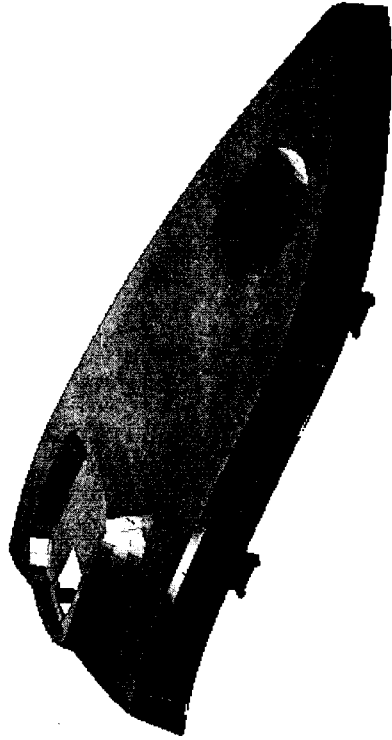


사출성형에서 Cycle Time 감소를 위한
Sprue, Runner 설계 방법의 개선



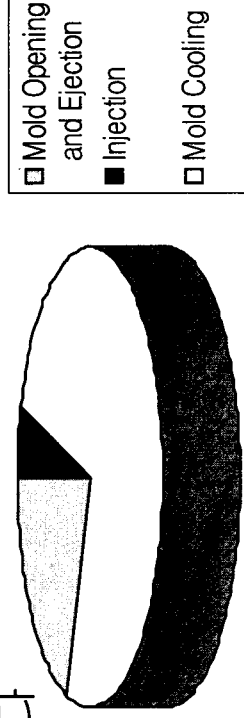
연두희, 노우준

㉞ 韓國大東電子工業(株) 金型工場

目的

- 사출해석을 통한 Sprue, Runner의 설계 방법 개선
 - Runner의 크기는 경험적으로 크게 만든다
 - 금형 설계 방법의 개선으로 Sprue, runner를 작게 만들 수 있다
 - Sprue, Runner가 작으면 냉각이 빨라 Cycle Time을 단축할 수

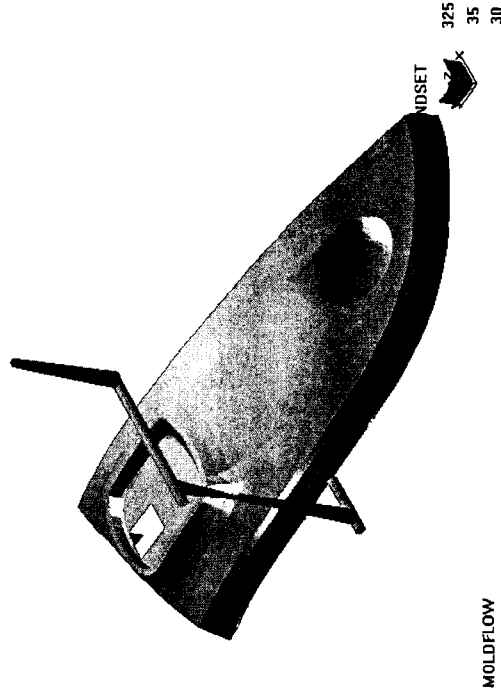
있고, 또한 재료비도 절약할 수 있다



Total Cycle Time

目次

- 成形性検討
 - Runner Diameter
 - 流動(Fill Time)
 - 壓力(Pressure)
 - 溫度(Temperature)
- Cycle time
 - 硬化(Frozen Layer)
 - Cycle time



