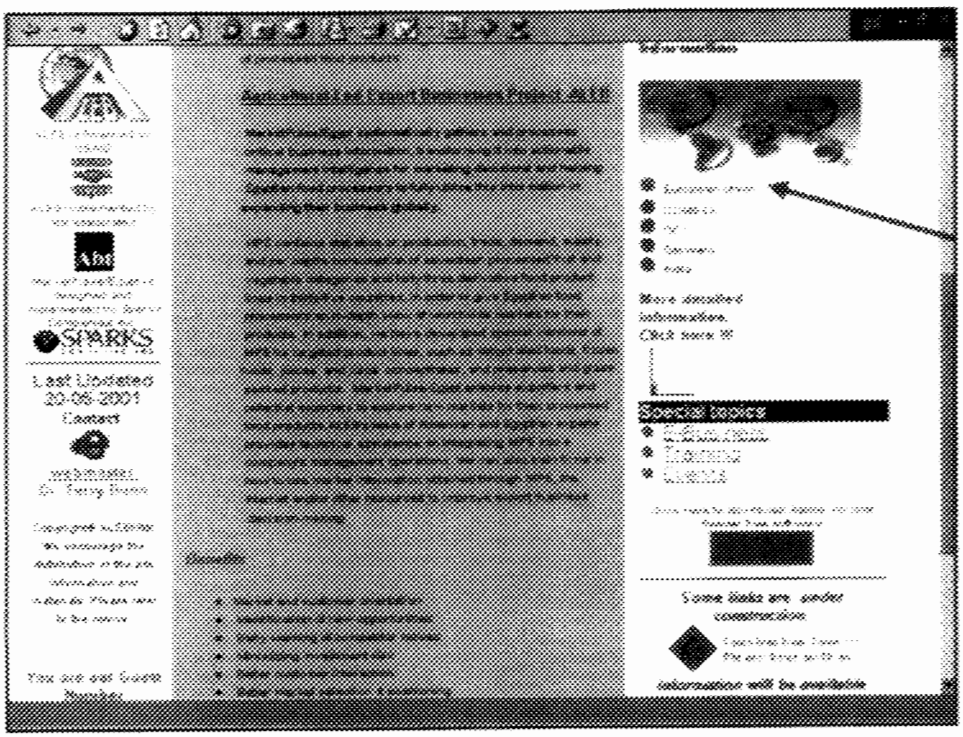
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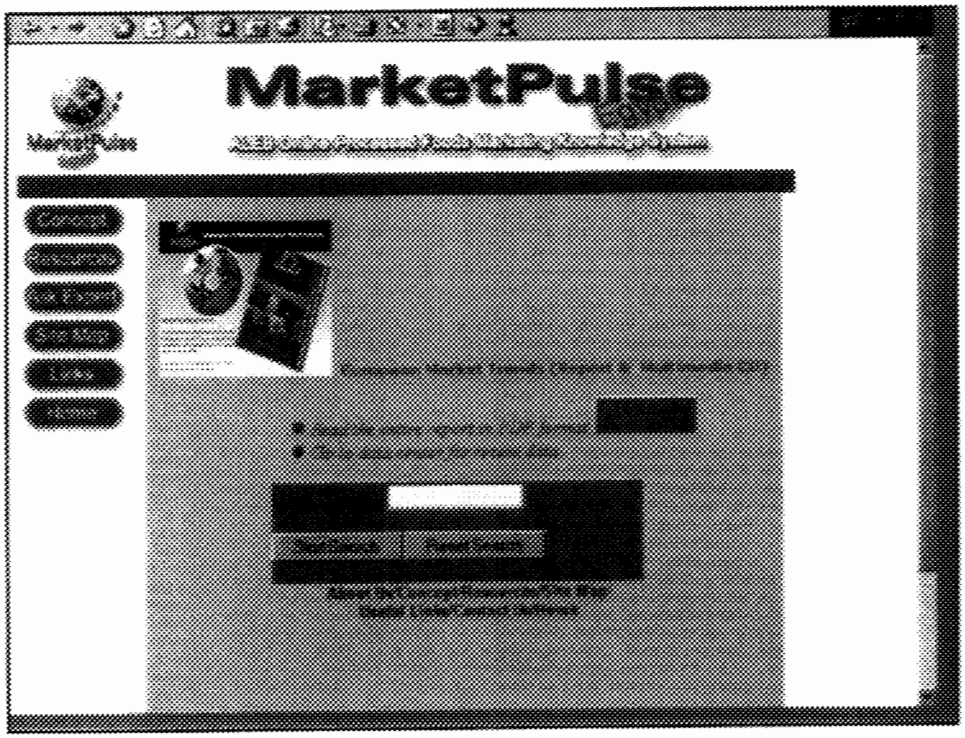
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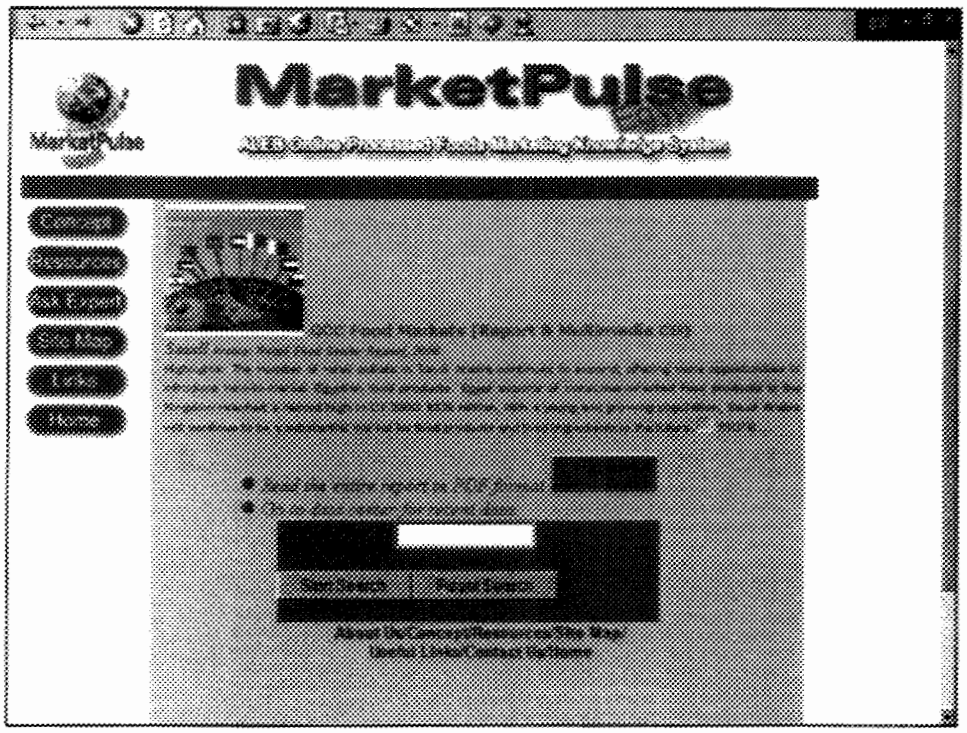
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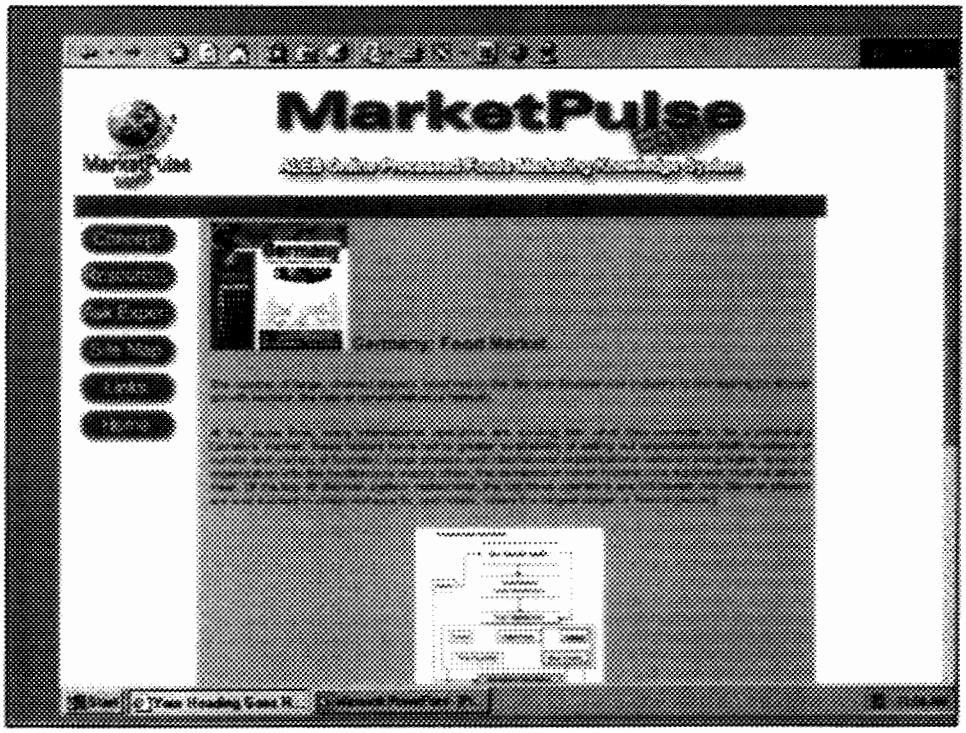
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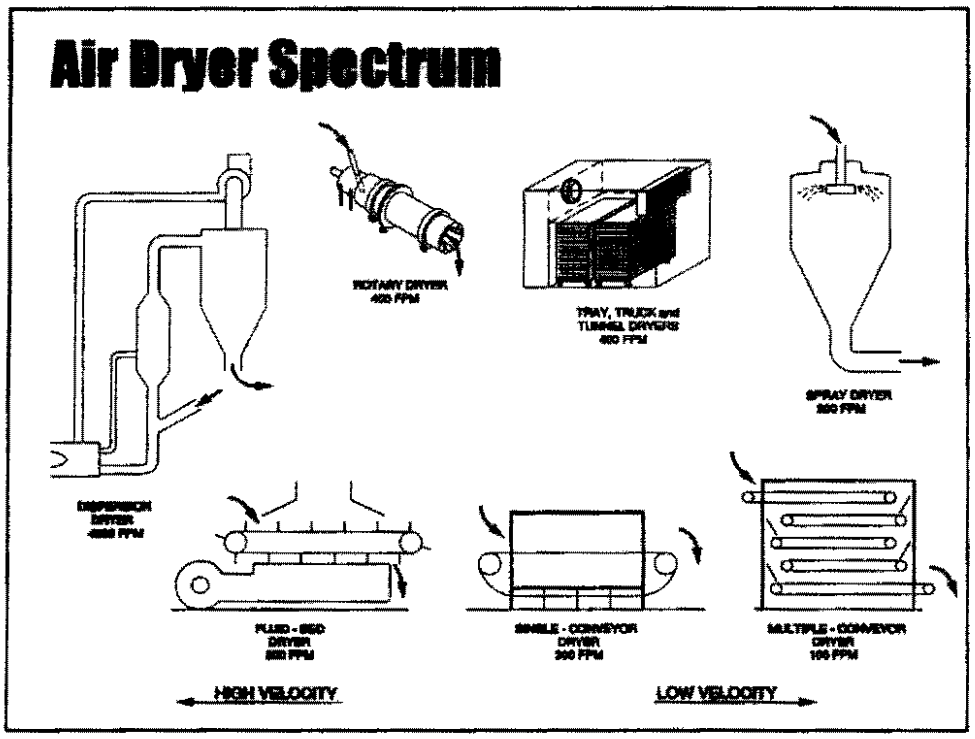
MODERN DRYING EQUIPMENT

