

# APV products & processes

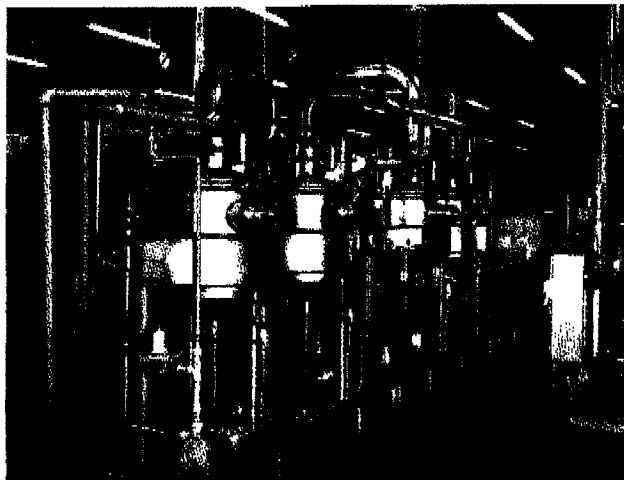
## the versatile APV 'Junior' size plate evaporator

The APV 'Junior' plate evaporator is designed for reliable, economical concentration of liquid food, pharmaceutical and chemical products during production runs, tests on new products, or as a finishing stage for high viscosity liquids.

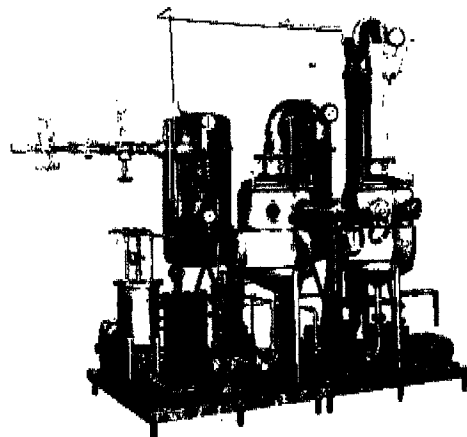
The 'Junior' unit is a scaled down version of the full size APV plate evaporator and is available in single or multiple effects to accommodate varying capacities or products. It easily concentrates heat sensitive liquids at evaporation rates from 100 to 2000 lbs/hr. The system combines a small rising/falling film plate evaporator and separator of either 304 or 316 stainless steel construction with all required auxiliary components: float-controlled balance tank with feed pump and piping, feed rotameter, stainless steel vapor ducting, a product extraction pump, surface condenser, condensate pump and piping, steam pressure controller and relief valve, a choice of mechanical vacuum pump or steam jet ejector, and the usual thermometers and pressure gauges. The entire, preassembled package is mounted on a sturdy mild steel base.

### economical/efficient/versatile

Since the 'Junior' evaporator is a packaged system, substantial savings may be realized in capital investment, installation costs, operating labor, utilities and maintenance. The single effect system takes only 36 sq ft of floor space while the largest available multiple effect arrangement requires only



Triple effect, four stage rising/falling film system concentrates 3084 lbs/hr of grape juice from 16° Brix to 54° Brix.



Coffee extract is concentrated from 14 to 55% solids in a double effect, two stage 'Junior' system.

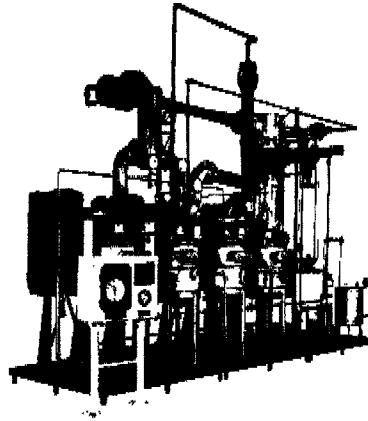
108 sq ft. All systems can be set up in less than 9' of overhead, need no special foundations, and do not require structural steel supports. Service requirements for the typical single effect system include 600 lbs/hr of steam and 60 gpm of water at 70°F. All systems can be cleaned in place with minimum use of steam and detergent.

From the viewpoint of efficiency, the plate evaporator couples ease of operation with extremely short heat contact time and rapid throughput which fully protects highly heat sensitive liquids from thermal degradation.