製品Model

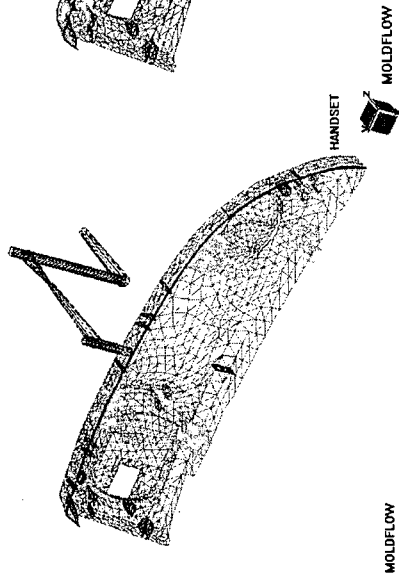
Model Name : Facsimile receiver set

Mesh Element : 3,855

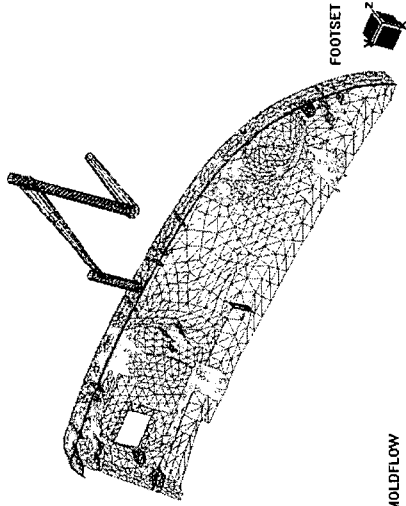
Node : 2,019

Volume : 75.14 cm³

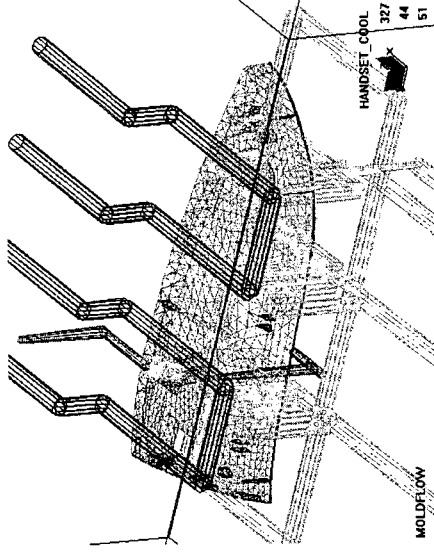
Resin : PS



Case1