By: Walter G. Frick

AGENDA

- INTRODUCTION TO TYPES OF DRYERS
- BELT DRYING & TYPES OF BELT DRYERS
- DESIGN PARAMETERS OF BELT DRYERS
- DRYING CURVES & TESTING
- DATA COLLECTION
- PROCESSING CONSIDERATIONS
- MECHANICAL ISSUES
- PURCHASING FACTORS
- SUMMARY



TYPES OF DRYERS

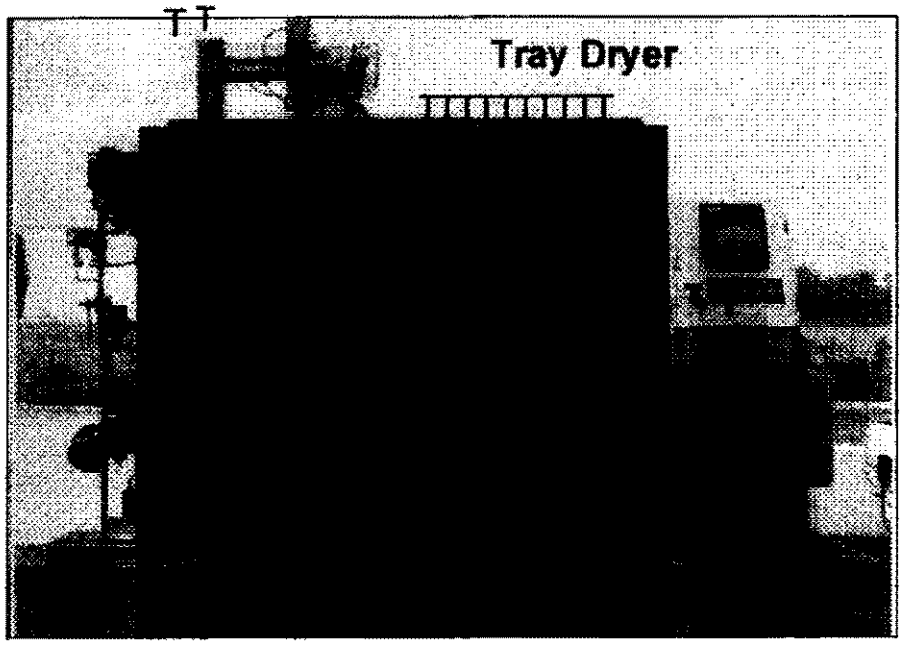
- Tray
- Truck
- Conveyor
- Fluid Bed
- Rotary
- Pulse
- Dispersion
- Spray
- Vacuum Freeze
- Microwave
- Vacuum Microwave
- Radio Frequency

TRAY / TRUCK DRYERS

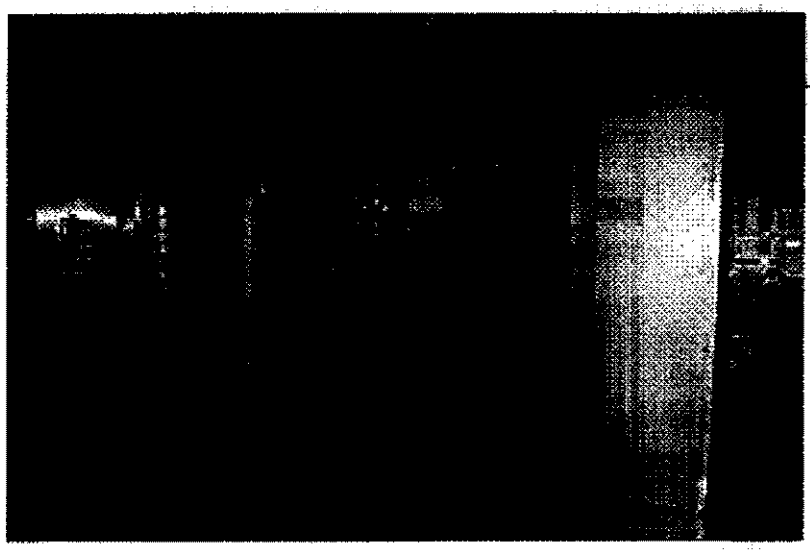
- Principle difference between tray, truck, tunnel and conveyor dryers is the degree of batch vs. continuous operation and thus production capacity
- Trays are loaded onto trucks and the trucks are pushed into the dryer in truck dryer operation
- The tunnel truck dryer offers semi-continuous or even continuous product flow