The unusual versatility of the system, meanwhile, permits the concentration of many products long considered difficult to handle because of viscosity or heat sensitivity.

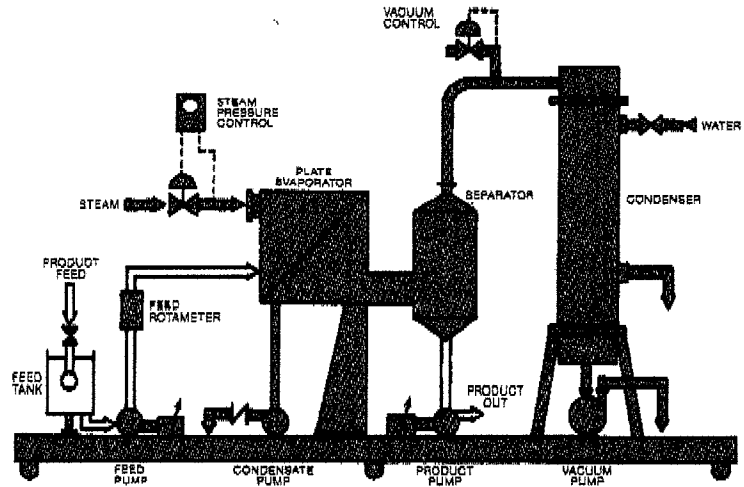
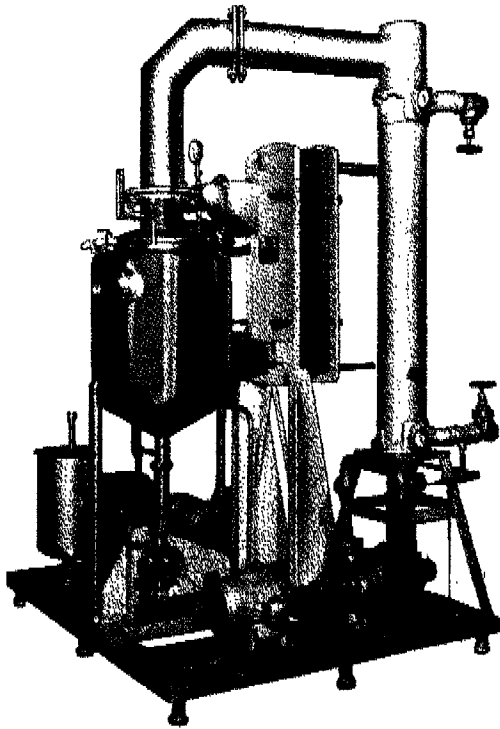
Depending upon the number and arrangement of evaporator effects, typical concentrations in the 'Junior' evaporator include:

	Feed Strength	Product Strength
apple juice	10° Brix	72° Brix
amino acids	5% T.S.	60% T.S.
gelatin	2-6% T.S.	25-50% T.S.
grape juice	15° Brix	72° Brix
pineapple	12° Brix	60-72° Brix
orange juice	10° Brix	60-72° Brix
lemon juice	8% T.S.	50% T.S.
distillery effluent	5% T.S.	50% T.S.
malt extract	12% T.S.	80% T.S.
corn steep liquor	6% T.S.	55% T.S.
monosodium glutamate	20% T.S.	60% T.S.
soup stock	4% T.S.	45% T.S.
coffee or tea	4% T.S.	40% T.S.
milk	9% T.S.	50% T.S.
yeast cream	10% T.S.	30% T.S.



Preassembled double effect, four stage 'Junior' with thermo recompression uses low temperature operation to prevent heat damage to a penicillin type pharmaceutical product. Feed rate is 2052 lbs/hr with concentration from 5.5 to 22% solids.

TYPICAL PACKAGED SINGLE EFFECT 'JUNIOR' PLATE EVAPATOR



Single effect unit of 3A design used for tests on whole milk and whey.