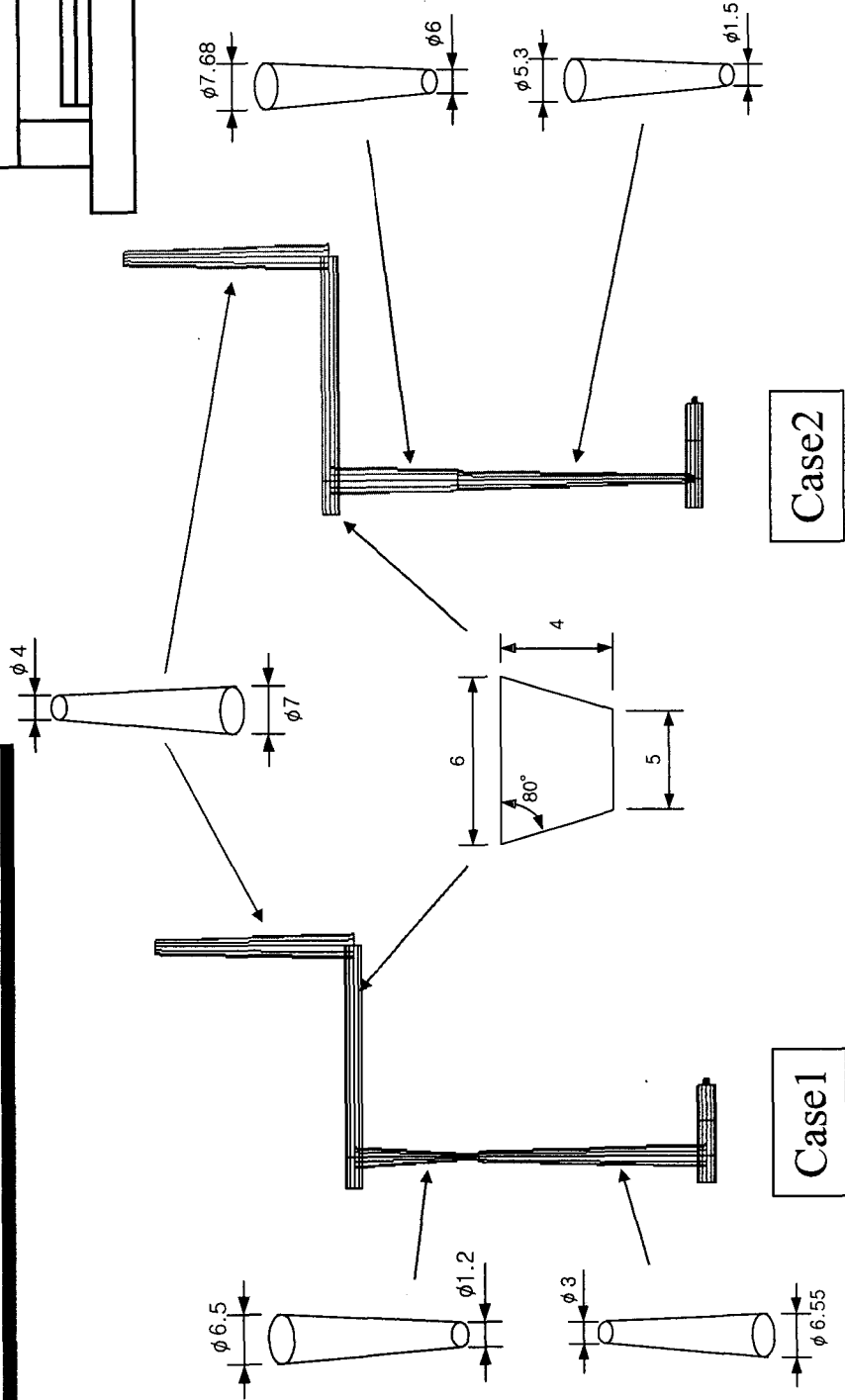
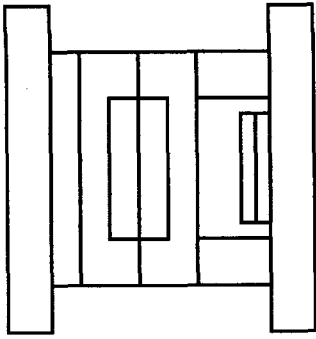


Case2

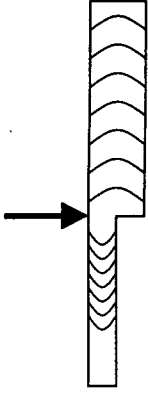


Cool Design

Runner Diameter

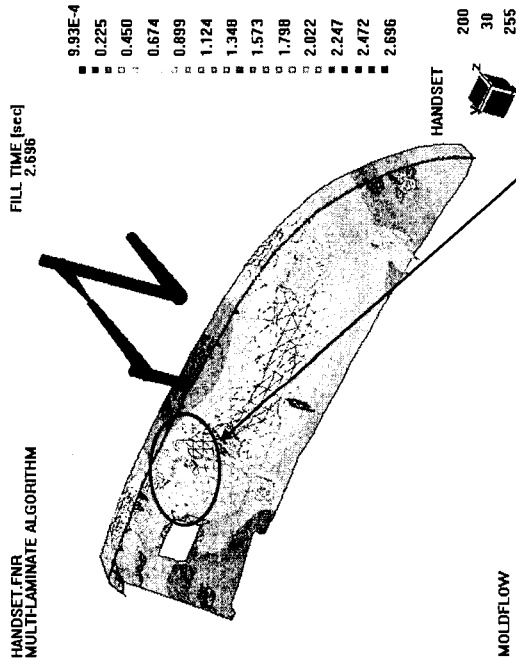
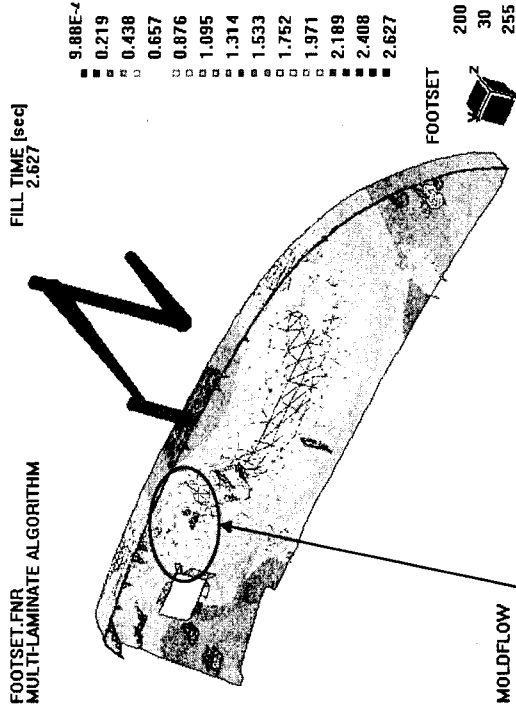