TRAY/TRUCK DRYER OPERATION

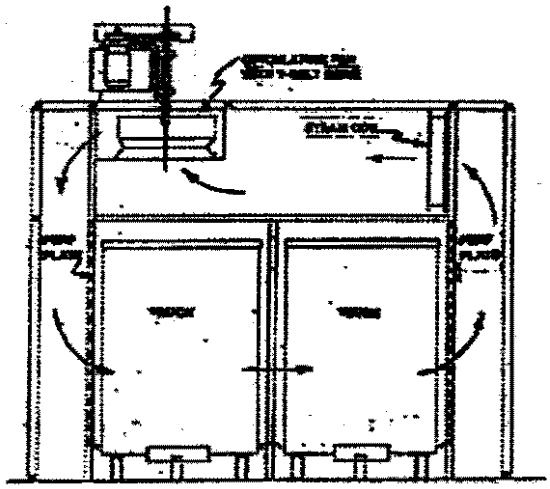
- Perforated air distributors on the side assure uniform airflow
- Reversal of airflow from side-to-side for uniform drying
- Several fans and heaters on the sides permit zoned drying conditions
- Typical temperatures - 60° to 200°C
- Air velocity - 1 to 5 M/sec.



Truck Dryer



TRUCK DRYER CROSS SECTION



TUNNEL TRUCK DRYERS

- If trucks are arranged to be pulled or pushed in series through a tunnel, the dryer is known as a "Tunnel Truck Dryer"
- Frequently used for fruit drying with high volume shrinkage and very long drying times.
- Usually arranged with the hottest air at the end of the drying cycle circulating toward the wet end

CROSS CURRENT AIR FLOW TUNNEL

- **For better control and product moisture uniformity, tunnel truck dryers can be arranged with cross air flow and multiple fans in zones**
- **This zoning results in finer control of temperatures and times at those temperatures**
- **Initial cost is higher but product quality is better and drying times are usually shorter**

ROTARY DRYERS

- Product continuously tumbles and cascades through a relatively high velocity air stream with heated gas
- Internal lifters/flights elevate and drop feed from the top to bottom cascading along length of dryer moving forward due to slope of drum.
- Air stream velocity is about 2M/sec
- Product attrition can be severe
- Usually used to dry waste food, forage for animals or chemical/mineral products

ROTARY DRYERS

- **Feed Characteristics**
  Powders, granules, non friable agglomerates, large solid particles.
- **Heat Source**
  Steam, electrical, coal, liquid fuels, or gas.
- **Dust Collection**
  Cyclones, bag houses, scrubbers, Electrostatic precipitators. Systems require dust collection.
- **Control**
  Usually PLC. System controls on discharge temperature.

BENEFITS OF ROTARY DRYERS

- High throughput
- Low cost
- Intimate product contact
- Robust
- Can handle variations in feed although product may be inconsistent
- High temperature operation - can be refractory lined.
- Unit can have integral cooling section

45

LIMITATIONS OF ROTARY DRYERS

- Clogging although chains and knockers can reduce this
- May cause size reduction due to attrition and impact
- Inconsistent dried product characteristics
- Poor energy efficiency
- Poor heat transfer
- High maintenance
- No implicit dust separation

DISPERSION/ FLASH DRYERS

- Handles fine, granular products
- Product injected into an air-stream
- Velocity about 20 M / second
- Dried and conveyed to a separation/collection system

FLASH DRYER BASICS

- Heart of flash drying system is vertical duct, or flash tube, in which drying process takes place.
- Fan forces drying gas through a heater and upwards through flash tube.
- Product enters drying gas stream, which instantly suspends and carries it to collection equipment, usually a cyclone or bag collector.
- Proper dispersion of wet feed material into the drying gas is crucial.

Advantages of Flash Dryers

- Usually no additional grinding or milling is required.
- Minimum of moving parts
- Small floor space requirements
- Automatic operation

Limitations of Flash Dryers

- Product must be in powder form
- Product must give up it's water readily
- Difficult to reach very low moisture contents
- High noise level due to high horsepower fans
- Bag collectors or cyclones maintenance prone

SPRAY DRYING AND SPRAY DRYERS

- Spray drying is most important method for dehydration of **fluid** foods.
- Development of the process is intimately associated with dairy industry and for drying of milk powders.
- Technology has been expanded to cover a large food group which is now being successfully spray dried.

SPRAY DRYERS

- Product is fed as liquid or paste
- Atomized into an air-stream
- Airflow about 1 M / second
- Collected as powder in bag house or cyclones
- Used to dry flavorings, coffee, instant milk powders and many chemicals

SPRAY DRYING BASICS

- Relatively high temperatures needed for spray drying operations.
- Heat damage to products generally slight, due to evaporative cooling effect.
- Time of exposure to high temperatures of dry material is very short.
- Typical surface temperature of a particle during constant drying zone is 45-50 C.
- Possible to control many factors which influence powder structure to obtain desired properties.

SPRAY DRYING APPLICATIONS

Bananas	Egg (whole)	Proteins (animals)
Blood	Egg (white)	Proteins (milk)
Cake mixes	Egg (yolk)	Proteins (plants)
Citrus Juice	Fish conc.	Shortening
Coffee	Infant form.	Starch derivatives
Corn syrup	Milk (whole)	Tea
Cream	Milk (skim)	Tomato puree
Creamers	Milk (replacers)	Yeast
Cremes	Potatoes	Yogurt

UNIT OPERATIONS

- Spray drying consists of the following unit operations:
- Pre-concentration of liquid
- Atomization (creation of droplets)
- Drying in stream of hot, dry air
- Separation of powder from moist air
- Cooling
- Packaging of product

PULSE DRYING

- Drying of low solids/high moisture (liquid) feeds
- Basis is use of pulse burner - produces a pulsating airflow along with heat for evaporation
- Produces pressure waves and heat from one source
- Frequency of about 45 - 50 cycles/second - amplified to 250 cycles/sec wave form
- Wave form atomizes feed into many finely divided particles
- Temperature is 1260°C but for only milliseconds
- Particle temperature does not exceed 52° to 57° C

USES FOR PULSE DRYERS

- **Used for organic, inorganic, process and waste streams**
- **Organic fish meal**
- **Hazardous plating wastes**
- **Radioactive depleted uranium oxides**

IMPINGEMENT PROCESSING

- High velocity air or gas "impinges" on products impervious to air
- Very rapid heat transfer rates
- Used for cooking meats, roasting coffee and tea, toasting of breakfast foods and puffing of cereal grains
- Recent use is for roasting of potatoes prior to freezing

FLUID BED DRYERS

- High Velocities
- High Heat Transfer Rate (Puffing of Product)
- Very High Investment Cost
- High Maintenance Costs
- High Energy Costs

Vacuum Freeze Dryers

- Highest quality product
- Limited use of products produced
- Very high initial cost
- High operating costs
- High maintenance costs

Vacuum Microwave Dryers

- Excellent quality product
- Low capacity
- Very high initial cost
- High operating costs
- High maintenance costs
- Very costly end product

OTHER TYPES OF DRYERS

- Impingement Dryers and Ovens
- Suction Drum Dryers
  - For Textiles
  - For Potato Flakes and similar products
- Loop Dryers for Textiles
- Tenter Dryers for Textiles

CONVEYOR DRYING

- One of the most common forms of drying.
- Suitable for heat sensitive products in various shapes that require extended drying times.
- Can be zoned for precise control of temperature to avoid product overheating.
- Wide range of heat sources possible.
- Pre-forming permits even wider range of product drying