SYSTEM	TYPICAL CAPACITIES	SPACE REQUIREMENTS
Single effect	up to 800 lbs/hr	9' high 6'x 6'
Double effect	up to 1200 lbs/hr	9' high 6'x12'
Triple effect	up to 1600 lbs/hr	9' high 6'x18'
T/E with finisher	up to 1750 lbs/hr	9' high 6'x24'

TYPICAL SERVICE REQUIREMENTS

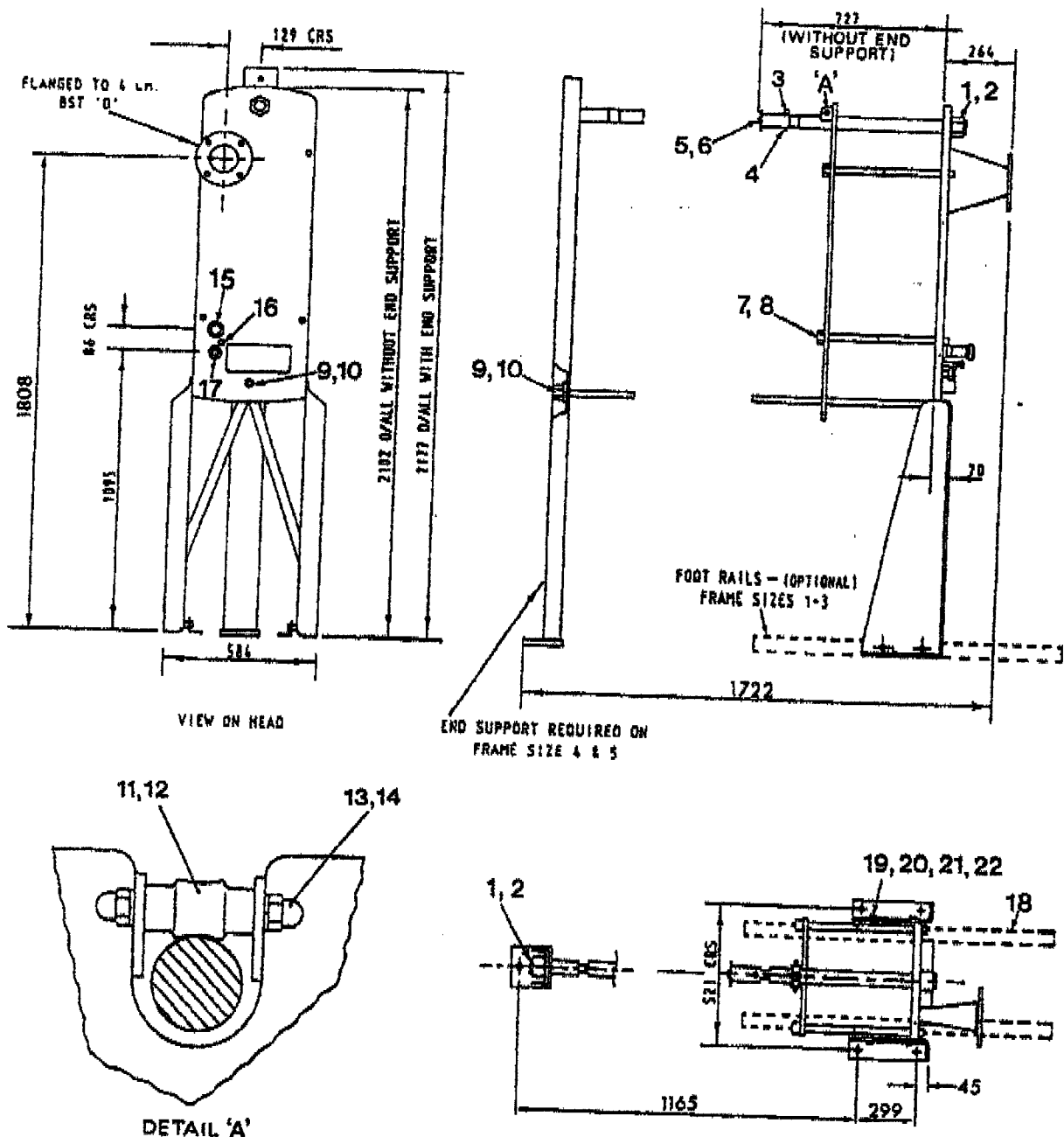
Single effect: steam—600 lbs/hr water—60 gpm at 70°F  
electric—7 HP



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# LEADING PARTICULARS



- NOTES: (1) All dimensions are in Millimetres except where otherwise stated.  
 (2) 'Bold' numbers are Parts List References. (See Section 7).