流動(Fill Time)



Fill time : 2.62 Sec

Fill time : 2.69 Sec



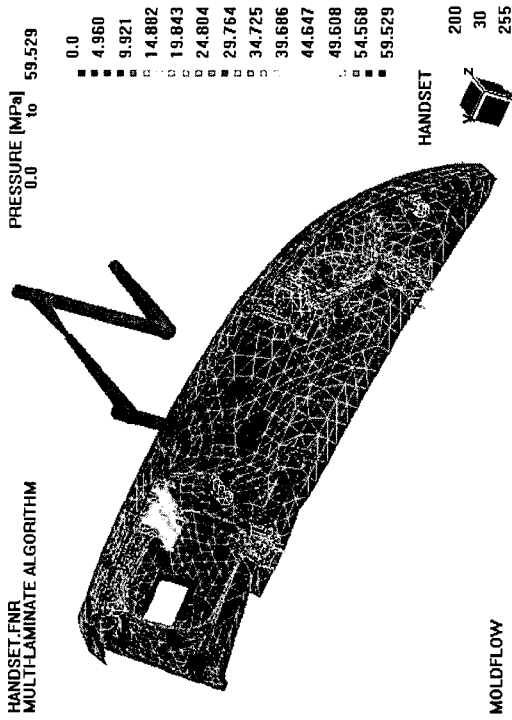
Case2

Case1

Rib部分 流動 停滯 注意

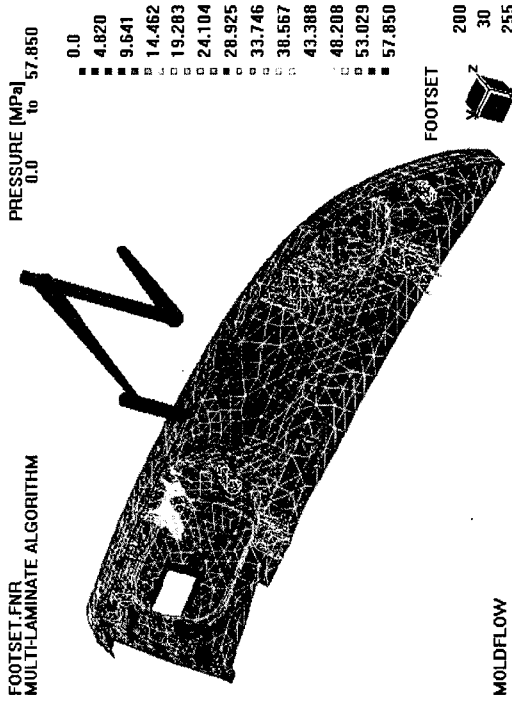
壓力(Pressure)