TYPICAL DESIGN PARAMETERS OF CONVEYOR DRYERS

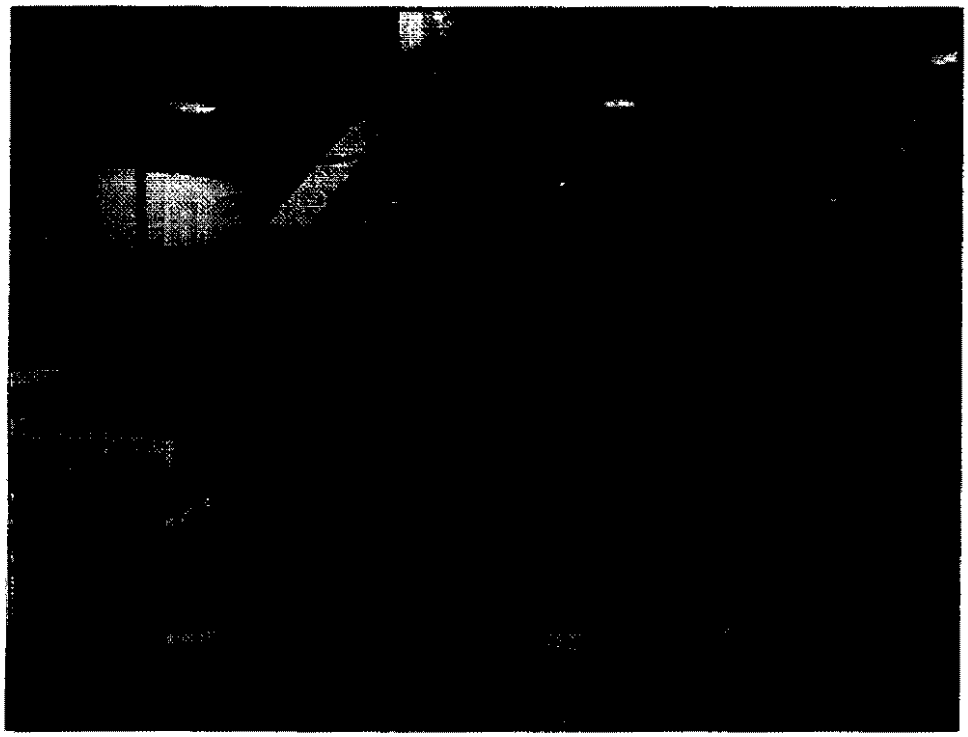
- Conveyor widths range from 0.6 to 4.6 meters with about 3 meters being most typical
- Lengths range from 3 to 100 meters or longer
- Can be multiple zones and even multiple stages
- Airflow is usually through the product with velocities ranging from 0.25 to 1.3 m/sec. May be up through or down through or a combination.
- Temperatures range from 50° to 400°C but most foods are dried at below 175°C

TYPICAL DESIGN PARAMETERS OF CONVEYOR DRYERS (continued)

- Typical conveyors are 9 to 20 MM pitch and are usually manufactured of perforated stainless steel.
- Perforations are selected based on product characteristics such as particle size, need for cleaning, etc.
- Conveyor open areas selected are usually 25% to 45%
- Conveyor plates may be hinged or hingeless.
- Loadings are in range of negligible to 600 kg./sq. M
- Bed depths can range from single layer to 2 M deep.

TYPES OF CONVEYOR DRYERS

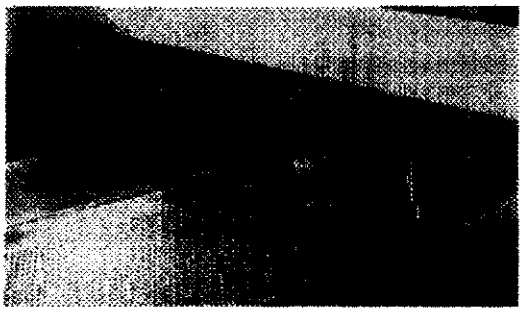
- Single conveyor is the most widely used
- Air flow is usually from centrifugal, turbine fans through air distributors, through the material, through heaters and back to fan.
- Heating system may be steam, hot water,direct or indirect gas (natural or LPG), electric, thermal oil, waste heat, geothermal water
- One conveyor through the entire machine, may be zoned and with integral cooling if required



PREPARATION FOR DEHYDRATION

- Importance of Uniformity of Size
- Continuous Feed
- Cleaning
- Slicing or Dicing
- Blanching / Sulphiting

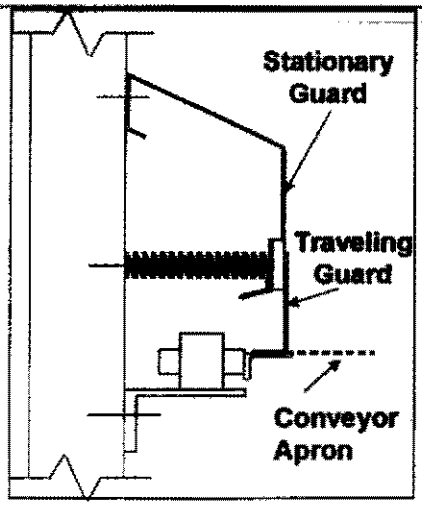
Conveyor Systems



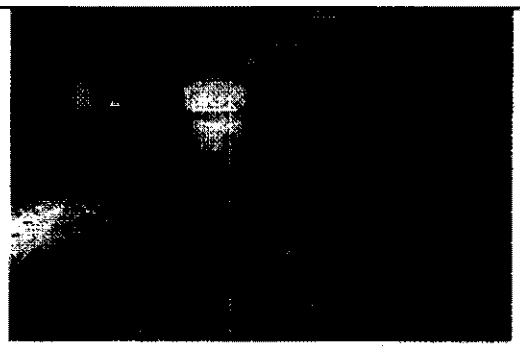
Perforated Stainless Steel
Stainless Steel Wire Mesh
Continuous Stainless Steel Band

Material Guards

- Traveling & Stationary Side Seals
- Prevents Bypass
- Minimizes Product Loss
- Springs Maintain Constant Contact