Fig. 1 Dimensional Details

TABLE 1 - PLATE CAPACITIES

Frame Size	Maximum Number of Plates
1	16
2	28
3	40
4	72
5	100

1. PLATE DATA

Plate Material	316 S16 Stainless Steel
Plate Gauge	20 swg
Water Capacity of 1 plate unit:	
4 plate unit	16 lb
6 plate unit	24 lb

2. CONNECTIONS

Product Feed Inlet	1½ in RJT
Condensate Outlet	1 in RJT
Non-Condensibles Outlet	5/8 in Realm

## SECTION 1 - DESCRIPTION

### 1. GENERAL

(1) The Super Junior Plate Evaporator is a single-pass plate heat exchanger in which the process of evaporation occurs by boiling inside a pack of flat vertical plates clamped together in a frame by four tie-bars and sealed around the edges by elastomer gaskets. The liquid feed enters the unit continuously and the final concentrate and evaporated vapour are drawn off continuously. Although the plate pack operates as a single pass, a limited amount of external re-circulation is sometimes necessary under certain conditions.

(2) The frame is available in five sizes and extra plate units can be added at a later stage, in situ, up to the design maximum. Plate unit capacities for each size of frame are given in Table 1, Leading Particulars.

### 2. FRAME

(1) The frame consists of the following main members constructed in carbon steel, unless otherwise stated, and finished in zinc-rich primer and top coats of Silicone Alkyd - Polyurethane Extended Enamel.

(a) A floor-standing vertical head plate containing all product and service connections. A stainless-steel steam facing plate is welded to the inner face and accepts a standard steam plate gasket.

(b) A stainless-steel top bar which terminates in a stop plate on Frame Sizes 1 to 3 and connects to an end support on Frame Sizes 4 and 5.

(c) A stainless-steel bottom bar, cantilevered from the head on Frame Sizes 1 to 3 and connected to an end support on Frame Sizes 4 and 5.

(d) A floor-standing vertical end support for Frame Sizes 4 and 5.

(e) A follower plate suspended from the top bar on a roller assembly to enable it to move freely along the bar. A stainless-steel steam facing plate is welded to the inner face and this plate accepts a standard steam plate gasket. The follower compresses the plate pack against the head by means of:

(f) Four stainless-steel tie-bars which pass through holes in the follower and are screwed into threaded holes in the head. The tie-bars are in the form of hexagon-head bolts at the follower end. A thrust washer fits between the hexagon bolt and the follower.

(2) A set of foot rails and fittings can be supplied as optional extras, if required, for the frames without an end support. These give extra stability to the cantilever-type Frames 1 to 3.

### 3. PRODUCT AND SERVICE CONNECTIONS

(1) All connections are fitted on the head plate. Details are given under LEADING PARTICULARS.

### 4. PLATES

(1) The plates are arranged in units, a standard unit consisting of two steam plates and two product plates for a 1 Up/1 Down arrangement, but other units are available for special applications.

(2) The plates each have five basic ports comprising a product feed port, a steam port, a concentrate/vapour outlet port, a condensate port and a non-condensibles port. In addition, certain plates incorporate a product transfer port as described below.

Type A  
(JIAS) Steam is admitted to the plate through the steam port and condensate and non-condensibles leave through their respective ports.

Type B  
(JIBS) This is a product UP plate. Product enters through the product feed port, boiling takes place and the evaporating liquid is carried vertically UPWARDS to a transfer port at the top of the plate.

Type C  
(JICS) This is a steam plate similar to plate type A, but it incorporates a gasketed product transfer port at the top.

Type D  
(JIDS) This is a product DOWN plate. The partially concentrated product and vapour enters the plate at the top, via the transfer port in the adjacent steam plate, and passes DOWNWARDS where, in its finally concentrated form, it leaves, together with the vapour, through the large port at the bottom of the plate.

Type E  
(JIES) This is a product DOWN plate, similar to type D, but incorporates a product transfer port at the top.

Type F  
(JIFS) This is a steam plate, similar to plate type A, but incorporates a gasketed product transfer port at the top.

Type G  
(JIGS) This is a product UP plate, similar to plate type B, but without a transfer port.