Pressure : 59.53 MPa
Clamp Force : 39.41 ton



Case1

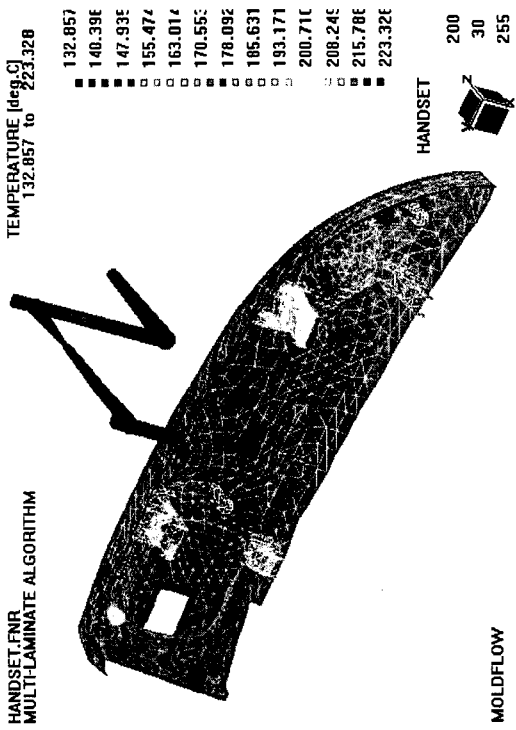
Pressure : 57.85 MPa
Clamp Force : 39.07 ton



Case2

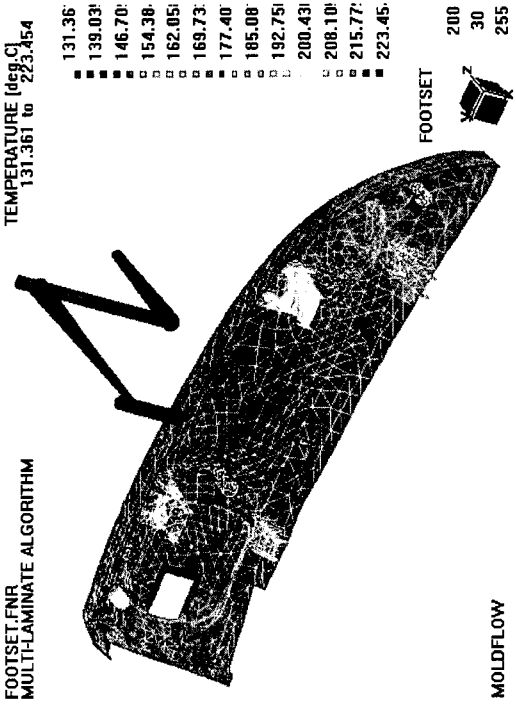
温度(Temperature)