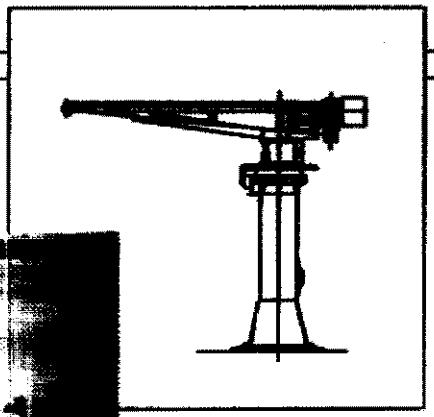
Air Distribution



- Uniform Distribution Of Air & Temperature
- Perforated Plenums

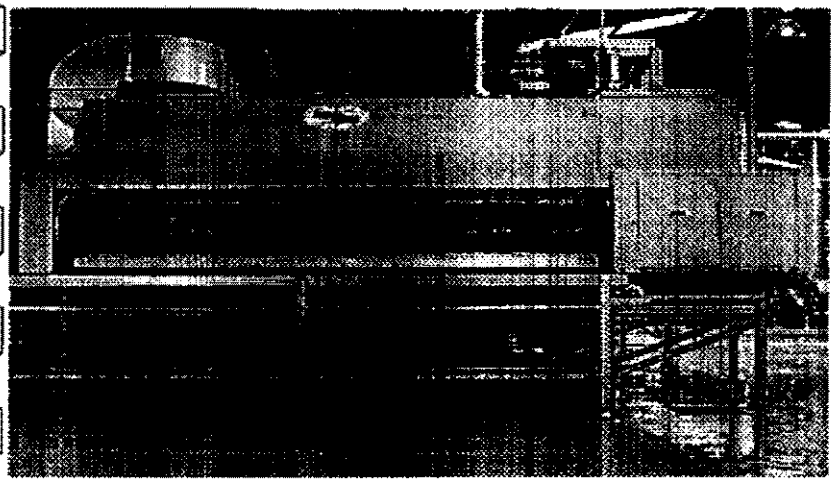
Feeding Equipment

Oscillating Belt Feeders
Biased Cut Vibratory Feeders
Wiper Feeders



Pin Breaker

APRON CONVEYOR DRYER

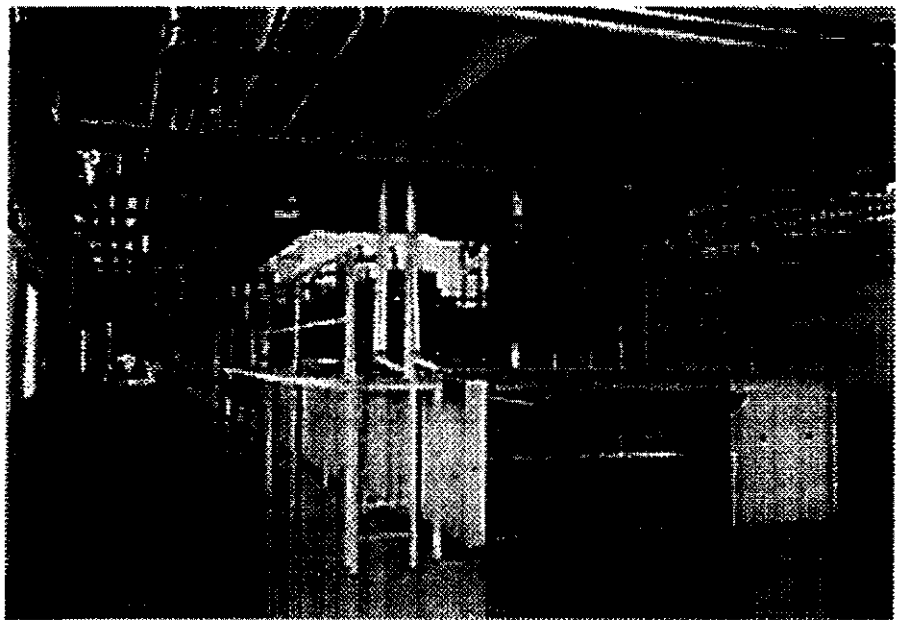


SINGLE CONVEYOR DRYER

Material Handling

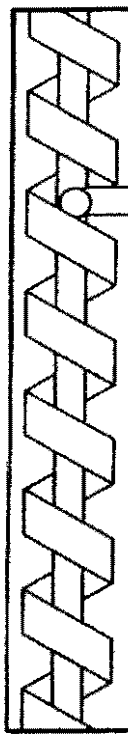
- Feeding/Distribution of Product
- Break-up Of Agglomerated Product
- Product Turnover & Mixing
- Exposes New Surfaces To Drying
- Uniformity Of Moisture
- Optimum Product Quality

SINGLE CONVEYOR DRYER



TYPICAL PRODUCTS DRIED ON SINGLE CONVEYOR DRYERS

- Cereals
- Pet Foods
- Nuts
- Tobacco
- Gelatin
- Bread Products
- Pigments
- Synthetic Fibers
- Synthetic Rubber
- Instant Rice



MULTI-STAGE SINGLE CONVEYOR DRYER

- Employed when a large amount of shrinkage occurs during early drying stages.
- Also valuable when turnover/reorientation of product is desirable for faster, more uniform drying.
- Product is reloaded on each stage, usually deeper than on previous stage for more drying efficiency, shorter machine

MULTI-STAGE APRON CONVEYOR DRYER

ONION DRYER

TYPICAL PRODUCTS DRIED ON MULTI-STAGE CONVEYOR DRYERS

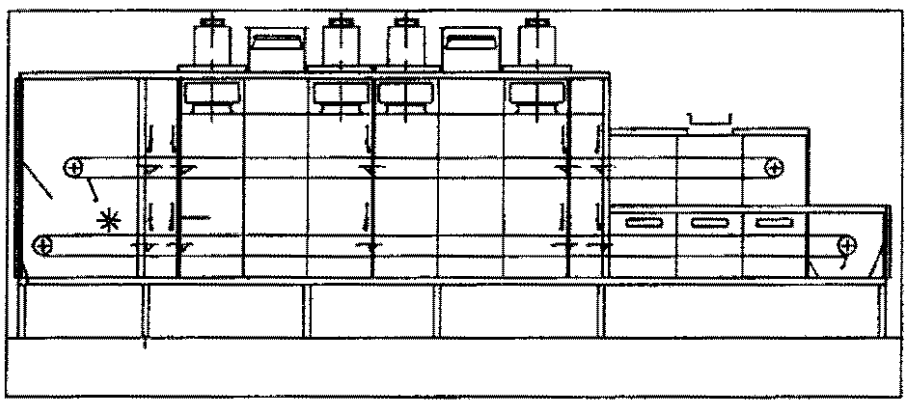
- Vegetables
- Fruits
  - Natural
  - Sugar Infused
- Potatoes
- Desiccated Coconut
- Breakfast Foods

MULTI CONVEYOR DRYER

- Used for drying slow drying, temperature sensitive products such as pasta and cereal/snack pellets.
- Low velocity air and low temperatures are used for most gentle drying to prevent undesirable cracking or "checking" of the products.
- Generally short pitch or screen conveyors are used to minimize height of the machinery.