Temperature : 132.85 ~ 223.32℃



Case1

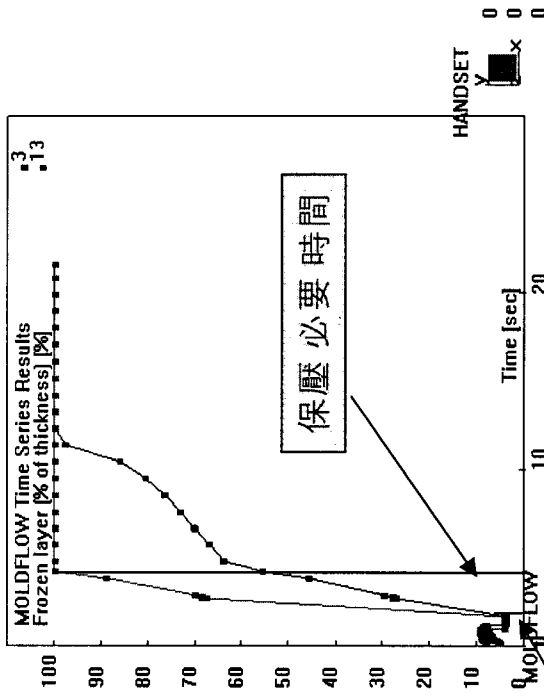
Temperature : 131.36 ~ 223.45℃



Case2

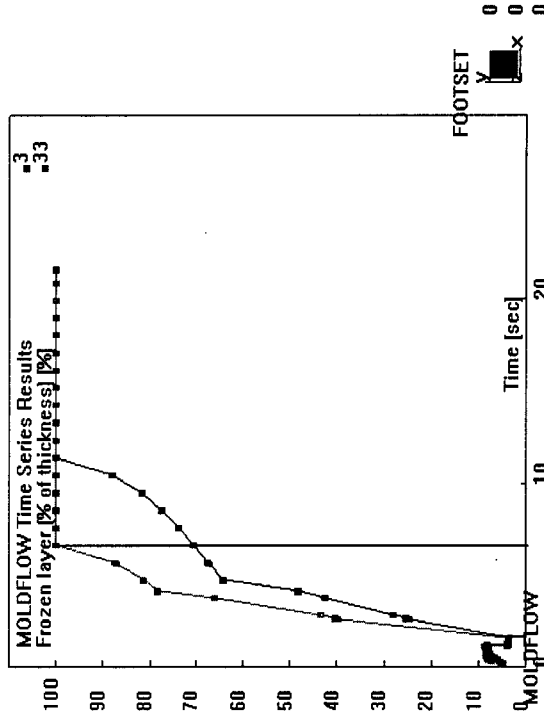
Frozen Layer of Gate

Frozen Layer of Gate : 4.2sec
(Need Time of Hold Pressure : 2.7sec)



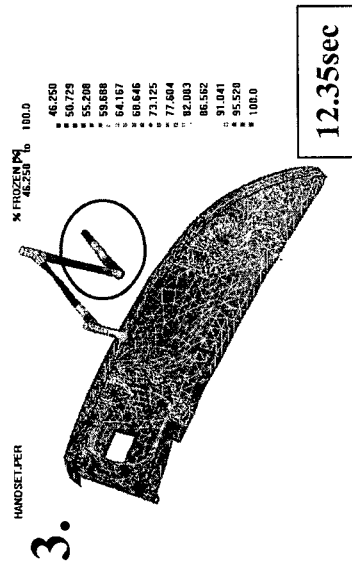
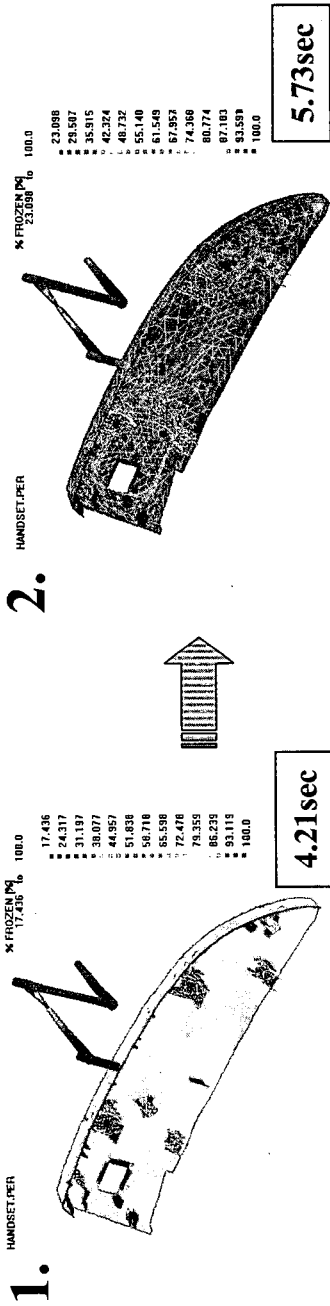
Case1

Frozen Layer of Gate : 4.7sec
(Need Time of Hold Pressure : 3.2sec)



Case2

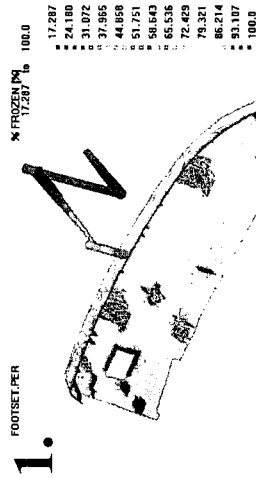
Frozen Layer(Case1)



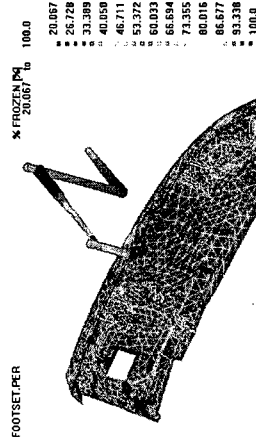
1. Cavity에 樹脂 充填 直後 硬化率は 50% 정도이다.
2. 5.73sec에 Cavity의 硬化率は 95%, Sprue는 35%정도로 取出이 곤란한 상태이다.
3. 12.35sec에 sprue 硬化率が 65%로 取出이 가능하다.

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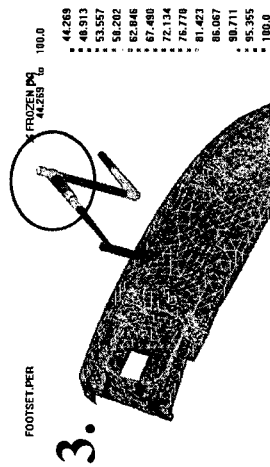
Frozen Layer (Case2)



4.76sec



5.70sec



14.26sec

1. Cavity에 樹脂 充填 直後 硬化率は 50% 정도이다.
2. 5.70sec에 Cavity의 硬化率は 95%, Sprue는 35%정도로 取出이 곤란하다.
3. 14.26sec에 runner 硬化률이 65%로 取出이 가능하다.

Cycle Time(Case1,2)

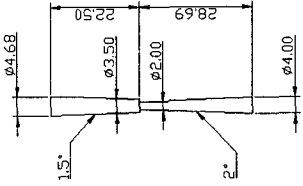
• Cycle Time 條件

單位 : sec

	Case1	Case2
	2段 Runner	Straight Runner
充填時間	2.6	2.6
保壓時間	2.7	3.2
<u>冷却時間</u>	<u>7.0</u>	<u>8.4</u>
金型 關閉	10.0 - α	10.0

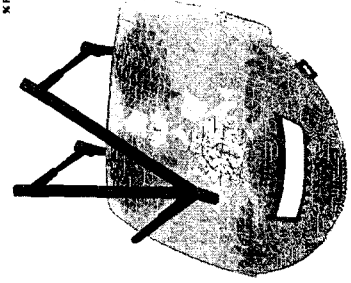
Cycle Time 22.3 24.2

Frozen Layer(Case3)



- Other Model : CD player upper case
- Mesh Element : 5,369
- Node : 2,849
- Volume : 42.12 cm³
- Resin : PC

1.



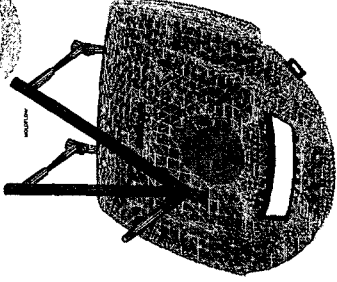
* FROZEN PM to 100.0
2.358

■	2.386
■	11.079
■	15.163
■	22.747
■	35.338
■	42.414
■	51.498
■	55.581
■	67.665
■	75.749
■	83.832
■	91.916
■	100.0

2.35sec



2.



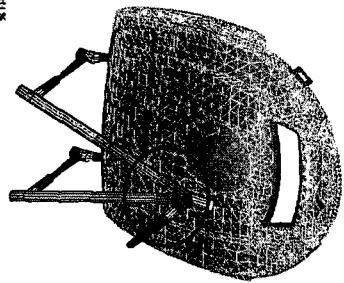
* FROZEN PM to 100.0
7.875

■	25.093
■	31.340
■	37.587
■	43.834
■	50.081
■	56.327
■	62.574
■	68.821
■	75.067
■	81.274
■	87.516
■	93.758
■	100.0

7.87sec



3.