65

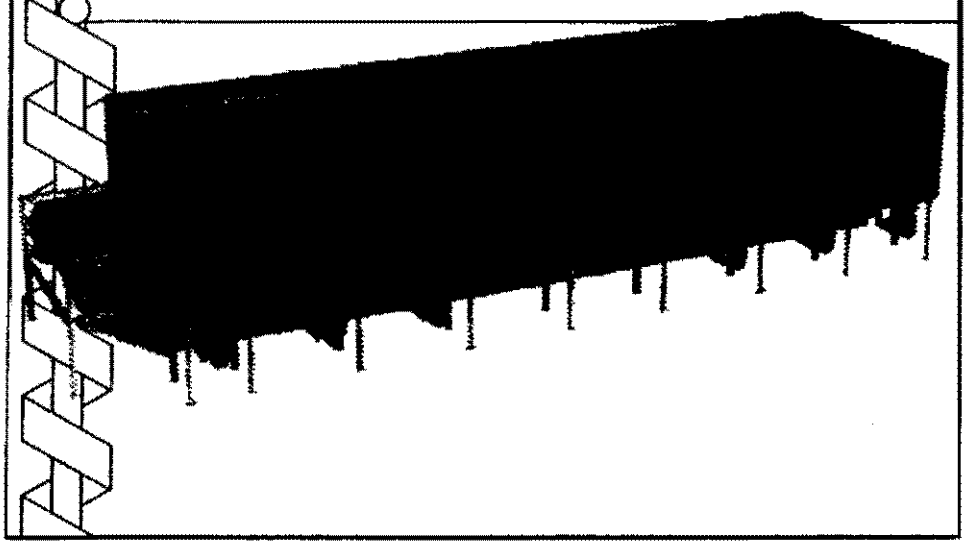
MULTI-TIER CONVEYOR DRYER



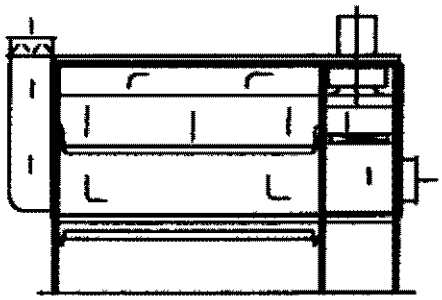
TYPICAL PRODUCTS DRIED ON MULTI- CONVEYOR DRYERS

- Breakfast Foods
- Snacks
- Pasta Products
- Pet Foods

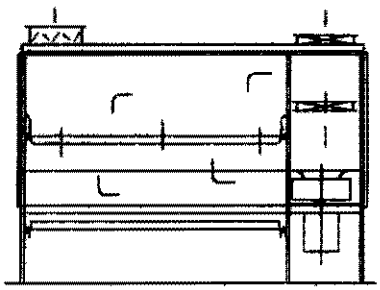
CONTINUOUS CONVEYOR DRYER



Air Down Section View



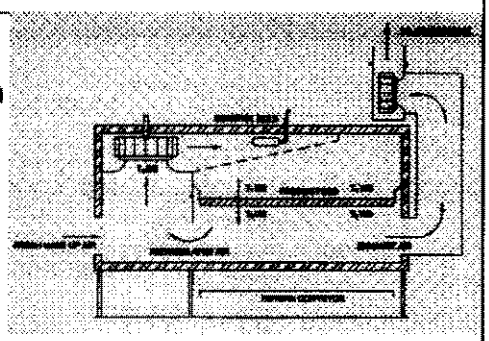
Air Up Section View



Air Up Zone

Cross Section Conditions

- Air enters bed at set condition
- Water evaporates, temp. drops, humidity increases as air leaves product bed
- This is exhaust condition, proportion of air removed at this point.



- Remainder of air is recycled, mixes with fresh air and enters the heaters where it is increased in temperature and reenters product

BASICS OF DRYING

DRYING RATES DEPENDENT ON THE FOLLOWING FACTORS

- PRODUCT CUT
- PARTICLE STRUCTURE
- MOISTURE DISPERSION
- SURFACE EXPOSURE
- AGITATION/MIXING
- TEMPERATURE DIFFERENTIAL

CONVECTION

- FORCED CIRCULATION --- TYPICAL
- VELOCITY DEPENDENT
- AIR FLOW UP OR DOWN THRU BED
- ZONED APPROACH TO DRYING

HEAT TRANSFER & PSYCHROMETRY

- Heat transfer is governed by:
  - Temperature of the circulating air
  - Velocity of the circulating air
  - Product surface area which can be exposed to the circulating air

HEAT TRANSFER & PSYCHROMETRY

- Convective dryers - heat to evaporate water is supplied by heated circulating air
- This air also takes evaporated water away from product being dried.
- Rate of performance related to amount of air passing through dryer and application of this internally circulating air.

MASS TRANSFER

- WATER EVAPORATION
- INTERNAL MIGRATION TO SURFACE
- PRODUCT DEPENDENT
- PIECE SIZE/SHAPE
- SURFACE EXPOSURE

LIMITATIONS IN DESIGN

- Temperature may be limited by nature of material
- Air velocity may be limited by material structural layer or presence of fines in product bed
- Surface area is dependent on allowable preparation of material prior to drying.
- Physical characteristics of material effected by prior treatment such as cooking, blanching, etc.

Laboratory Dryer

Tray Type

Variable temperatures

Variable circulation

Variable exhaust

Variable Humidity

Courtesy of Proctor & Schwartz

LABORATORY TESTING

- Scale up from lab testing is very straightforward
- Difficult to get representative sample because of time and condition of shipment
- Simulate in test:
  - Temperature
  - Humidity
  - Velocity
  - Loading
- Develop drying curves by weighing of drying product at set intervals

LABORATORY TESTING

- Samples submitted must be realistic and representative of actual product to be dried.
- Draw vendor's attention to special characteristics
- Submit a sample of properly dried or representative product

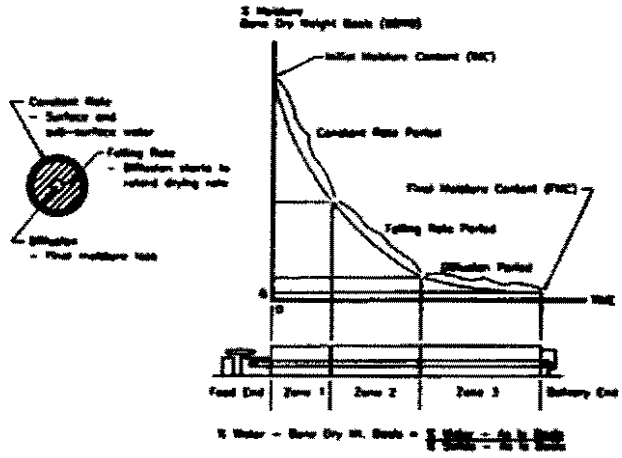
TEST PLANNING

- Probable machine configuration
- Required preparation
- Preforming if necessary
- Staging

DRYING CURVES

- GRAPHICAL REPRESENTATIONS
- DRYING RATES
- TYPICAL CURVES
- DRYING REGIONS
- PROCESSING FACTORS
- DRYING KEY POINTS

Classic Drying Curve



DRYING CURVES CONSTANT RATE

- SURFACE MOISTURE
- EXTERNAL CONDITIONS
- VELOCITY/TEMPERATURE
- PRODUCT TEMPERATURE (LOW)
- VAPOR PRESSURE DIFFERENCE
- DRYING RATE == CONSTANT

DRYING CURVES
FALLING RATE

- SURFACE PARTIALLY WET
- MOISTURE MIGRATES TO SURFACE
- PRODUCT STRUCTURE
- SHRINKAGE
- VELOCITY/TEMPERATURE
- RATE CONTINUOUSLY DECLINES

DRYING CURVES
DIFFUSION PERIOD

- PRODUCT SHRINKAGE/STRUCTURE
- INTERNAL MOISTURE MIGRATION
- CAPILLARY ACTION
- TEMPERATURE --- SENSITIVE
- VELOCITY --- INSENSITIVE

GENERAL TEST OBSERVATIONS

- Product
  - Shrinkage
  - Breakup
  - Discoloration
  - Melting
  - Agglomeration
- Fines
  - Generation
  - Sifting/Blowing
- Fumes/Smoking
- Sticking to tray bottom/conveyor

WHAT THE SUPPLIER NEEDS FROM THE BUYER

Walter Frick

&

Richard Stier

ما يحتاجه المورد من المشتري

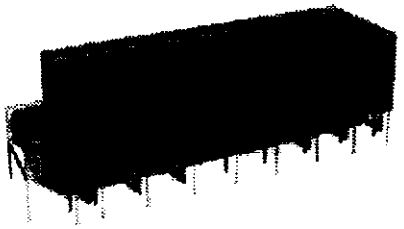
وولتر فريك وريتشارد ستير

SUPPLIER NEEDS

- Equipment manufacturers need detailed information to assure that they can meet your needs
- Buyers must be open and honest with them
- Buyers must do their homework, also.

احتياجات المورد

- يحتاج مصنعو المعدات إلى معلومات تفصيلية لضمان تلبية كافة احتياجاتك.
- يجب على المشترين أن يكونوا صرحاء مع الموردين.
- وعلى المشترين أن يقوموا بمهامهم وواجباتهم كذلك.



BUYER'S HOMEWORK

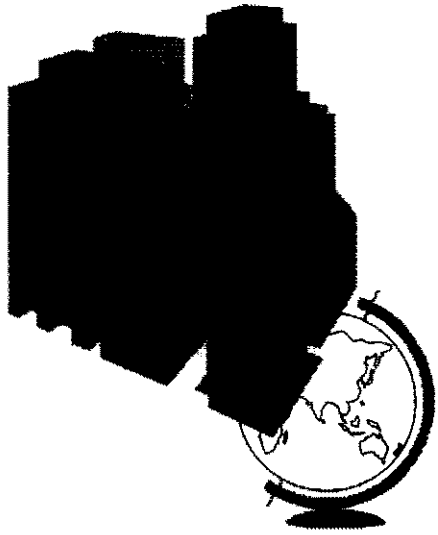
- What do you want to process?
- Do you have a market?
- Source of supply?
- Proper raw materials?
- Can you get enough materials?
- Can you operate profitably?
- This information and more is needed before you contact an equipment supplier

مهام المشتري وواجباته

- ما الذي تريد أن تقوم بتصنيعه؟
- هل لديك سوق لمنتجاتك؟
- هل لديك موردين؟
- هل لديك مواد خام جيدة؟
- هل تحصل على المواد بشكل كاف؟
- هل تعود عليك ارباح من انتاجك؟
- إن تلك المعلومات يجب أن تكون متوفرة قبل اتصالك بمورد المعدات.

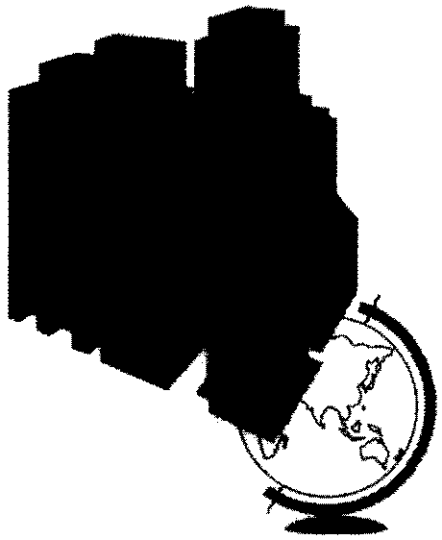
COMPANY INFORMATION

- Company name
- Address
- Phone, fax and email
- Principal contact(s)
- Plant location, if different from above



معلومات عن الشركة

- اسم الشركة
- العنوان
- الهاتف والفاكس والبريد الإلكترونى
- جهة الاتصال المسئولة
- موقع المصنع، إذا كان في مكان آخر غير مكان الشركة



WHAT DO YOU WANT?

- Do you want…
- Replace old equipment
- Convert existing equipment
- Purchase a new system
- What type of system are you looking to purchase?

ما الذي تريده؟

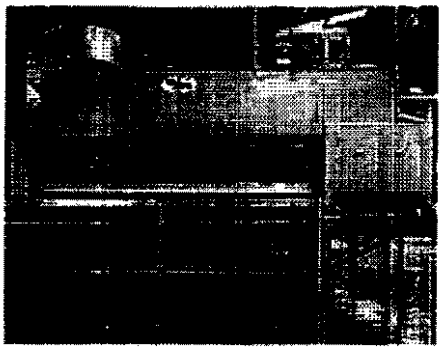
- هل تريد ...
- استبدال معدات قديمة
- تحويل المعدات الموجودة لديك
- شراء نظام جديد
- ما هو نوع النظام الذي ترغب في شرائه؟

WHAT PRODUCTS?

- List of products
- Shape of product before drying -slices, diced, leaves, halves
- Character - Sensitive to heat, corrosive

ما هي المنتجات؟

- قائمة المنتجات
- شكل المنتج قبل تجفيفه: شرائح، مقطع مكعبات، أوراق ، أوراق مجزئة
- خصائصه: حساس للحرارة، يؤدي للتآكل



PRODUCT CHARACTERISTICS

- Bulk Density in kG/m^3
- Pounds of dried product required per hour
- % moisture entering dryer
- % moisture exiting dryer

خواص المنتج

- الكثافة الظاهرية بالـــ كجم/م^3
- أوزان المنتج المجفف الناتج فى الساعة
- نسبة الرطوبة في المنتج عند دخوله جهاز التجفيف
- نسبة الرطوبة في المنتج عند خروجه من جهاز التجفيف

OPERATING PARAMETERS

- Drying temperature (temp of air circulating around the product)
- Will product be cooled?
- If it is to be cooled, to what temperature
- How long will drying take (estimated)
- How long will the machine operate each year?
- How long will the machine operate each day?
- Packaging systems? Bulk or other

المقادير المتغيرة (بارامترات) للتشغيل

- درجة حرارة التجفيف (درجة حرارة الهواء المحيط بالمنتج)
- هل سيتم تبريد المنتج؟
- إذا كان سيتم تبريده، فما هي درجة الحرارة المتطلبة؟
- ما هو الزمن التقديري للتجفيف؟
- ما هي فترة تشغيل الماكينة سنويا؟
- ما هي فترة تشغيل الماكينة في اليوم؟
- ما هي أنظمة التعبئة والتغليف؟ سائب أم معبأ

UTILITIES

- Steam - pressure at location
- Gas - type and pressure at location
- Oil - type, specific gravity
- Electric - Phase and amount; supplier
- Electric - Is power supply reliable?
- Water - well or city
- Air quality

المرافق

- البخار : الضغط في الموقع
- الغاز: نوع الغاز والضغط في الموقع
- الزيت: النوع والكثافة
- الكهرباء: الطور (الفاز) وحجمه، مصدر الامداد الكهربائي
- الكهرباء: هل مصدر الكهرباء يعتمد عليه؟
- الماء: من بئر أم من المدينة
- جودة الهواء

CONTROLS

- Motors - Source and type
- Control Panels - Source and type
- Motor Starters - Source and type
- Temperature Controls - Source and type
- Feed Belts - Source and type

أجهزة التحكم

- المحركات: مصدرها ونوعها
- لوحات التحكم: مصدرها ونوعها
- بادئات دوران المحركات: مصدرها ونوعها
- وسائل التحكم في درجة الحرارة: مصدرها ونوعها
- سيور التغذية: مصدرها ونوعها

PLANT DESCRIPTION

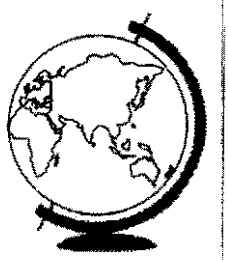
- Available space for dryer (footprint) in m^3
- Where will machine be located? Ground floor, other
- Restrictions - Door size, elevator capacity, access to plant, floor loading, other
- Factory altitude above sea level
- Fresh air sources - Temperature, will it need filtering

وصف المصنع

- المساحة المتوافرة لجهاز التجفيف
- أيـن سـيتم تـركيب الماكيـنات؟ في الطابق الارضي أم في طوابق أخرى
- أوجـه الـتقييد: حجم الأبواب، قدرة الروافع، أمـاكن الدخـول للمصنع، الانزال الارضي، غيرها
- ارتفاع المصنع عن مستوى سطح البحر
- مصـدر الهـواء الـنقي: درجة الحرارة، هل يحتاج الى ترشيح؟

ACCESSSORIES

- Do you want a dryer only?
- Turn-key operation - complete system
- Other equipment needs - oscillating feeder, cutters, dicers, packaging systems
- Flooring
- Other



التركيبات الاضافية

- هل تحتاج الى جهاز تجفيف فقط؟
- النظام جاهز للاستعمال (بنظام تسليم المفاتيح) – نظام كامل
- الحاجة الى معدات اخرى: أجهزة تلقيم تذبذبية، آلات قطع، آلات قطع الى مكعبات، أنظمة تعبئة وتغليف
- تغطية الارضيات
- غيرها

COMMENTS

- Provide the manufacturer with any other information that you feel will be useful
- Open and honest
- The information will remain confidential
- An equipment purchase is a partnership
- Get the information together and then meet with the equipment manufacturer
- If he knows your needs, he can be better prepared

تعقيبات

- قم بتزويد المُصنّع بأي معلومات أخرى ترى أنها ستكون مفيدة
- الصراحة والامانة
- ضمان سرية المعلومات
- عملية شراء المعدات هي نوع من الشراكة
- قم بجمع المعلومات ثم قم بعقد اجتماع مع المصنع
- إذا كان يعرف متطلباتك، فانه سيكون على استعداد افضل للتعامل

SUMMARY

- Companies interested in new dryers need to do their homework
- Equipment suppliers are in business to sell equipment, not do market research or sell finished goods
- Manufacturers need information to understand your needs
- Work together to benefit all