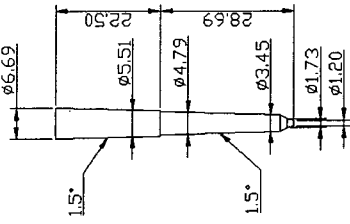
* FROZEN PM to 100.0
43.622

■	49.822
■	54.004
■	58.185
■	62.367
■	66.548
■	70.730
■	74.911
■	79.092
■	83.274
■	87.455
■	91.637
■	95.818
■	100.0

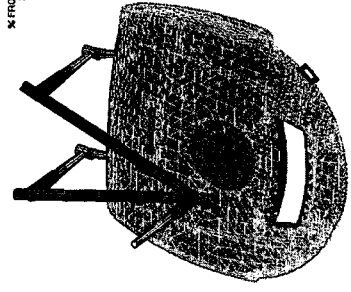
13.95sec

1. Cavity에 樹脂 充填 直後 硬化率は 50% 정도이다.
2. 7.87sec에 Cavity의 硬化率は 95%, Sprue는 35%정도로 取出이 곤란한 상태이다.
3. 13.95sec에 sprue 硬化률이 65%로 取出이 가능하다.

Frozen Layer(Case4)

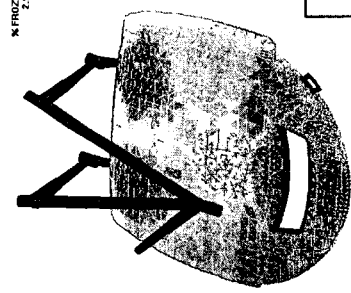


2. 2.375 to 100.0
- 24.206
 - 30.572
 - 36.938
 - 43.315
 - 49.671
 - 55.787
 - 62.103
 - 68.419
 - 74.735
 - 81.051
 - 87.367
 - 93.683
 - 100.0



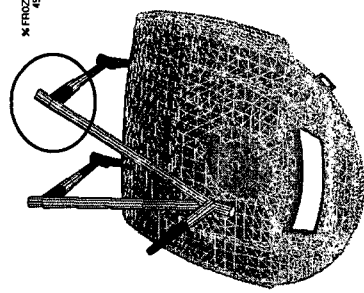
7.87sec

1. 2.375 to 100.0
- 2.975
 - 11.061
 - 19.146
 - 27.232
 - 35.317
 - 43.402
 - 51.488
 - 59.573
 - 67.658
 - 75.744
 - 83.829
 - 91.914
 - 100.0



2.23sec

3. 49.390 to 100.0
- 49.390
 - 51.697
 - 57.825
 - 62.042
 - 64.260
 - 70.477
 - 74.695
 - 76.912
 - 83.130
 - 87.347
 - 91.565
 - 95.782
 - 100.0

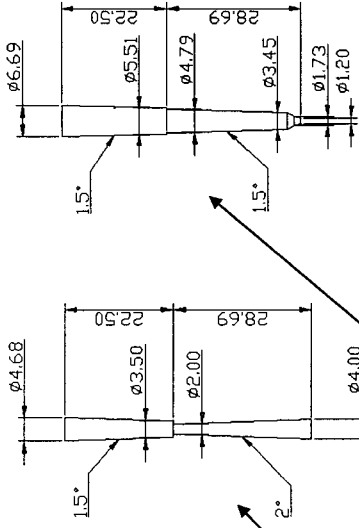


15.41sec

1. Cavity에 樹脂 充填 直後 硬化率は 50% 정도이다.
2. 7.87sec에 Cavity의 硬化率は 95%, Runner는 35%정도로 取出이 곤란한 상태이다.
3. 15.41sec에 runner 硬化率が 65%로 取出이 가능하다.

Cycle Time(Case3,4)

• Cycle Time 條件



單位 : sec

Case3

2段 Runner

充填時間	2.4
保壓時間	3.1
冷却時間	<u>8.4</u>
金型閉閉	10.0 - α

Case4

Straight Runner

充填時間	2.3
保壓時間	3.2
冷却時間	<u>9.9</u>
金型閉閉	10.0

Cycle Time

23.9

25.4

結 論

- 成形性
 - Fill time, Pressure, Temperature
 - 근소한 차이
- Fill time(Case1,2)
 - Rib 部分 流動 停滯 注意
Gate가 가까운 곳에 얇은 리브
- Cycle Time 短縮(Case1, Case3)
 - Sub Runner는 2段쪽이 양호