ملخص لما سبق

- إن الشركات المهتمة بشراء أجهزة تجفيف جديدة تكون في حاجة الى معرفة ما ستقوم به (مهمتها المحددة)
- إن عمل موردي المعدات هو بيع المعدات فقط وليس إجراء ابحاث عن الاسواق او بيع المنتجات النهائية
- يكون المصنعون في حاجة الى معلومات اكثر لفهم احتياجاتك
- فلتتعاونوا معا لصالح الجميع

DRYER DATA SHEET

COMPANY _____

STREET OR BOX NUMBER _____

CITY _____ STATE OR COUNTRY _____

PHONE NUMBER _____ FAX NUMBER _____ E-MAIL _____

PLANT LOCATION (If different from above) _____

1. INSTALLATION: ☐ Replacement, ☐ Conversion, ☐ New Description: _____
2. PRODUCT TO BE DRIED: _____
3. FORM (Physical Shape of Product Before Drying): _____
4. CHARACTER OF PRODUCT (Toxic, Explosive, Heat Sensitive, Corrosive): _____
5. BULK DENSITY OF MATERIAL ENTERING DRYER _____ Lbs/Ft³ (_____ Kg/M³)
6. TOTAL Lbs (Kgs) OF COMMERCIAL DRY PRODUCT REQUIRED PER HOUR: _____
7. MOISTURE CONTENT OF PRODUCT ENTERING DRYER (On Wet Weight Basis): _____
8. MOISTURE CONTENT OF PRODUCT LEAVING DRYER (On Wet Weight Basis): _____
9. DRYING TEMPERATURE (Maximum Temperature of Air Circulating Around Product): _____
10. IS PRODUCT TO BE COOLED AFTER DRYING: ☐ No ☐ Yes Temperature: _____
11. DRYING TIME IS: _____ ☐ Minutes ☐ Hours ☐ Seconds As Estimated By: _____
12. MACHINE WILL OPERATE: _____ Hours per Day; _____ Days per Week
13. MATERIALS: In Contact With Product: _____ Dryer Interior: _____ Dryer Exterior: _____
14. UTILITIES AVAILABLE:

    A. Steam ☐: Pressure at Dryer Location _____ psig (_____ Kg/cm²)

    B. Gas ☐: Natural ☐ Propane ☐ Manufactured ☐ _____ BTU/Ft³ (_____ Kcal/ M³)

    Pressure: _____ Insurance Underwriter FM ☐ IRI ☐ Other: _____

    C. Oil ☐: Type _____ Specific Gravity _____ BTU/Ft³ (_____ Kcal/ M³)

    D. Electrical Power Available:

Power – Polyphase _____ Volts, _____ Phases, _____ Hertz

Control-Single Phase _____ Volts, _____ Phases, _____ Hertz

E. Other: _____

15. CONTROLS:

A. Motors By: Supplier ☐ Customer ☐ TEFC ☐ Mill & Chemical ☐ Other: _____

B. Control Panel By: Supplier ☐ Customer ☐ NEMA 12 ☐ NEMA 4 ☐ Other: _____

C. Motor Starters By: Supplier ☐ Customer ☐

D. Temperature Controls By: Supplier ☐ Customer ☐ Recording ☐ Indicating ☐

16. PLANT DESCRIPTION:

A. Space Available for Dryer: _____ Length, _____ Width, _____ ,Height

B. Is Machine Located On: ☐ First Floor ☐ Second Floor ☐ Other _____

C. Any Restrictions Such As Door Size, Elevator Size or Capacity, Floor Loading, Etc.? _____

D. Factory Altitude (Above Sea Level): _____ feet (_____ meters)

E. Fresh Air: From Room ☐ Outside ☐ Temperature _____ Must Air Be Filtered?: Yes ☐ No ☐

17. OTHER ACCESSORY EQUIPMENT TO BE SUPPLIED BY WP&S (Oscillating Feed, Extruder, etc.)

_____

18. COMMENTS:

_____

قائمة البيانات الخاصة بجهاز التجفيف

الشركة _____

رقم الشارع أو رقم صندوق البريد _____

المدينة _____ الدولة _____

رقم الهاتف _____ فاكس _____ البريد الإلكتروني _____

موقع المصنع (إذا كان في مكان آخر) _____

١. التركيب: ☐ استبدال ☐ تحويل ☐ جديد الوصف: _____

٢. المنتج الذي سيتم تجفيفه: _____

٣. شكل المنتج (الشكل المادي للمنتج قبل تجفيفه): _____

٤. خواص المنتج (سام، متفجر، حساس للحرارة، مؤدي للتآكل): _____

٥. الكثافة الظاهرية للمادة الداخلة في جهاز التجفيف _____ باوند/القدم٣ (_____ كجم/م٣)

٦. إجمالي وزن (كجم) المنتج الجاف التجاري المتطلب في الساعة: _____

٧. محتوى رطوبة المنتج الداخل في جهاز التجفيف (على أساس الوزن المبلل للمنتج) _____

٨. محتوى رطوبة المنتج الخارج من جهاز التجفيف (على أساس الوزن المبلل للمنتج) _____

٩. درجة حرارة التجفيف (درجة الحرارة القصوى للهواء المحيط بالمنتج): _____

١٠. هل سيتم تبريد المنتج بعد التجفيف: ☐ لا ☐ نعم درجة الحرارة: _____

١١. زمن التجفيف هو: _____ ☐ دقيقة ☐ ساعة ☐ ثانية كما هو مقدر بحوالي: _____

١٢. سيتم تشغيل الماكينة: _____ ساعة في اليوم: _____ يوما في الأسبوع

١٣. المواد: تلامس المنتج: _____ الجزء الداخلي لجهاز التجفيف: _____ الجزء الخارجي لجهاز التجفيف: _____

١٤. المرافق المتوفرة:

أ. بخار ☐: البخار عند موقع التجفيف _____ الضغط على البوصة٢/جم (_____ كجم/سم٢) _____

ب. غاز ☐: طبيعي ☐ بروبان ☐ صناعي ☐ وحدة حرارية بريطانية/القدم٣ (_____ كيلوكالوري/م٣)

الضغط: _____ ضامن التأمين FM ☐ IRI ☐ غيره: _____

ج. زيت ☐ : نوعه _____ الكثافة النوعية _____ وحدة حرارية بريطانية/القدم٣ (_____ كيلوكالوري/م٣)

د. الطاقة الكهربائية المتوفرة:

_____

الطاقة – متعدد الأطوار_____فولت،_____الأطوار (الفاز)_____هيرتز

التحكم – طور أحادي _____فولت،_____الأطوار (الفاز)_____هيرتز

هـ. غيرها: _____

١٥. وسائل التحكم:

أ. المحركات بواسطة: المورد ❑ العميل ❑ TEFC ❑ Mill&Chemical ❑ غيرها:_____

ب. لوحة التحكم بواسطة: المورد ❑ العميل ❑ NEMA12 ❑ NEMA4 ❑ غيرها:_____

ج. بادئات تشغيل المحرك: المورد ❑ العميل ❑

د. وسائل التحكم في درجة الحرارة: المورد ❑ العميل ❑ التسجيل ❑ الدلالة على ❑

١٦. وصف المصنع:

أ. المساحة المتوفرة لجهاز التجفيف:_____الطول_____،العرض_____، الارتفاع

ب. هل تم تركيب الماكينة في: الطابق الأرضي ❑ الطابق الثاني ❑ مكان آخر_____

ج. أي اوجه تقييد مثل حجم الأبواب، حجم الرافع، الإنزال الأرضي، الخ_____

د. ارتفاع المصنع (عن مستوى سطح البحر): _____قدما (_____مترا)

هـ. هواء نقي: من الحجرة ❑ من الخارج ❑ درجة الحرارة _____هل يجب ترشيح الهواء؟ نعم ❑ لا ❑

١٧. التركيبات الإضافية الأخرى التي سيقوم المورد بتوريدها (جهاز تغذية تذبذبي، جهاز الطرد المركزي، الخ.)

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١٨. تعقيبات:

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